Draft wood bison recovery plan

Alberta species at risk recovery plan

DRAFT VERSION March 2026

Alberta

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Abbreviations

Acronym	Definition
AB	Alberta
ABMI	Alberta Biodiversity Monitoring Institute
ACFN	Athabasca Chipewyan First Nation
AEP	Alberta Environment and Parks
APOS	Alberta Professional Outfitters Society
BC	British Columbia
BIG	Bison Integrated Genomics
BNP	Banff National Park
CFIA	Canadian Food Inspection Agency
DNA	Deoxyribonucleic Acid
DRFN	Doig River First Nation
ECCC	Environment and Climate Change Canada
EINP	Elk Island National Park
EPA	Alberta Environment and Protected Areas
GoA	Government of Alberta
GPS	Global Positioning System
HUC	Hydrologic Unit Code
IGRA	Interferon Gamma Release Assay
LRRCN	Little Red River Cree Nation
MCF	Malignant Catarrhal Fever
MCFN	Mikisew Cree First Nation
PC	Parks Canada
RIG	Recovery Implementation Group
RLBH CMB	Ronald Lake Buffalo Herd Cooperative Management Board
RSF	Resource Selection Function
SARA	*Species at Risk Act*
WBNP	Wood Buffalo National Park
WMU	Wildlife Management Unit

Recovery Planning in Alberta

Albertans are fortunate to share their province with an impressive diversity of wild species. Populations of most species of plants and animals are healthy and secure. However, a small number of species are either naturally rare or are now imperiled because of human activities or natural processes. Alberta Species at Risk recovery plans establish a basis for cooperation among government, Indigenous communities and organizations, industry, conservation groups, landowners, and other stakeholders to ensure these species and populations are restored or maintained for future generations of Albertans.

Alberta has a robust provincial recovery program to support its commitments to the federal/provincial *Accord for the Protection of Species at Risk* and the *National Framework for the Conservation of Species at Risk*, and its requirements established under Alberta's *Wildlife Act* and the federal *Species at Risk Act*. An overall goal of the program is to restore species identified as Threatened or Endangered to viable, naturally self-sustaining populations within Alberta.

Alberta Environment and Protected Areas is committed to providing opportunities for Indigenous communities and organizations, stakeholders, and the Alberta public to provide their perspectives and influence plan content during recovery planning. The process for how Albertans are engaged can vary based on the socio-economic and conservation issues and the level of interest expressed. Draft recovery plans are posted online for public comment for at least 30 days. Following public review, Alberta's Endangered Species Conservation Committee reviews draft plans and provides recommendations on their acceptability to the Minister of Environment and Protected Areas. Plans accepted and approved for implementation by the Minister are published as a provincial government recovery plan. Approved plans are a summary of the Ministry of Environment and Protected Areas' commitment to work with involved stakeholders to coordinate and implement conservation actions necessary to restore or maintain vulnerable species.

Recovery plans include two main sections: (1) a situational analysis that highlights the species' distribution and population trends, threats, and conservation actions to date; and (2) a recovery section that outlines goals, objectives, associated broader strategies, and specific priority actions required to maintain populations and their distribution and enable recovery of Threatened or Endangered species. Each approved recovery plan undergoes regular review and at that time, progress on implementation is evaluated. Implementation of each plan is subject to internal and external resource availability.

Recovery plans are systematically reviewed as needed. Where there are large changes in the goals, objectives, or strategy sections due to a new understanding or circumstance, a plan may need to be redrafted, consulted on, reviewed by the Endangered Species Conservation Committee, and the changes approved by the Minister.

Acknowledgements

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In particular, we would like to thank Environment and Protected Areas staff (Natalka Melnycky, David Johns, Curtis Stambaugh, Troy Hegel, Janine Higgins, Robyn Rush, Angela Rideout, Brandi Arndt, and Sheri Pidhirney) that variously helped organize and deliver workshops and assisted in developing, writing and editing sections of the Recovery Plan and help with communications and organizing public engagement. Lyle Fullerton retired part way through the Recovery Plan development but his sage council based on his long career working with the wildlife and communities in northern Alberta, was greatly appreciated and informed many aspects of the planning process and plan content.

Executive Summary

Introduction of disease (bovine brucellosis and bovine tuberculosis) into wood bison populations in Wood Buffalo National Park in the 1920s has dominated the management of wood bison within Alberta. These diseases are a significant threat to the livestock industry in Alberta. Of the five bison populations that spend the majority of their time in Alberta's jurisdiction (Etthithun, Hay-Zama, Ronald Lake, Wabasca and Wentzel), only the Wentzel population is confirmed to be diseased. Alberta established a comprehensive wood bison disease management program in 2010 with improved testing, surveillance, and monitoring continuing to present day. One of the major findings of this program was that the Ronald Lake and Wabasca populations were disease-free. Prior to this program, the Ronald Lake and Wabasca populations were assumed by GoA staff to be diseased, due to their close proximity to the diseased animals in Wood Buffalo National Park. These disease-free populations are important for the overall recovery of wood bison.

Wood bison have been listed as Threatened under the federal *Species at Risk Act* since 2003. Alberta released a status report update in 2017, and a federal recovery strategy was released in 2018. In 2021, the Alberta Wildlife Regulation was amended to designate wild wood bison as Threatened in identified Wildlife Management Units within northern Alberta. The status change was intended to provide protection for disease-free bison populations in Alberta. With this change in status came the need for a provincial recovery plan.

Alberta continues to advocate for the complete eradication of bovine brucellosis and tuberculosis diseases from Alberta and the federally managed WBNP populations while identifying shorter-term conservation actions to enhance the sustainability of Alberta's disease-free populations.

Population Status

The disease-free populations (Etthithun, Hay-Zama, Ronald Lake, Wabasca) are the focus of this Recovery Plan. The Etthithun and Hay-Zama populations are the result of past conservation reintroductions, while the Ronald Lake and Wabasca populations are considered natural origin. The Etthithun, Hay-Zama, and Ronald Lake populations show stable or increasing population trends, while the Wabasca population is declining and at risk of extirpation.

Threats

Risk of disease exposure is high for the Ronald Lake and Wabasca populations, due to their proximity to Wood Buffalo National Park. Past lethal disease sampling and harvest prior to protections likely contributed to declines of the Wabasca and Ronald Lake populations. Wood bison populations are subject to different land-uses within and near Wood Bison Ranges, which could result in different forms of habitat alteration or loss. Establishment of additional anthropogenic disturbance (e.g., linear features) that could promote movement to areas of higher disease risk, or result in increased human conflict (e.g., removal of individuals or vehicle collisions) are especially important to consider.

Recovery Goals and Objectives

The long-term goal for wood bison recovery in Alberta is to achieve self-sustaining[1] wild, disease-free populations that provide ecological benefits, contribute to food security for Indigenous peoples and harvest opportunities for Albertans. Each population of wood bison in Alberta occurs in a unique conservation and socio-cultural context requiring that each have its own recovery objective.

- It is expected that the Hay-Zama and Etthithun populations will eventually merge due to growth and expansion of the Etthithun population. The objective for the combined Hay-Zama/Etthithun population is for the population to increase to 1,000 individuals within the next decade, as long as disease risk and human conflict are effectively managed.

[1] For this Recovery Plan, the words "self-sustaining" means that the population on average demonstrates stable or positive population growth over the short-term (≤ 20 years) and is large enough to withstand stochastic events and persist over the long-term (≥ 50 years), without the need for ongoing active management intervention (Environment Canada 2011). It will not be possible for Alberta's disease-free wood bison populations to be fully self-sustaining until the threat of tuberculosis or brucellosis infection has been eliminated.

- The objective for Wabasca is for the population to stabilize and become self-sustaining and for the disease risk from neighboring diseased populations to be effectively contained or eliminated.
- The objective for Ronald Lake is for the population to increase or stabilize, and become self-sustaining, while contributing to cultural connections, maintaining the disease-free status and health of the population, maintaining habitat within the current range, and allowing opportunity for the population to expand its distribution.
- The objective for Wentzel is to continue to manage the risk and spread of brucellosis and tuberculosis by restricting the population's distribution and abundance through harvest.

Habitat Needed to Support Recovery

Recommendations on land-use were made specific to the unique context (population status, disease risk, land-use context, and available habitat) of each Wood Bison Range. Achieving recovery objectives for all disease-free populations may require an area extending beyond current Wood Bison Ranges. Development of these "Support Areas" was based on watersheds surrounding current disease-free Wood Bison Ranges.

Recovery Strategies and Actions

Key actions and strategies needed to mitigate the key threats and other barriers to recovery and achieve the population and distribution objectives for each population include:

- Maintaining and enhancing disease surveillance and containment activities.
- Contributing to efforts to eliminate disease in wild wood bison including vaccination and potential removal of diseased individuals and replacement with disease-free and genetically appropriate individuals.
- Reducing bison-human conflict through partnering with municipalities, Indigenous communities and organizations, and local community organizations and establishing a conflict mitigation program.
- Continued management of wood bison harvest.
- Improved engagement with Indigenous and stakeholder groups.
- Public education on conservation issues facing wood bison.
- Maintaining or enhancing disease-free populations, including reinforcement of the Wabasca population and potential reintroduction of new populations.

Process for Plan Development

A phased approach was used in developing the Recovery Plan that began with engagement with representatives from Indigenous communities and organizations. Three groups were engaged; one focused on the Hay-Zama/Etthithun populations, one focused on the Wabasca population, and one focused on a region to the south of the Wabasca population within historical wood bison distribution. The organizations that participated in this engagement were: Beaver First Nation, Bigstone Cree Nation, Dene Tha' First Nation, Doig River First Nation, Duncan's First Nation, Fort Vermilion Métis Local 74, Little Red River Cree Nation, Paddle Prairie Métis Settlement, Peerless Trout First Nation, and Tallcree First Nation.

Initial ideas for the draft Recovery Plan were discussed with stakeholders with a longstanding interest in wood bison management such as domestic livestock organizations (Alberta Beef Producers, Canadian Bison Association, Bison Producers of Alberta), local counties and municipalities (Mackenzie County, County of Northern Lights, Regional Municipality of Wood Buffalo), local conservation groups (ShagowAskee Foundation), the Alberta Professional Outfitters Society and internally by other GoA departments.

Engagement on the Ronald Lake population was primarily through the Ronald Lake Buffalo Herd Cooperative Management Board (RLBH CMB; Section 1.2). Communities and organizations that are represented on the RLBH CMB were not engaged directly on this Recovery Plan. The RLBH CMB is concurrently developing a Management Plan for the Ronald Lake population, and content from this draft Management Plan guided development of applicable sections of this Recovery Plan.

Meetings were organized and facilitated by Pat Fargey and summary notes developed by Scott Wilson, Angela Rideout, Brandi Arndt, and Taramarie Turnbull. The drafting of the Recovery Plan was done by Pat Fargey and Scott Wilson, with input from GoA staff: Curtis Stambaugh, Troy Hegel, David Johns, and Natalka Melnycky.

1.0 Introduction

Since the introduction of bovine brucellosis (*Brucella abortus*) and bovine tuberculosis (*Mycobacterium bovis*)[2] into Wood Buffalo National Park (WBNP) in the 1920s, lowering transmission risks of these diseases has been the main focus of wood bison (*Bison bison athabascae*) management in Alberta (Section 2.2). These diseases are reportable (i.e., mandatory by law to report to the Canadian Food Inspection Agency [CFIA]) and are a significant threat to the livestock industry in Alberta. Of the five bison populations that spend the majority of their time in Alberta's jurisdiction (Section 2.1.2), only the Wentzel population is confirmed to be diseased (Section 2.2.2.2). Due to the close proximity of the disease-free Wabasca and Ronald Lake populations to the diseased animals in WBNP, until the mid-2000s it was assumed that these populations were diseased. The Government of Alberta (GoA) purposefully withholds the protections typically afforded to wildlife under the Alberta *Wildlife Act* and Wildlife Regulation for wood bison populations that have had the presences of these two diseases confirmed. This enables harvest pressure, referred to in the Recovery Plan as "unregulated harvest", to assist in restricting the distribution of diseased wood bison populations. The GoA continues to advocate for the complete eradication of bovine brucellosis and tuberculosis diseases from Alberta and the federally managed WBNP populations while identifying shorter-term conservation actions to enhance the sustainability of Alberta's disease-free populations (see Section 2.2.2.2 for more context and definition of "disease-free" status).

1.1 Status

1.1.1 Federal Status

Wood bison have been listed as Threatened under the federal *Species at Risk Act* (*SARA*) since 2003. Prior to the federal *SARA*, the Committee on the Status of Endangered Wildlife in Canada has listed wood bison as Endangered in 1978, Threatened in 1988, and further down-listed to Special Concern in 2013. A revised status report and assessment is scheduled for April 2026.

1.1.2 Prior to Provincial Status Changes (2021)

Prior to November 2021, a limited number of wild bison populations were recognized and protected under Alberta's *Wildlife Act* and Wildlife Regulation for specific populations and geographic areas. The Hay-Zama population was listed as Endangered in 1994 within a defined area of northwestern Alberta (Figure 1). The Ronald Lake population was listed as a Subject Animal within the identified Ronald Lake Special Bison Area in 2016. Other populations found on provincial lands with no protection or status included the Wabasca, Wentzel, Etthithun, and bison found on provincial Crown lands adjacent to WBNP. Bison within WBNP occur within a number of sub-populations and are listed nationally under *SARA* and fall under the jurisdiction of federal agencies. Additional background can be found in Status of the American Bison (*Bison bison*) in Alberta: Update 2017 (AEP and ACA 2017) as well as the Recovery Strategy for the Wood Bison (*Bison bison athabascae*) in Canada (ECCC 2018b).

1.1.3 Imminent Threat Assessment

Concerns over protection deficiencies for Alberta's disease-free wood bison and their habitat resulted in an Imminent Threat Assessment by Environment and Climate Change Canada. An Imminent Threat Assessment is a process used to assess whether there are threats to the survival and recovery of a species such that it is warranted to use the emergency provisions of the federal *Species at Risk Act*. Following the Imminent Threat Assessment, the federal Minister of Environment released his opinion in January 2020 (ECCC 2021), that wood bison faced imminent threats, such that immediate intervention was required to allow for recovery. This finding led to a negotiated draft agreement under Section 11 of the *SARA* between the Government of Canada and GoA, to promote recovery of wood bison, specifically focusing on the Wabasca and Ronald Lake populations. The draft

[2] Throughout this document, these diseases will be referred to as simply "brucellosis" and "tuberculosis". "Diseased" bison refers to presence of these diseases in the population.

agreement was consulted on[3]. Section 2.4 provides additional information on the imminent threats facing these two populations.

1.1.4 Provincial Status Changes (2021)

GoA made an amendment to the Wildlife Regulation in November 2021 designating wild wood bison as Threatened in identified Wildlife Management Units (WMUs) within northern Alberta. The intention was to provide protections to disease-free wood bison, and areas that have potential to support wood bison (Figure 1). With this change came the need for a provincial recovery plan for wood bison.

The Wildlife Regulation amendments maintained the existing Northwest Bison Protection Area and established a new Wabasca Bison Protection Area (Figure 1). Bison Protection Areas prohibit all harvest of bison without issuance of a specified Bison Special Licence.

WMUs including, and adjacent to, disease-free bison populations were included as part of the Threatened designation and afford regulatory protection to wild bison found within these designated WMUs. This designation protects wood bison from hunting in the specified WMUs by people other than those with Indigenous-specific hunting rights such as Treaty rights. That is, unless a licence is issued under the regulation to specifically enable hunting.

For those with Indigenous-specific hunting rights such as Treaty rights, bison hunting regulations in the Northwest Bison Protection Area remain the same; such Indigenous persons require a licence to hunt bison in this Protection Area. All hunting of bison in the Wabasca Bison Protection Area is now in effect prohibited because no licences are issued.

1.2 Ronald Lake Buffalo Herd Cooperative Management Board

Indigenous peoples of the Lower Athabasca Region have a long-standing cultural relationship with the Ronald Lake Buffalo Herd[4]. Representatives from local communities and organizations have emphasized the importance of the herd as it is genetically distinct, representative of wood bison, and disease-free.

Teck Resources Limited applied to the Alberta Energy Regulator for the Frontier Oil Sands Mine Project in November 2011 and submitted an updated application in June 2015. The proposed mine site would have occupied a significant portion of the home range of the Ronald Lake Buffalo Herd. The mine was recommended in the July 2019 Joint Panel Review report, but it was recognized that the Teck Frontier Oil Sands Mine and other industrial activities in the area have the potential to negatively affect the Ronald Lake population by displacing them and increasing their exposure to diseased bison in WBNP. The company withdrew its application in February 2020, a few days before the Federal Government Cabinet decision on whether to approve the project was announced.

Concerns about approval of this mine catalyzed a shift in management of the herd. From 2016 onwards, wood bison within the Ronald Lake Special Bison Area were listed as “Subject Animals” under the *Wildlife Act* and Wildlife Regulation, which protects them from unlicensed hunting by any person other than by individuals with Indigenous-specific harvesting rights, when they are hunting for food. The Ronald Lake Buffalo Herd Cooperative Management Board (RLBH CMB) was established in 2019 by Ministerial Order (19/2019) to advise the Minister of Environment and Protected Areas (EPA):

“On matters related to the long-term sustainability of the Ronald Lake Bison Herd, including sustainability of Indigenous traditional use of and cultural connection to the herd. In developing its recommendations the Board shall consider both Indigenous Knowledge and Western Science.”

The RLBH CMB includes representatives from local Indigenous organizations, and other stakeholders. This is the first time a cooperative management approach to managing a wildlife population has been taken in Alberta. Details on the history of the RLBH CMB are available online in the Terms of Reference for the RLBH CMB. The RLBH CMB had its first meeting in 2021.

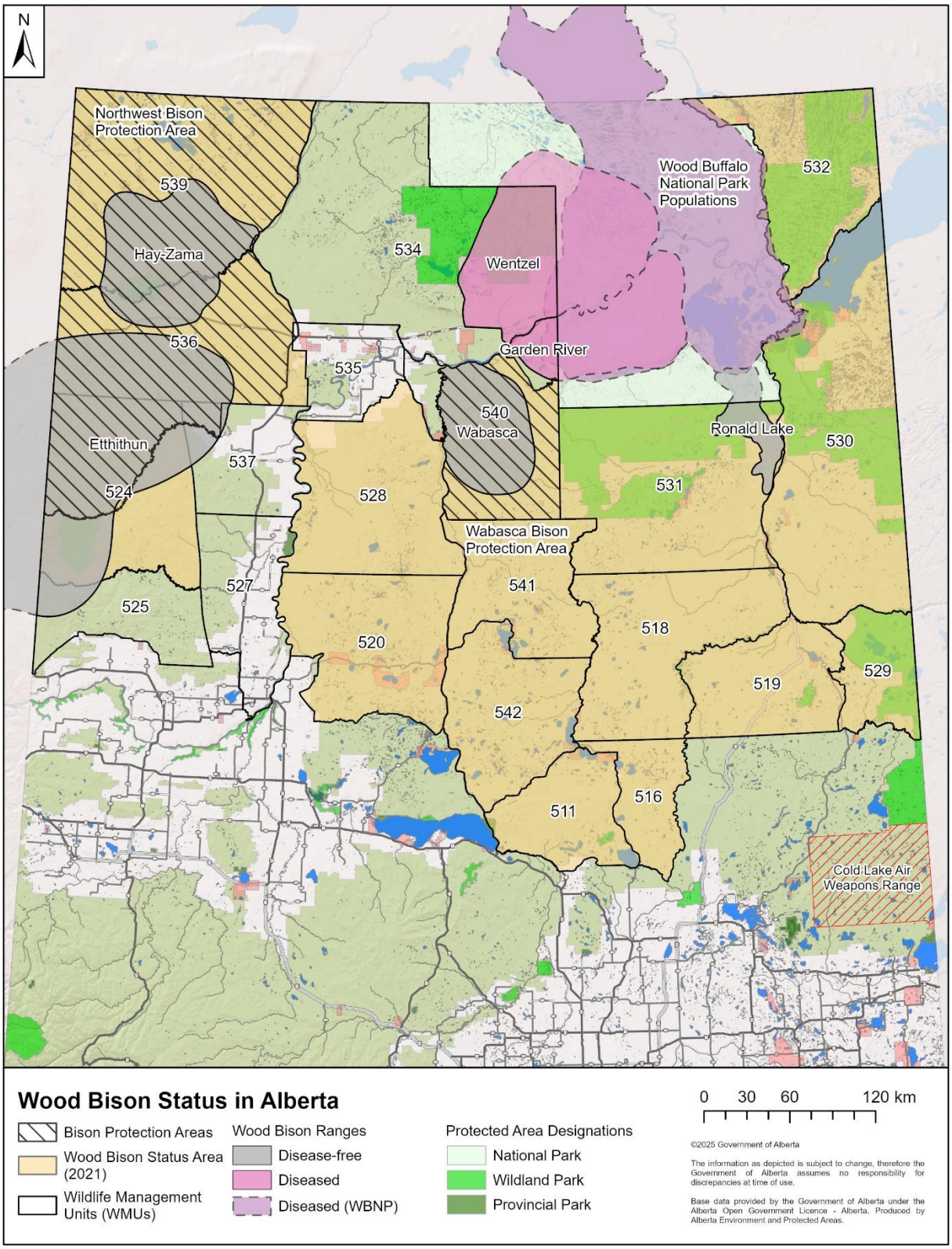
[3] https://www.alberta.ca/bison-conservation-agreement-engagement

[4] Note: “Buffalo Herd” is the preferred terminology for Cooperative Management Board members.

The RLBH CMB is concurrently developing a Management Plan as its advice to the Minister of EPA on the management of the Ronald Lake Buffalo Herd, and to guide its own work priorities.

This Recovery Plan and the Ronald Lake Buffalo Herd Management Plan are intended to be complementary. Although there has been effort to align advice in the Management Plan and the Recovery Plan, the Management Plan is more detailed, and representative of the priorities identified by the RLBH CMB. If there is difference in advice in the Management Plan and Recovery Plan specific to the Ronald Lake population, more detailed advice in the Management Plan should be considered.

Figure 1. Wildlife Management Units and associated wood bison status in Alberta. The Wood Buffalo National Park population range is approximate and is in the process of being updated.



2.0 Situational Analysis

Wood bison biology, population status, and management history were reported in the Status of American Bison in Alberta (AEP and ACA 2017), the federal Status Report (COSEWIC 2013), and the federal Recovery Strategy for Wood Bison in Canada (ECCC 2018b). The Situational Analysis in this Recovery Plan focuses on scientific reports, Indigenous Knowledge from existing reports and shared during engagement on this Recovery Plan, and bison monitoring and management activities taken by the GoA and its partners.

2.1 Population Overview

There are five wild populations of wood bison that spend the majority of their time in Alberta's jurisdiction: Etthithun, Hay-Zama, Ronald Lake, Wabasca and Wentzel (Table 1). The Ronald Lake and Wentzel populations overlap both Alberta and WBNP, and the Etthithun populations overlaps both Alberta and BC. There are some WBNP bison populations (e.g., Garden River), whose ranges extend onto provincial land, but are primarily managed by WBNP (Figure 1; Table 1). In addition, the wood bison populations occurring within WBNP, and Elk Island National Park (EINP), are protected by the federal *National Parks Act* and *Species at Risk Act*. This Recovery Plan focuses on management of free-ranging wood bison on provincial land. For populations that overlap multiple jurisdictions, collaboration with these jurisdictions on management of these populations occurs as required.

Table 1. Free-ranging wood bison populations in Alberta.

Population	Alberta Provincial Status	Population Origin	Jurisdiction	Disease Status	Monitoring Types	Most Recent Population Estimate (Year)	Recent (5 – 10 Year) Population Trend
Etthithun	Threatened; regulated hunting within specified portions of Northwest Bison Protection Area.	Reintroduction in British Columbia with individuals from Elk Island National Park, released in 2002 (Rowe and Backmeyer 2006). The population expanded into Alberta as early as 2006.	BC AB	Disease free	• Aerial Surveys • GPS Satellite Collars	200 in AB, 193 in BC (2021)	Increasing
Hay-Zama	Threatened; regulated hunting within specified portions of Northwest Bison Protection Area.	Reintroduction with individuals from Elk Island National Park. Released to the wild in 1993.	AB	Disease free	• Annual Aerial Surveys • GPS Satellite Collars	678 (2025)	Stable. Population maintained through regulated harvest opportunity. See Section 2.3.4 for more details.
Ronald Lake	Threatened; protection from hunting in WMU 531 except for those with Indigenous specific hunting rights.	Natural origin; genetic evidence of past interaction with WBNP population. Range overlaps provincial land and WBNP.	AB PC	Disease free	• Aerial Surveys • (Mark-resight) • GPS Satellite Collars • Remote Cameras	424 (2024)	Increasing
Wabasca	Threatened; protection from Indigenous and non-Indigenous hunting within Wabasca Bison Protection Area.	Natural origin; genetic evidence of past interaction with WBNP population.	AB	Disease free	• Aerial Surveys • GPS Satellite Collars • Remote Cameras	9 (2025)	Decreasing
Wentzel	No Designation; Unregulated hunting except within Caribou Mountains Wildland Provincial Park.	Natural origin; Satellite population of WBNP. Range overlaps provincial land and WBNP.	AB PC	Diseased	• GPS Satellite Collars	179 (2017)	Uncertain

Population	Alberta Provincial Status	Population Origin	Jurisdiction	Disease Status	Monitoring Types	Most Recent Population Estimate (Year)	Recent (5 – 10 Year) Population Trend
Wood Buffalo National Park (including Garden River)	No Designation outside of WBNP where they are protected under the *Canada National Parks Act*; Unregulated hunting but see Wentzel.	Natural origin as well as plains bison introduced in 1920s; Multiple sub-populations within WBNP. Ranges can extend outside of WBNP (e.g., Garden River, Hay Camp, Delta).	PC AB	Diseased	• GPS Satellite Collars (AB and WBNP) • Aerial Surveys (WBNP) • Remote Cameras (WBNP)	Garden River: 982 Little Buffalo: 101 Nyarling: 282 Hay Camp: 424 Delta: 642 (2024 survey conducted by WBNP)	Populations low compared to last 20 years; similar to populations observed in 1990s.

2.1.1 Habitat

This section focuses on use of natural habitats by wood bison; use of anthropogenic habitats by wood bison is discussed in Section 2.4.2. Although variability in habitat selection has been observed across populations, habitats that provide sufficient forage are known to be a key component of wood bison habitat selection, especially in winter (Larter and Gates 1991; Jung 2015b; Strong and Gates 2009; Belanger et al. 2020). Open areas such as wet meadows, riverine cut-offs and oxbows support abundant forage opportunities and are important wintering habitat for wood bison (COSEWIC 2013; AEP and ACA 2017). In comparison to plains bison, wood bison consume primarily sedges and rushes in the winter, while plains bison consume more grasses (Hecker et al. 2025). Graminoids (e.g., grasses, sedges (*Carex sp*.), and rushes (*Juncus sp*.)) form a significant component of wood bison winter diet (Reynolds et al. 1978; Larter and Gates 1991; Jung 2015b; ECCC 2018b). Wet, lowland meadows, or "meadow marsh," and other graminoid wetlands are a preferred winter foraging habitat for wood bison (Reynolds et al. 1978; Larter and Gates 1991; Strong and Gates 2009).

Indigenous Knowledge studies on habitats used by wood bison in Alberta provides valuable information that may reflect preferred habitats prior to declines in population size and changes to the landscape due to anthropogenic disturbance. Several sources of Indigenous Knowledge highlight the importance of wet meadows (i.e., graminoid wetlands), as well as upland meadows for wood bison (Olson et al. 2018; ShagowAskee Foundation 2023).

During summer months, wet-meadow habitats become flooded and become less suitable for bison foraging. Habitat use is more flexible and habitats used include shrubby areas (e.g., willow savannas), forested habitats, and drier graminoid-dominated areas found along watercourses, riparian areas, or wetland margins (Reynolds et al. 1978; Larter and Gates 1991; Belanger et al. 2020; Thomas et al. 2021). In late-summer and early fall, wood bison diet is also supplemented with willow browse and lichens (Reynolds et al. 1978; Larter and Gates 1991; COSEWIC 2013; ECCC 2018b; Hecker et al. 2021). A dietary analysis of the Ronald Lake population found transition from grazing in spring and winter, to browsing in summer (Hecker et al. 2021). Microhabitat site features, forage availability and other trade-offs are also determinants of bison habitat suitability and seasonality of use. For example, summer habitat selection of the Ronald Lake population was influenced by insect harassment, ground firmness (i.e., soil density and moisture content), and winter habitat selection is primarily influenced by forage availability (Belanger et al. 2020).

Forested habitats are used by wood bison for refuge from insects, resting, and foraging (ECCC 2018b; Belanger et al. 2020). Scientific evidence is not definitive on bison use of forested stands. An analysis of the Wabasca population found high selection in snow free periods for treed wetlands and upland forest cover including deciduous, conifer and mixed wood dominated stands (MSES and Roam 2024). The Ronald Lake population was found to have a neutral response to deciduous forest in the "snow-free season", and demonstrated avoidance in the "snow season" (DeMars et al. 2020). The Nahanni population demonstrated neutral selection of deciduous forest in summer and winter (Thomas et al. 2021). There are several sources of Indigenous Knowledge that highlight the importance of forested habitats to wood bison. These differences suggest that habitat use patterns may differ across populations and warrant further investigations specific to local populations (Larter and Gates 1991). Differences may also be related to the methodology used in many scientific analyses (e.g., resource selection functions) that focus on use of habitats relative to their availability on the landscape. Some upland forested habitats are often common in Alberta Wood Bison Ranges, and although they may not be used more than expected based on their availability on the landscape (i.e., "selected"), wood bison still spend time in these habitats, and they are important for certain behaviours. Finally, these scientific analyses are often based on remotely sensed landcover data that although useful for modelling habitat selection at the Wood Bison Range scale, may not have the resolution to accurately characterize differences in forest stand age, or small wetland foraging patches that could occur within forested habitats.

Indigenous Knowledge of the Wabasca population suggests the use of shrubby, forested areas more than other nearby bison populations, where mature white spruce forest is an important habitat year-round due to thermal protection, snow interception and forage on willows, forbs, lichen, mosses, and ferns (ShagowAskee Foundation 2023; personal communication, ShagowAskee Foundation). LRRCN knowledge holders also noted the importance of 'spruce bluffs' for the Wentzel population, and that this population may rely on forested habitats more so than the Wabasca population (Schramm 2005). Important habitat features include upland ridges and sandy eskers, which the Ronald Lake population use to move throughout their range (MSES 2018; Olson et al. 2018).

2.1.2 Distribution

This section provides an overview of where wood bison occur in Alberta. Wood bison are found in discontinuous populations across Alberta's northern boreal forests. Historical distribution of wood bison populations in Alberta is discussed in AEP and ACA (2017).

Wood Bison Ranges were created for each population using GPS collar data collected from Alberta's wood bison monitoring program (initiated in Ronald Lake in 2013 and other populations by 2020; Section 2.1.2.1). Home ranges were delineated for each individual, and averaged within a population using autocorrelated kernel density estimation. Boundaries were adjusted to incorporate bison observations from aerial survey data, and high-quality habitat patches that were not captured by GPS collar data. As the majority of wood bison collared are females, the inclusion of aerial survey data allows for some consideration of male bison distribution. Where appropriate, boundaries were aligned with major landscape features such as major rivers and highways.

The Ronald Lake population occurs in between the community of Fort McKay, the Birch Mountains, and the Athabasca River. The range overlaps Kitaskino Nuwenëné Wildland Provincial Park, and extends north into WBNP (Figure 1). Indigenous Knowledge indicates that in the past, the Ronald Lake range extended farther south towards Fort McKay, and farther west into the Birch Mountains, with periodic occurrences east of the Athabasca River (FMFN SD 2018; MSES 2018; Olson et al. 2018).

The Wabasca population occurs within the Wabasca Bison Protection Area (Figure 1), east of the Wabasca River and Highway 88, west of WBNP, and south of the Peace River. Historical presence of bison in this region and outside of the current Wabasca range has been identified by Indigenous Knowledge holders (Schramm 2005) and documented sightings discussed in Gates et al. (2001) and AEP and ACA (2017). There is ongoing work to document the historic and current occurrence of bison in areas outside of the known Wabasca range, including aerial search efforts by the GoA in 2023 and 2024 and ongoing ground-based efforts by local Indigenous Knowledge holders and land users. This includes the areas west of Highway 88 and south of Tallcree First Nation reserves and to the south and west of the Wabasca population (ShagowAskee Foundation 2023). To date, bison have not been observed in these areas outside of the known Wabasca population range during aerial search efforts taken by GoA. However, Indigenous Knowledge holders did observe bison in this area in 2022, and tracks in 2023 (ShagowAskee Foundation 2023).

Garden River is a component of the Greater WBNP population and primarily occurs within WBNP, south of the Peace River but is also found on provincial lands adjacent to WBNP and east of the Fox Lake community.

The Wentzel population occurs in the vicinity of Wentzel Lake and provincial lands within and southeast of the Caribou Mountains Wildland Provincial Park. The Wentzel population also utilizes portions of the western side of WBNP and likely a component of the Greater WBNP population. LRRCN knowledge holders reported that the Wentzel population extended farther southwest, prior to the establishment of John D'or Prairie, and that the population's range did not extend very far into WBNP (Schramm 2005).

The Ronald Lake and Wabasca populations both occur within a relatively short distance (ranges only separated by tens of kilometers) from the WBNP populations (Figure 1).There are no obvious barriers in the terrain and GoA biologists assumed that these population were part of the Greater WBNP population. However, this paradigm had to be revisited when the Wabasca and Ronald Lake populations were tested and found to be disease-free (Section 2.2.2). Later genetic results confirmed that while Wabasca and Ronald Lake were derived from the Greater WBNP population, they both showed genetic differentiation suggesting they have been separate from the Greater WBNP population for some time (Section 2.1.3). Despite their proximity to WBNP animals, both Ronald Lake and Wabasca are considered to be separate populations and maintaining this separation is priority for this Recovery Plan (Section 5.1.2)

Both the Hay-Zama and Etthithun populations occur within portions of the Northwest Bison Protection Area (Figure 1). The reintroduced Hay-Zama population occurs north of Highway 58, and west of Highway 35, primarily overlapping the Hay-Zama Lake Wildland Provincial Park and the vicinity of the Chateh and Zama City communities and some presence along Highway 58 east of Rainbow Lake. Within Alberta, the Etthithun population (a reintroduced population that has expanded outside of BC) primarily occurs near the BC border and the Chinchaga Wildland Provincial Park. The Etthithun Lake population continues to utilize linear features and roads to expand its distribution north towards Rainbow Lake, AB and eastward towards Paddle Prairie, AB. As a result of range expansion it is likely that the Hay-Zama and Etthithun populations (both sourced from EINP) will

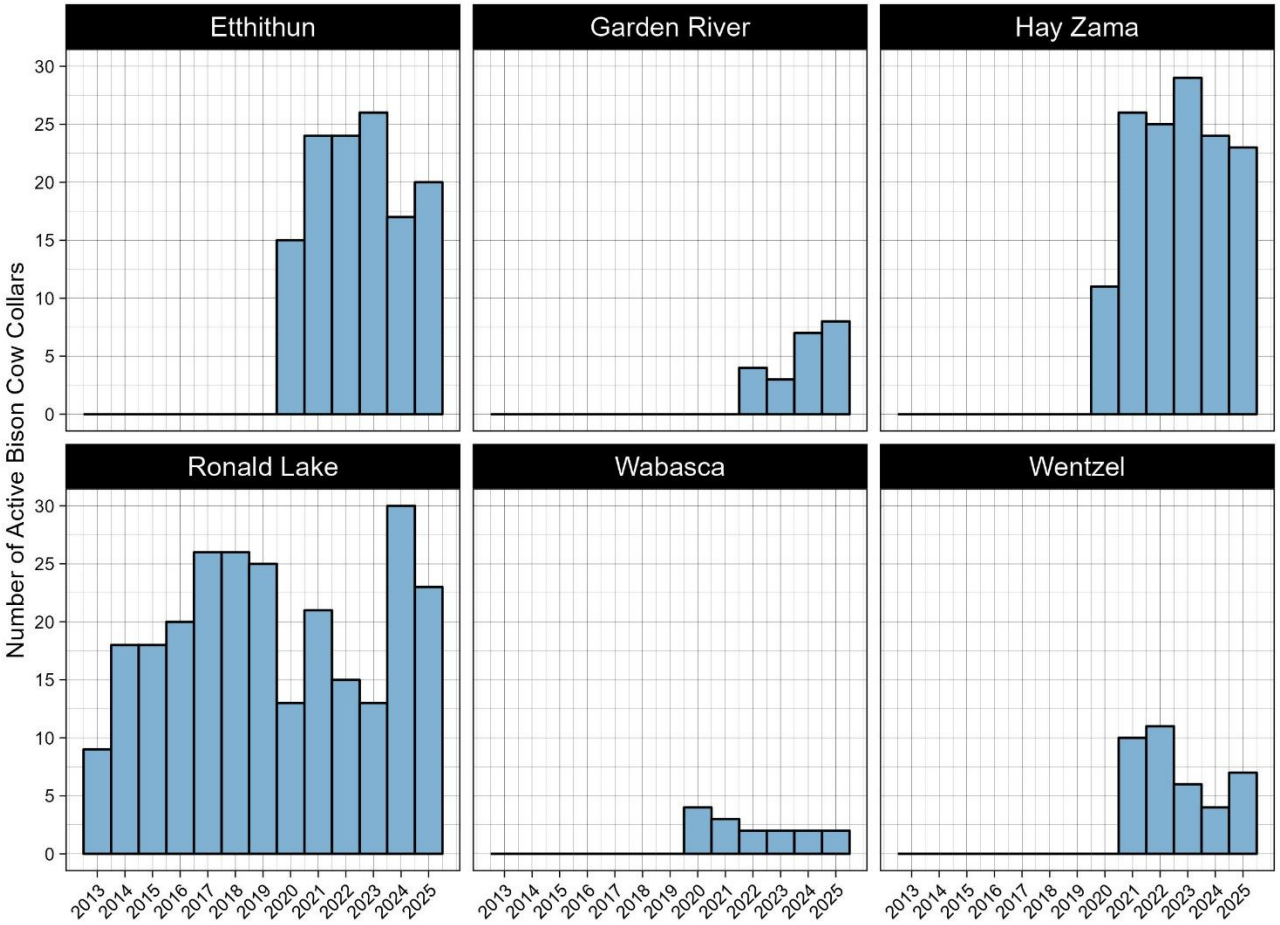
connect and interact in the near future as known barriers to movement do not exist. Prior to collar deployment, monitoring of distribution was limited to winter surveys conducted annually within Hay-Zama, and sporadic surveys of key areas for the Etthithun population as well as surveillance flights and limited public reporting.

2.1.2.1 Collar Data and Monitoring

GoA has been monitoring wood bison populations by deploying GPS satellite collars on a sample of individuals from all the populations whose ranges occur, or partially occur on provincial land (Table 1; Figure 2). Understanding of current population ranges has been improved by information from GPS collars; however, current collaring has focused on adult females and resulted in more limited information on male movement and dispersal. Ronald Lake was the first population to be collared, beginning in 2013. Collaring of the remaining populations began in 2020. The number of active collars at a given time changes frequently due to new deployments and failure of older collars. Collar data are transmitted through satellite where they can be downloaded or reviewed in an online portal. Collar locations are regularly downloaded and reviewed by GoA staff, to identify potential conflict situations such as risk for movement into bison-human conflict, or higher disease risk (Figure 4).

The reason that few males have been collared is that they tend to be much harder on the collars (especially during the rut), resulting in failure much sooner than is typically observed in females. This lack of representation of male bison in the GPS collar dataset has created a knowledge gap on male bison movements which is problematic because they are known to range more widely than the females putting them a higher risk for encountering diseased bison.

Figure 2. Summary of bison collaring efforts by Alberta.



2.1.2.2 Seasonal Distribution and Important Habitats

Certain wood bison populations within Alberta demonstrate seasonal use of specific areas across multiple years. Seasonal ranges could be driven by local habitat availability (e.g., graminoid wetlands during winter), or behaviours, such as rutting, and calving/post-calving. The Wabasca population demonstrates clear spatial segregation in seasonal ranges, based on GPS collar data. Established seasonal movements of the Wabasca population has likely contributed to the disease-free status of this population, by maintaining separation from the nearby diseased Garden River population. The Wabasca population uses riparian corridors during the winter and demonstrates seasonal movement to the northwest portion of their range during the summer where the habitat is primarily comprised of upland deciduous forest. The Ronald Lake population uses a specific upland meadow during the post-calving season (i.e., 'neonatal' or 'nursery' range), likely driven by availability of forage (Buitrago Gutierrez 2024; Hecker et al. 2024). Movement to these specific areas follow established natural movement corridors. The northern portion of the Ronald Lake range overlaps WBNP. In winter of some years, a small number of individuals from the Ronald Lake population will move to the northern extent of this range towards Lake Claire and Welstead Lake.

Distinct seasonal ranges have not been observed to date within collar data from the Etthithun, Hay-Zama, and Wentzel populations; however collar data are limited to beginning in 2020, and more investigation is required. The Hay-Zama and Etthithun populations appear to be more evenly distributed throughout their ranges regardless of time of year, compared to the Ronald Lake and Wabasca populations. This may be a result of larger proportional use of anthropogenic disturbances as sources of forage, and/or multiple groups of individuals distributed throughout the Hay-Zama and Etthithun populations.

Further investigation into time periods where calving or rutting occurs could inform seasonal ranges. Identification of areas where male and female bison congregate during the breeding season could be used to identify breeding grounds or calving areas.

2.1.3 Genetic Status and Origin

Wood bison and plains bison meet the criteria to be considered *Designatable Units* by Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2013). This essentially means that wood bison and plains bison are considered distinct enough from each other to warrant their management as separate entities. This decision is supported by the following findings summarized in AEP and ACA (2017), as well as more recent preliminary genetic analyses (Oppenheimer et al., in prep):

- *inherited traits, including skeletal and external morphology also differ between wood and plains bison (van Zyll de Jong et al. 1995);*
- *a natural break in distribution occurred between original ranges of wood and plains bison, such that movement and interaction of bison between the separated ranges was limited (van Zyll de Jong 1986); and*
- *the distribution in original ranges of wood and plains bison were separate based on occupation of different biogeographic areas or ecoregions in North America (i.e., the boreal forest versus grasslands; Olson et al. 2001).*
- *A survey of over 200 ancient bison DNA specimens has shown that wood and plains bison are more differentiated than any other bison groups in the last 50,000 years (Oppenheimer et al., in prep.)*
- *despite the introduction of plains bison to WBNP in the 1920s, the genetic distinctiveness of wood and plains bison remains (Wilson and Strobek 1999). While all wood bison herds appear to have some level of plains bison introgression, the amount varies from 10% to >50% (Oppenheimer et al., in prep)*

Indigenous Knowledge describes the Wabasca population as displaying unique characteristics compared to other bison populations (personal communication, ShagowAskee Foundation). Origins of the Wabasca population remain unclear however, historical bison use of the area has long been documented back to 1920s (Gates et al. 2001; Schram 2005; AEP and ACA 2017). The uniqueness of Ronald Lake population in relation to bison populations in WBNP has been long emphasized by local Indigenous peoples. For example, Athabasca Chipewyan First Nation (ACFN) member's knowledge indicates that the Ronald Lake population is representative of wood bison, as opposed to hybridized plains/wood bison that occur in WBNP (MSES 2018).

The Ronald Lake and Wabasca populations demonstrate genetic differentiation from WBNP populations (Ball et al. 2016). It has been suggested that these populations were formed from emigrants from WBNP, which have

been isolated from WBNP populations for several generations (Ball et al. 2016). The results of the same analysis found that the Wentzel population did not display genetic differentiation from the WBNP population, and was considered part of the WBNP metapopulation (Ball et al. 2016). Recent genetics work has found evidence of relatively large proportions of plains bison DNA (Deoxyribonucleic Acid) in the Wabasca and Ronald Lake populations, suggesting either WBNP origin, or past interaction with WBNP populations, where over 6,000 plains bison were released in 1925 (Oppenheimer et al., in prep.; Brower 2008).

The Hay-Zama Bison population was reintroduced from a source of 29 disease-free wood bison from EINP, who were kept in a paddock beginning in 1983 and 49 were released in 1994 (AEP and ACA 2017). The reintroduction of Hay-Zama bison was a joint venture between the Government of Canada, GoA, and Dene Tha' First Nation to re-establish a sustainable population of wood bison in northwestern Alberta. The Etthithun population was reintroduced from a project by the BC Ministry of Environment, who placed 19 bison sourced from EINP in paddocks near Strom Lake, BC in 1999/2000 (Rowe and Backmeyer 2006). In 2002, 43 bison were released into the wild. The reintroduced bison quickly expanded in population and range and were found in Alberta as early as 2006.

2.1.4 Population Size and Demographics

2.1.4.1 Population Size

The GoA has conducted regular aerial population surveys for a number of bison populations (Figure 3). More information on surveys conducted by other jurisdictions, as well as historical or anecdotal population estimates are provided in AEP and ACA (2017). Collaring of cows from each population has improved understanding of population distributions and improved assessments of population size and status.

The Etthithun population occurs in both Alberta and BC and since the release of these bison, with time, the number of individuals in Alberta has increased. During surveillance surveys conducted by Alberta government in 2013, 121 individuals were observed, 54 of which were in Alberta. In 2015, 167 individuals were observed, 34 of which were in Alberta and in 2019, 131 individuals were observed in Alberta. (Figure 3). The Government of BC also conducts population surveys (Lewis and Das Gupta 2021) and in 2021, a joint minimum count survey was coordinated with Alberta and BC concurrently and resulted in a joint minimum count of 393 bison throughout the entire range (200 in AB and 193 in BC).

Annual population surveys are conducted for Hay-Zama, and the population is managed through a hunt intended to maintain population size and reduce bison-human conflict (Section 2.3.4). The Hay-Zama population has grown to be the largest population found on provincial lands with a peak of 652 bison in 2008 and has since been managed towards a goal of 400-600 individuals, with 678 individuals observed in 2025.

All formal population estimates for Ronald Lake followed a mark-resight framework. While it appears the herd increased in size from 101 (90% confidence interval: 74 - 159) in 2010 to 424 (95% confidence interval: 321 - 588) in 2024 (Figure 3), any increase in size must be interpreted cautiously. The 2010 survey was conducted prior to detailed information on the herd's distribution and did not cover the same area as subsequent surveys. Therefore, not all animals in the herd may have been observable, and there was only one resighting session, which can lead to a biased estimate. Additionally, the 2015 and 2018 surveys may have been conducted in such a way as to lead to an inflated resighting rate, which would bias the population estimate low. Past population estimates have been provided as part of Indigenous Knowledge studies developed for other purposes (e.g., identifying threats to the Ronald Lake population). Some of these studies indicate that the Ronald Lake population was larger in the past (FMFN SD 2018; Olson et al. 2018).

Population surveys for Wabasca have been conducted since 2010, and annually since 2019 (Figure 3). The Wabasca population is the most imperiled wood bison population in Alberta, with 9 individuals observed in 2025. The main causes of the decline are likely at least in part due to lethal sampling for disease testing (Section 2.2.2) and unregulated harvest prior to 2021 status updates and additional protections (Section 2.4.5); however factors continuing to limit recovery remain unclear. During interviews conducted in 2023, Indigenous Knowledge holders reported there were 40-60 individuals in the Wabasca population until the early 2000s, and the population has declined significantly in the past 10 years (ShagowAskee Foundation 2023).

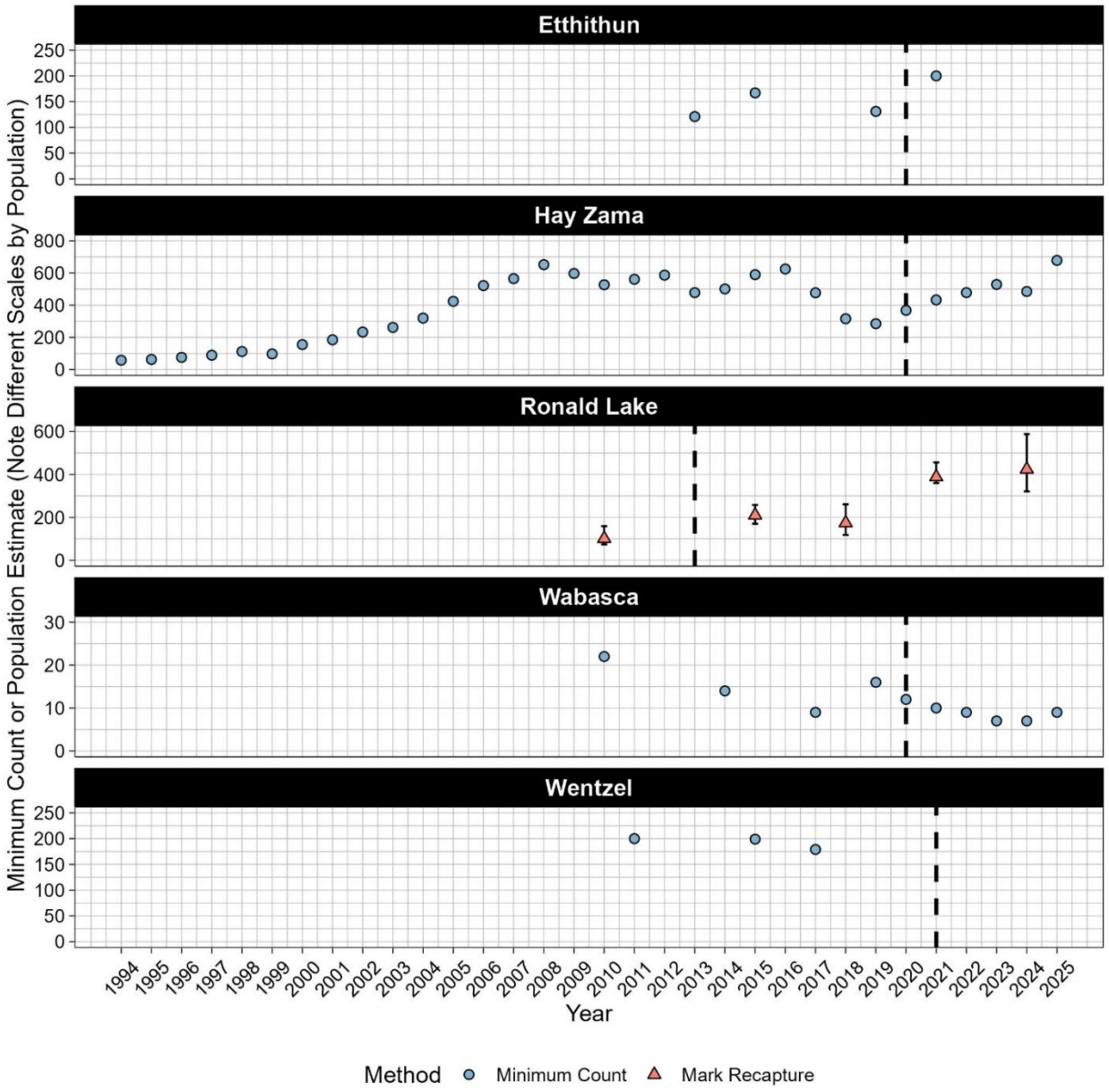
Population estimates for Wentzel have remained relatively stable between 2011 (200) to 2017 (179). Wentzel bison often move within or outside WBNP depending on snow levels and harvest pressure, challenging survey

efforts. In 2011, a portion of individuals observed were likely part of the Greater WBNP population (AEP and ACA 2017) while surveys in 2015 and 2017 found the majority of individuals observed were in Caribou Mountains Wildland Provincial Park. Population surveys are not conducted regularly for Wentzel, as this population is known to be diseased and of lower conservation concern (Section 2.2.2). Land users reported a decline in the Wentzel population over the last 40 years, during interviews conducted in the early 2000s (i.e., since the 1960s; Schramm 2005).

2.1.4.2 Demographic Data

Demographic data (e.g., cow:calf ratios, age, and sex of individuals) is collected where possible during aerial surveys conducted by EPA. Methods are being evaluated for using remote camera images to determine the demographics (e.g., age, sex, cow:calf ratios) of the Ronald Lake population (Hill et al. 2025). During the 2023-24 Hay-Zama harvest, voluntary incisors (front of bottom jaw) submissions from harvesters have been aged and are being used to improve existing population demographic models.

Figure 3. Population estimates by year based on aerial observations; note different y-axis values. Methods "minimum count" and "mark recapture" are based on structured aerial surveys completed by Government of Alberta. "Minimum counts" represent the minimum number of bison observed during an aerial survey. "Mark recapture" estimates follow methodology to allow estimation of population size, accounting for error in detection of individuals. Confidence intervals are provided for mark recapture estimates. The dashed line indicates the first year of GPS collar deployment by Government of Alberta.



2.2 Disease Management

Of the five wood bison populations managed by GoA, only the Wentzel population is confirmed to be diseased (i.e., evidence of brucellosis or tuberculosis in the population). The Wabasca and Ronald Lake populations have been extensively tested (Table 3) and no disease has been detected to date (Table 4), however, their close proximity to diseased WBNP bison puts them at a high risk of infection (Figure 1). The Hay-Zama and Etthithun bison populations are routinely tested and remain disease-free. To maintain the disease-free status, there is a managed hunt of the Hay-Zama population designed to limit size and distribution, thus reducing potential contact with diseased populations in WBNP. Disease-free populations have a critical role in wood bison recovery and maintaining the disease-free status is of utmost importance. Discussion of the threat of disease to Alberta wood bison populations is provided in Section 2.4.1.

2.2.1 Managing Disease Risk in Alberta's Wood Bison

In 1925 a decision was made to transport over 6,000 thousand young plains bison (*Bison bison bison*) by train and barge from Buffalo National Park (which later became Canadian Forces Base Wainwright) to WBNP. Not only was it a poor management decision to mix plains bison with wood bison from a genetics perspective, the translocated plains bison had been infected with two diseases from domestic cattle: tuberculosis and brucellosis. Brucellosis and tuberculosis are chronic diseases in bison, and have impacts on reproduction and survival (Joly and Messier 2004a; ECCC 2018b). A summary of pathology and transmission of these diseases is provided in Appendix 6 of AEP and ACA (2017). See Brower (2008) for more details on the history of Buffalo National Park and the transfer of bison to WBNP. For more background of the history of disease management within WBNP consult McCormack (1992), Pybus and Shury (2012), and Shury et al. (2015).

In order to maintain the ability to market meat products outside of Alberta, a national effort, led by the CFIA has gone to great lengths, with substantial financial investments by the provincial cattle and bison industries, to ensure all Alberta cattle and bison are free of the brucellosis and tuberculosis. From 1988 to 1990, a federal environmental review panel recommended that all diseased bison in the WBNP population be removed and replaced by disease-free wood bison (FEARO 1990). This recommendation was never implemented, but the GoA continues to advocate for a permanent solution to diseased WBNP bison. The reservoir of brucellosis and tuberculosis in wild bison within and around WBNP presents a significant concern to this industry (Nishi et al. 2006).

Historically, Alberta's main strategy for containing diseased wood bison was to not provide wood bison any regulatory protection from harvest once they left WBNP. This meant that anyone could harvest a bison at any time of the year as long as they had legal access to the land and followed provincial and national laws governing firearms possession and use, as well as basic public safety requirements for discharging a firearm. This policy contributed towards limiting the distribution of diseased wild bison to WBNP and a few areas next to the park.

Attempts to establish a disease-free population of wood bison in Alberta began in 1983 in the Hay-Zama region of northwestern Alberta (see section 2.1.3 for details). Shortly after wood bison left their containment pen in 1994 they were listed as Endangered in Alberta in spatially defined area NW Alberta. Within this area they were fully protected. Population increase and range expansion of the Hay-Zama population had potential to increase interaction with diseased bison populations west of WBNP. The increased numbers also provided an opportunity to offer limited recreational hunting and Indigenous harvest of these bison. A regulated hunting season on the Hay-Zama population was implemented in 2008, with an objective of limiting population increase and range expansion, and therefore of reducing risk of disease exposure. Samples collected from harvested Hay-Zama bison were submitted for brucellosis and tuberculosis testing beginning in 2008 (GoA 2011). The status as an Endangered species was provided for only the northwest corner of Alberta and the unregulated harvest was maintained east of Highway 35 to the boundaries of WBNP. Status changes that occurred in 2016 and after are discussed in Section 1.1.

Management of the risk of disease transfer from WBNP animals changed in 2010 with the implementation of the Managing Disease Risk in Alberta's Wood Bison program. This program was supported by the cattle and bison industry who worked closely with, and provided funding for, activities undertaken by Alberta Environment and Parks (AEP; now EPA and Alberta Agriculture and Rural Development [now Agriculture and Irrigation]). The disease-management program was in addition to maintaining the existing large area within northeastern and northcentral Alberta where bison were not protected from harvest.

The program began following discussions with agricultural stakeholders in 2009, and transitioned into a larger wood bison management program in 2020[5]. Disease surveillance, testing, and monitoring continued to present day. The specific program objectives and activities undertaken are summarized and evaluated in Table 2. The program has been successful at monitoring disease-free bison populations in northwestern Alberta, determining disease status of wood bison populations, responding to, and removing bison observed within agricultural areas or those at risk of moving eastward and encountering diseased bison in the vicinity of WBNP. This program confirmed that the distribution of diseased bison was limited to WBNP, and to areas immediately adjacent to the park (Figure 1; Section 2.2.2.2).

2.2.1.2 Disease Testing

As part of the Wood Bison Disease Management Program, populations with all or part of their range occurring in GoA's jurisdiction were sampled for brucellosis and where possible, carcasses were sampled for tuberculosis. The introduced Etthithun population (with range split between BC and AB) and Hay-Zama population in northwest Alberta were founded using disease-free individuals and not expected to be diseased. Both populations are sporadically tested (via testing of animals at time of collar deployment, submission of hunter harvest samples during a hunt, or through dedicated disease sampling). As part of the disease management program, and in response to possible exposure to diseased livestock within the BC portion of their range, dedicated disease sampling was conducted on the Etthithun population in spring of 2017, with all results coming back negative for brucellosis.

Prior to testing, it was assumed by provincial and national bison managers that all the populations within or near WBNP had both diseases. However, during the early 2000s, local Indigenous knowledge holders advised GoA that the Ronald Lake population was both distinct from populations in WBNP, and disease-free. Subsequent testing confirmed that the Wentzel population contained individuals infected with brucellosis, but to date, neither disease has been detected in the Wabasca or the Ronald Lake populations (Section 2.2.2). While there is no current evidence of disease in either the Wabasca or Ronald Lake populations, there is ongoing risk of potential exposure due to their proximity to known diseased bison within or near WBNP. More information on disease sampling is provided in Section 2.2.2.

Confirmation that the Ronald Lake and Wabasca populations were disease-free was the primary reason that Alberta later changed the status of wood bison to Threatened in spatially defined areas in 2021.

2.2.1.2 Surveillance Zone Flights

As part of the wood bison disease management program, surveillance zone flights adjacent to Highway 35, and the Fort Vermillion-La Crete agricultural area were conducted once monthly beginning in 2009/2010 during the winter months each year, weather permitting. The purpose of these flights is to identify movement of bison outside of normal ranges and areas of higher risk through observation and investigation of bison observations or bison sign (tracks, feeding craters). When detected, any sign of bison were investigated and/or actioned for bison removal and disease testing. Sightings were rarely detected during these flights and the frequency of surveillance zone flights were reduced in 2018, in favor of revamped "Bison Watch" program encouraging public reporting. As of 2022, some winter surveillance flights have been reinstated, with focus on areas of separation between diseased and non-diseased bison populations and emphasis on areas between the Ronald Lake population and Delta (WBNP) population, and between the Wabasca and Garden River (WBNP) populations (Figure 5).

2.2.1.3 Bison Watch Program

In 2018, the Bison Watch program expanded to replace the surveillance zone flights, that relies on public reporting bison forays outside of known bison ranges to GoA staff for management. The Bison Watch program was deemed to be a more cost effective, and efficient way of monitoring for bison as it allows for daily observations by public travelling on main highway corridors, rather than a single flight once a month that is dependent on funding, staff availability, and ideal weather conditions.

[5]Many of the actions started as part of the Managing Disease Risk in Alberta's Wood Bison program are incorporated into Fish and Wildlife Stewardship's bison monitoring operations and will simply be referred to as the "wood bison disease management program" in this Recovery Plan.

Letters were sent by Alberta Agriculture and Forestry by post, email and fax to livestock owners within the northern area, informing them of the bison protection zone, and requesting reporting of bison seen outside of this zone. Advertisements for the program were placed in local newspapers. Large highway signs were along major highways within the Mackenzie County in order to make motorists aware of the potential for bison in the area. In areas outside of the Bison Protection Area, signs included a banner asking motorists to report bison to the Report a Poacher Hotline (1-800-642-3800). All reports are investigated.

All wild bison detected on private agricultural lands near Fort Vermilion and La Crete, and in any of the Agricultural and Highway 35 surveillance zones are removed. There were a minimum of 6 instances where bison had crossed, or were in proximity to Highway 35 in 2022. The response was to haze the bison west of km 10 on the highway. On one occasion, an individual was harvested east of Highway 35 where they are not protected. Wherever possible, meat is salvaged from known disease-free populations and tissue samples submitted for disease testing. In November 2022, two bison from the Hay-Zama population that had crossed Highway 35 and were at risk of moving towards agricultural areas were euthanized by GoA staff. Given that these individuals are from a disease-free population, the meat was provided to the community of Meander River.

2.2.1.4 Risk Assessment

The CFIA assessed the risk of brucellosis and tuberculosis transmission from free-roaming bison near WBNP to cattle in 2016 (CFIA 2016b). The annual probability of transmission of brucellosis was estimated to be 0.2% (i.e., unlikely to occur more than once every 555 years), and the annual probability of transmission of tuberculosis was estimated to be 0.93% (i.e., unlikely to occur more than once every 107 years). The models used by the CFIA did not incorporate the surveillance and outreach activities undertaken as part of the wood bison disease management program (Section 2.2.1) or the fact that lack of protections from harvest could facilitate the removal of diseased bison before they have reached agricultural areas. These additional disease management activities would make the risk of disease transfer even lower (CFIA 2016b).

2.2.1.5 Collar Data and Monitoring Population Movements

Collaring of a subsample of females in each population has allowed more accurate and year-round monitoring of population movements. In addition to the five populations managed by GoA, collars have also been deployed on the Garden River population, both by GoA and WBNP. In collaboration of WBNP, proximity between diseased, and disease-free populations can be monitored based on locations of collared animals. This can include aerial surveillance flights and automatic notification when collared individuals move into a pre-determined area (i.e., a “geofence” approach; Figure 4).

However, collared animals only represent a sub-set of the population and do not fully represent population distribution and movements, particularly for male bison as collars have poor performance and lifespan (Section 2.1.2.1). Male bison are more likely to make infrequent forays outside the currently defined ranges for each population (Jung 2017).

An analysis of habitat selection and movements of the Wabasca and Garden River populations, and potential for their interaction was conducted in 2024 (MSES and Roam 2024). While population ranges remain distinct and separate, there is overlap in the selection of some habitat categories and movement responses between the two populations. These findings suggest that interaction could occur if population size or distribution increased, particularly for the Garden River population or if movement corridors or habitat conditions were enhanced as a result of human and natural habitat modifications (e.g., creation of linear features, wildfire, etc.). Movement of the Garden River population out from WBNP was more likely on the western most extent of its range, near the Peace River and community of Fox Lake. The Wabasca population shows distinct habitat preferences for specific habitat types found within its home range such as treed and vegetated wetlands and upland coniferous and deciduous forest (MSES and Roam 2024). Alteration of these habitat features may result in modified behaviour and movement patterns for Wabasca and corresponding increases in potential risk for conflict or disease exposure.

The GoA has initiated additional study and development of improved habitat inventories in this region to improve mapping of both key bison habitats and movement corridors as well as exploring options for enhanced monitoring to detect changes in bison distribution and movement. A key management action is to explore designation of monitoring and active management zones to increase knowledge of Garden River’s use and distribution of the area, enhance detection and explore options to reduce prevalence of bison outside WBNP. Essential to these actions is exploring the establishment of partnerships with local Indigenous organizations and land users to

increase understanding of movement and habitat selection, and to implement monitoring and mitigative actions (MSES and Roam 2024).

Figure 4. Monitoring wood bison movements using GPS satellite collar data.

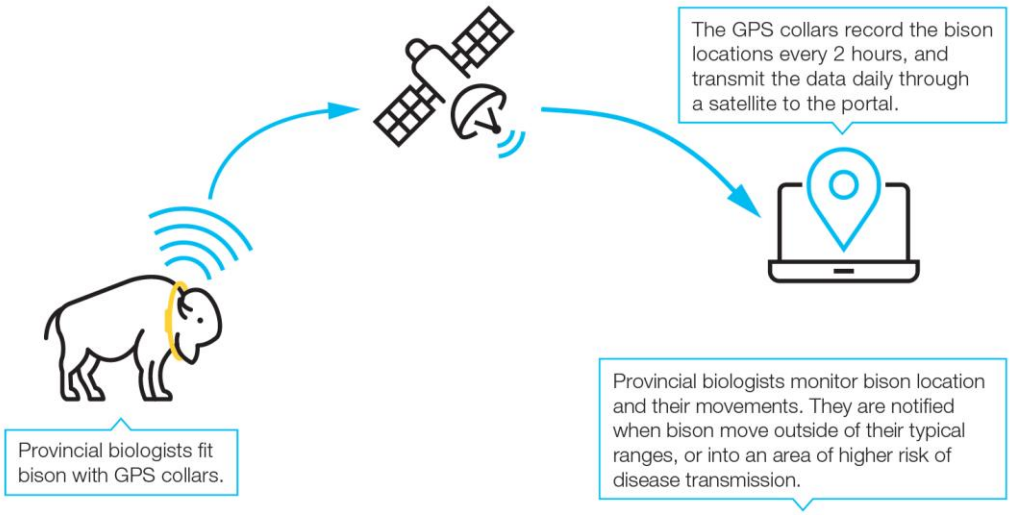


Figure 5. Disease surveillance zone flights.

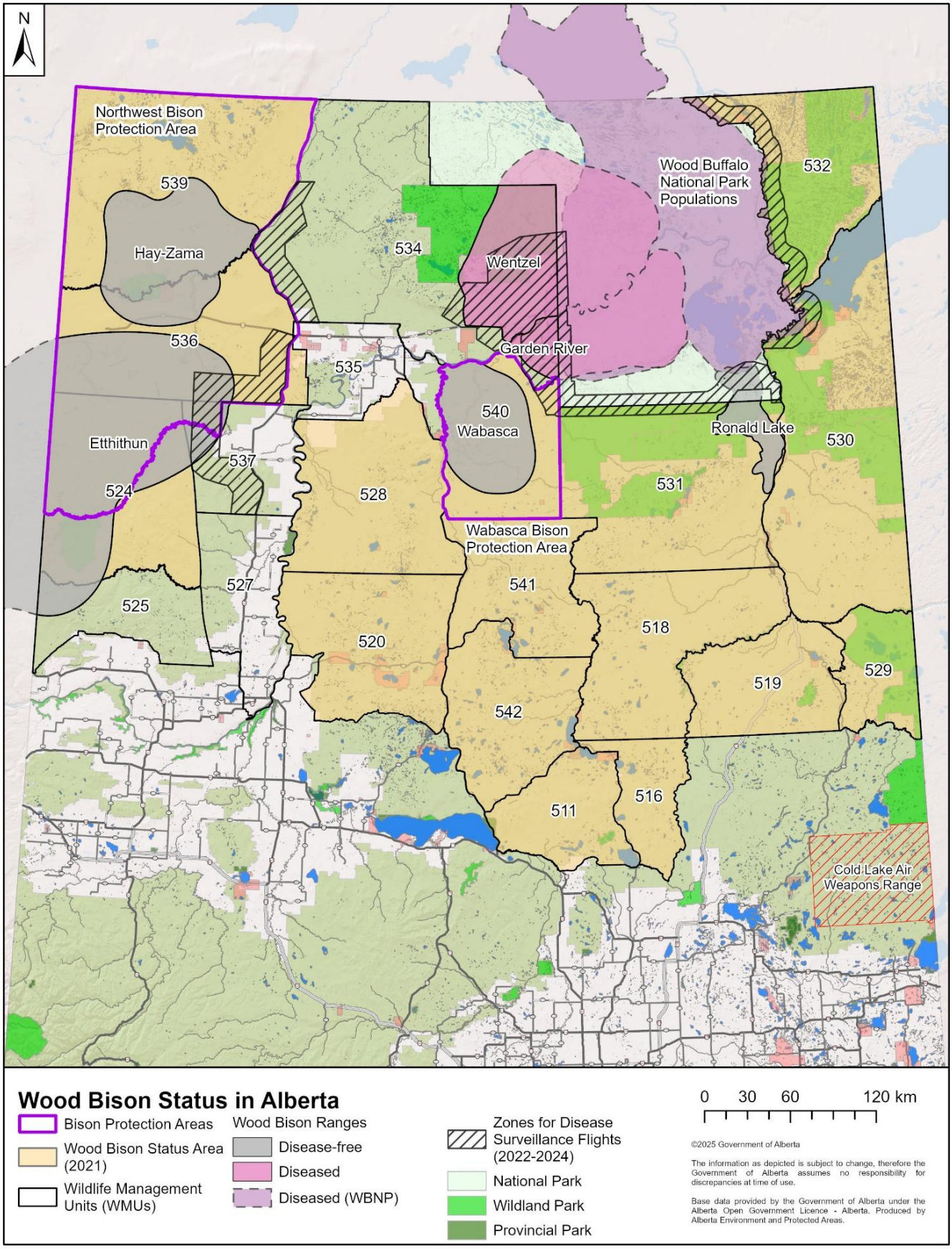


Table 2. Evaluation of the extent the objectives have been achieved for the wood bison disease management program. The evaluation was based on the disease management program reports.

Objective	Activities	Evaluation
For the Hay-Zama population: • Maintain disease-free status (tuberculosis and brucellosis). • Limit population and distribution to objective of 400-600 individuals. • Limit distribution of the population, to prevent expansion east of Highway 35. Thereby reducing the opportunity for exposure to diseased bison from the vicinity of Wood Buffalo National Park and reducing conflict in residential areas and on roadways.	• In winter of 2008-09, a managed hunt designed to maintain the population between 400 and 600 was implemented. • Intensive disease testing during first few years of the hunt to test for tuberculosis and brucellosis. • Following initial intensive testing, continued testing of blood serum for brucellosis, as a proxy for both diseases done through voluntary hunter sample submissions, and during collaring by Government of Alberta.	Fully achieved and ongoing • The hunt has been very successful at limiting bison numbers and has reduced incidents of bison dispersing outside of the target areas. The hunt has been very popular with recreational and Indigenous harvesters. • Disease surveillance testing occurred on approximately 353 of the harvested animals, all of which were negative for tuberculosis and brucellosis. • Ongoing disease sampling will occur as part of the hunt, and collaring by Government of Alberta.
• Detect any wild bison on private agricultural lands near Fort Vermilion and La Crete, the Agricultural Area, and Highway 35 Surveillance Zones. • Encourage client groups associated with government, as well as encourage the general public, to report wood bison sightings in the surveillance zones.	• Identified surveillance areas with the objective of flying areas at least four times each winter (once a month). Annual winter Surveillance flights occurred when weather conditions permitted beginning in 2010. • Surveillance flights were discontinued after 2016-17 in favor of revamped Bison Watch Program (2018) including increased signage on highways, newspaper ads, and letters to local residents, encouraging citizen reporting of bison within surveillance zones.	Fully achieved • Very few bison have been detected in the surveillance areas. The last occurrences were in April 2021, when two individuals were removed from Agricultural Areas, and in 2022 when six individuals were hazed west from Highway 35. • Cooperation by agriculture groups is high. Few reports may be reflective of lack of bison within these areas, however it is difficult to evaluate the objective because there have not been a pool of marked animals to measure the detection rate. The assumption is that bison within an agricultural landscape will be detected and reported. There might be an opportunity to evaluate this now as more animals are marked with GPS collars.
• Remove all wild bison detected on private agricultural lands near Ft. Vermilion and La Crete and in any of the agricultural and Highway 35 Surveillance Zones (Figure 5). Wherever possible, meat should be salvaged and tissue samples for disease detection should be collected.	• A finalized approved response plan is currently under development. Current responses by GoA staff are implemented on a case-by-case basis. The response plan will provide direction to GoA staff on appropriate response to a bison from an unknown source, found outside of known population ranges. Responses will depend on level of risks for human-conflict and disease transmission. Levels of response will likely range from limited need for a response, to hazing, to euthanasia.	Fully achieved • One bull bison was killed in the Agricultural Zone February 2014 and samples taken. • In 2022, there were a minimum of 6 instances where bison had crossed or were in proximity to Highway 35. The response was to haze the bison west of km 10 on the highway. On one occasion, an individual was harvested east of Highway 35 where they are not protected. In November 2022, two bison from the Hay-Zama population were euthanized by GoA staff, and given that these individuals are from a disease-free

Objective	Activities	Evaluation
		population, the meat was provided to a settlement in a local reserve.
• Determine the population numbers and distribution of wild bison in northern Alberta in areas surrounding Wood Buffalo National Park.	• Systematic aerial survey of the Wentzel population was conducted in 2017. Aerial surveys of the Wabasca population occurred in 2010, 2014, 2017, and annually since 2019.	Fully achieved • Generated minimum population estimates; no way of evaluating precision of estimate. This can be addressed differently now there are marked animals (collared) bison, so new methodologies should be considered.
• Determine the disease status of bison in northern Alberta to the west and southeast of Wood Buffalo National Park.	• All populations have been sampled over the last decade at a high enough sampling rate to have a high probability of detecting brucellosis if the prevalence of the disease is as high as the Wood Buffalo National Park population.	Fully achieved and ongoing • Disease testing is required to maintain disease-free status. Extremely low prevalence of diseased animals could be missed as not all bison in the population are being tested.

2.2.2 Disease Testing and Status

The approach used for the wood bison disease management program established in 2010 focused on prevention of infection of domestic livestock, and disease-free bison populations west of WBNP. The program was based on the following assumptions (GoA 2011):

- *That outlier herds (i.e., Ronald Lake, Wabasca, Wentzel herds) have similar prevalence of bovine tuberculosis or brucellosis to that occurring in WBNP (40% to 50%);*
- *That it may take small sample sizes to detect disease presence if it is at high prevalence; and*
- *That detection of either disease is enough evidence to classify a bison herd as diseased.*

2.2.2.1 Disease Sampling

Brucellosis status can be confirmed in wood bison through a blood serum sample. Although there are blood serum tests available for tuberculosis in bison, previous studies have recommended that these serological tests are used in combination with other methods, such as skin tests (e.g., caudal fold test; Chapinal et al. 2015). These other tests can be challenging to implement in a field setting, requiring repeat testing instances that involve capture and holding of individuals for multiple days (Joly and Messier 2004a). However, WBNP has used an interferon gamma release assay in recent years that uses whole blood (rather than serum) to test for tuberculosis. Given the methodology available at the time, the program established in 2010 aimed to collect (i.e., lethally sample) 2-4 individuals from each population per year to collect tissue samples for tuberculosis, and blood samples for brucellosis for up to three years (GoA 2011). Disease-sampling kits were also made available to bison hunters east of Highway 35.

Following the 2013/2014 sampling year, the program continued to test bison for brucellosis using blood serum samples, and further lethal sampling for tuberculosis was not conducted. It cannot be fully assumed that if an animal is negative for brucellosis, it is also negative for tuberculosis. However, given the high prevalence of these diseases in WBNP, and magnitude of testing effort, it is unlikely that if populations were exposed to either disease that it would go undetected. Recent efforts in WBNP found the prevalence of brucellosis was 88% in bulls and 80% in cows as all of these bison were older, mature individuals with maximum exposure. Prevalence of tuberculosis exposure was 76% in bulls and 36% in cows (personal communication, R. Kindopp, Resource Conservation Manager, Parks Canada). The GoA continues to collect brucellosis samples regularly during collaring programs, and from harvested individuals. The number of disease samples by type and year for each population are presented in Table 3.

2.2.2.2 Disease Status

Neither brucellosis nor tuberculosis has been detected in the four populations (Etthithun, Hay-Zama, Ronald Lake, Wabasca) identified as disease-free in this Recovery Plan. Fish and Wildlife Stewardship assigned them disease-free status and changed how these populations are managed after assessing a relatively large sample of disease tests from each population (Table 3). Disease-free status of these populations needs to be confirmed on an ongoing basis.

Two hunter-submitted samples from the Wentzel population in March 2011 tested positive for exposure to brucellosis in July 2011. In December 2011, seven individuals were collected from the Wentzel population for disease testing. Three of these individuals tested positive for exposure to brucellosis, and all individuals were negative for tuberculosis. Additional positive tests for brucellosis were collected in 2021/2022 and 2022/23 (Table 3; Table 4). Similarly, the Garden River population is known to be diseased, based on previous disease sampling conducted by WBNP, and positive brucellosis tests collected by GoA in 2021/2022.

There have been no positive disease samples from the Etthithun, Hay-Zama, Ronald Lake, and Wabasca populations (Table 3; Table 4). Testing has been completed for a subset, or sample of each population, therefore statistical analysis can be completed to determine the probability that disease (if it exists at all in a population) is below 5% prevalence in each population (Stevenson et al. 2024). This calculation used the most recent year with disease samples, and the cumulative number of negative brucellosis samples at that time, with the caveat that disease samples were collected over multiple years (Table 4). Additional parameters related to the brucellosis test used in the calculation were based on Gall et al. (2000).

The Wabasca population is considered to be disease-free, as the cumulative number of negative brucellosis tests (n = 30) in the latest year with sampling (2024) exceeded the population size of 7 individuals (Table 4). Although all samples collected from the Etthithun population have been negative to date, the disease status was not calculated, because the number of disease samples is only known for the portion of the population occurring in Alberta, and there has not been a recent population estimate of the entire population range in AB and BC. However, the Etthithun population was founded using disease-free individuals from EINP, and there has been no evidence of exposure to disease. The probability, at the time of testing, that the Hay-Zama and Ronald Lake populations have a disease prevalence of less than 5% is close to 100% (Table 4).

Table 3. Number of brucellosis and tuberculosis tests completed for wood bison populations in Alberta

	Etthithun				Garden River				Hay-Zama				Ronald Lake				Wabasca				Wentzel			
	Harvest		GoA		Harvest		GoA		Harvest		GoA		Harvest		GoA		Harvest		GoA		Harvest		GoA	
Year	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb	Br	Tb
08/09	-	-	-	-	-	-	-	-	97	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09/10	-	-	-	-	-	-	-	-	124	124	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10/11	-	-	-	-	-	-	-	-	21	21	-	-	1	1	-	-	-	-	-	-	3 (2)	-	-	-
11/12	-	-	-	-	-	-	-	-	37	37	-	-	-	-	-	-	-	-	4	4*	-	-	7 (3)	7*
12/13	4	4	-	-	-	-	-	-	-	-	-	-	-	-	24	11*	-	-	8	8*	-	-	-	-
13/14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	-	2	-	10	3*	-	-	-	-
14/15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15/16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-
16/17	-	-	32	-	-	-	-	-	74	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-
17/18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-
18/19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-
19/20	3	-	18	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	4	-	-	-	-	-
20/21	-	-	13	-	-	-	-	-	-	-	16	-	-	-	18	-	-	-	-	-	-	-	-	-
21/22	-	-	5	-	-	-	4 (2)	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	5 (2)	-
22/23	-	-	2	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	2 (2)	-
23/24	-	-	-	-	-	-	-	-	55	-	2	-	-	-	21	-	-	-	2	-	-	-	-	-
24/25	-	-	10	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	7	4	80	-	-	-	4 (2)	-	408	279	52	-	1	1	154	11	2	-	28	15	3 (2)	-	14 (7)	7

Br = brucellosis; Tb = tuberculosis; GoA = Government of Alberta Disease Surveillance Program; Harvest = hunter submission.
* = Lethal sampling as part of Government of Alberta Disease Surveillance Program.
All samples negative unless otherwise noted. Samples positive for brucellosis are listed in red; note that no individuals have tested positive for tuberculosis to date.

Table 4. Probability of disease prevalence in Alberta wood bison populations.

Population	Most Recent Year with Population Estimate and Disease Sampling	Population Size	Cumulative Number of Negative Samples	Probability that the Prevalence of Disease in the Population is ≤5%
Etthithun[a]	2021	200	70	N/A
Hay-Zama	2025	678	460	>0.99
Ronald Lake	2024	424	155	>0.99
Wabasca	2024	7	30	N/A[b]

[a] Population size and disease samples for Etthithun only represent those collected within Alberta. Cannot estimate disease prevalence for entire population.
[b] Confirmed to be disease-free; number of disease samples exceeds current population size.

2.3 Human Dimensions Considerations

This section highlights the important social considerations that will need to be factored into management of wood bison in Alberta, beyond disease management (Section 2.2), and human-wildlife conflict (Section 2.4.3).

2.3.1 Importance to Local Indigenous Peoples

Wood bison have largely been unavailable to Indigenous peoples as a food source in Alberta since they were nearly extirpated 150 years ago (ECCC 2018b). Disease concerns limited recovery efforts (Section 2.2) and hunting bison in WBNP has been prohibited since 1924 after the park was first established. Only a relatively small number of WBNP bison travel outside of the park in a few localized and isolated areas where they could be harvested. However, these bison populations are diseased, and less desirable for harvest by Indigenous peoples (Candler et al. 2015). Harvest of the Ronald Lake population is permitted to individuals with Indigenous-specific harvesting rights. However, during engagement for the Ronald Lake Buffalo Herd Management Plan, it was shared that in recent years, some Indigenous organizations have requested that their members abstain from harvest in order to promote recovery of the population. Opportunity to harvest the re-introduced, disease-free Hay-Zama population has been relatively recent (Section 2.3.4). There is evidence that bison were much more commonly used in the past by Indigenous peoples in northern Alberta, and there is a desire to harvest more bison if they were available (Beaver First Nation 2015; Candler et al. 2015).

Food insecurity is a significant problem in Indigenous communities in Canada (Shafiee et al. 2022). In a household survey, 57% of on-reserve First Nations households in Alberta suffer from food insecurity, which was higher than any other region surveyed within Canada (Batal et al. 2021). First Nation members in northern Alberta supplement their livelihoods with subsistence harvesting e.g., hunting, fishing, gathering, sharing (Natcher et al. 2021) and identified that time availability, resources to travel, physical well-being and experience were barriers to effective subsistence harvesting (Natcher 2019).

Establishing populations of bison over larger areas, in numbers that would contribute to a sustainable local harvest, would help remove some of the barriers to successful and effective subsistence harvest, making a meaningful contribution to address food security issues in northern Alberta and increase resiliency to economic downturns in the natural resource wage-economy (Natcher et al. 2021).

Indigenous organizations have also been advocates for the management and well-being of existing populations. For example, from 1988 to 1990, a federal environmental review panel recommended that all diseased bison in the WBNP population be removed and replaced by disease-free wood bison (FEARO 1990). The Indigenous organizations around WBNP were strongly opposed to the proposed removal of diseased bison and their opposition contributed to the government of the day not accepting the review panel's recommendation. These groups had a much different perspective than the scientists on the issue of hybridization with plains bison and disease and felt the methods proposed were inappropriate and the depopulation would have unintended consequences on other parts of the food web such as over-predation of moose by wolves (Ferguson 1989;

McCormack 1992). Advocacy by Indigenous organizations about the management of local bison populations also contributed to the recent increase in provincial and federal government attention to the management of the Wabasca and Ronald Lake bison populations (ECCC 2021; Section 1.1).

During engagement on this Recovery Plan, some representatives from Indigenous organizations expressed an interest in receiving an allocation of bison for commercial purposes, to develop Indigenous-led hunting and guiding businesses. For them, guiding and outfitting would be a sustainable way of facilitating socio-economic benefits to communities and the host regions while providing an opportunity for cultural exchange and education. Guardian Programs are Indigenous-led environmental stewardship programs. Guardian Programs provide the opportunity to monitor wood bison and their habitat, by people who already use the land and have an existing cultural connection to wood bison. Federal funding to support guardian programs became available in 2017, and a First Nations National Guardians Network was established in 2022. Some examples of Guardian Programs administered by Indigenous organizations on the RLBH CMB include the MCFN Guardian Program, Ni Ho Ghe Di – ACFN Guardian Program, and Fort McKay First Nation Environmental Guardian Program. These programs collect various information on the Ronald Lake population, and the habitat that supports it. In northwestern Alberta, the Dene Tha' First Nation has established a Guardian Program, which is developing a component that includes monitoring the Hay-Zama population to mitigate roadway collision risk.

2.3.2 Importance to Livestock Producers

Alberta's and Canada's economies benefit greatly from commercial bison and cattle farming. Bison and bison meat exports contributed approximately $90 million to Canada's Gross Domestic Product in 2021 (Agriculture and Agri-Food Canada 2022). Approximately 44% of the total domestic bison in Canada occur in Alberta (Canadian Bison Association 2021). A census conducted in 2021 reported 65,405 bison on 472 farms and ranches in Alberta (Canadian Bison Association 2021). The cattle industry contributed $437.4 million to Alberta's economy in 2019, with over 4.5 million head of cattle in Alberta (GoA 2020).

The potential for exposure to brucellosis or tuberculosis from free roaming bison in the vicinity of WBNP into domestic livestock is of great concern to livestock producers (Nishi et al. 2006). Domestic livestock in Canada are considered brucellosis free, with the last case detected in domestic cattle in Saskatchewan in 1989 (CFIA 2016a). There are infrequent, isolated cases of tuberculosis detected in domestic livestock in Canada, however Canada maintains status as tuberculosis-free (CFIA 2025a, 2025b). All cases of tuberculosis and brucellosis are reportable to the CFIA. Response to confirmed cases of either disease in domestic livestock could result in herd quarantine, enhanced testing, and destruction of animals (CFIA 2016a; CFIA 2024). Although it is unlikely that isolated cases would result in loss of Canada's brucellosis-free and tuberculosis-free status, loss of herds can impact individual producers and could have negative impacts on Alberta's and Canada's trade in animals and animal products.

The last outbreak of tuberculosis in Alberta was in 2016, where 6 cases were identified in a single cattle herd in southeastern Alberta (CFIA 2018). Approximately 34,000 cattle were tested for tuberculosis in response to the outbreak. Transmission of tuberculosis outside of the infected herd to other cattle herds was not detected. Approximately 12,000 animals were destroyed as part of the response, resulting in approximately $39 million paid in compensation to affected producers (CFIA 2018). The investigation had complex and lasting economic and emotional impacts on affected producers (Tremblay 2023). There was also a coordinated effort between CFIA and Alberta to test for presence of tuberculosis in wildlife during this time. The program focused on testing of hunter harvested elk from Canadian Forces Base Suffield. Tuberculosis was not detected in any of 381 elk tested (AEP 2019). The original source of the infection was not determined (CFIA 2018).

The majority of domestic cattle and bison in Alberta are not in close proximity to free roaming, diseased bison near WBNP (Figure 1). However, there is potential for spillback of brucellosis or tuberculosis from free roaming bison to domestic livestock in certain municipal districts of northern Alberta. Transmission of either disease from wild bison to domestic livestock in northern Alberta has not been documented to date, despite its known presence in WBNP for approximately 100 years, and the CFIA previously assessed the risk of transmission (Section 2.2 and Section 1.1; CFIA 2016b). Potential spillback is of great concern to livestock producers in these districts, as an outbreak could have direct impacts to animal and human health, and indirect economic (e.g., compensation costs, losses in marketability) and environmental consequences (CFIA 2016b). Alberta has also designated a portion of public lands in northern Alberta as ineligible for dispositions authorizing the grazing of domestic bison (Public Land Administration Regulation 187/2011).

2.3.3 Lessons Learned from Previous Reintroductions

Use of conservation reintroductions has been a powerful tool for wood bison recovery and has led to the successful establishment of seven disease-free wood bison populations in Canada including two within Alberta (ECCC 2018b). However, as bison have been absent from many of these landscapes for over a century, a number of potential concerns related to reintroductions have been expressed by local residents and communities and are discussed below. Such learnings help inform future reintroductions.

Wood bison were reintroduced into southwest Yukon from 1988-1992, known as the Aishihik population. Local First Nations identified potential bison-related impacts on other wildlife, habitat, and traditional livelihoods such as berry picking, and physical security (Clark et al. 2016; Jung 2020). While bison as a source of meat has become appreciated, particularly among the younger generations in these communities, this Yukon example emphasizes the need for early local engagement with Indigenous communities when considering reintroducing bison. This will be particularly important when considering areas where bison have been absent for many years.

The Etthithun population was reintroduced into BC in 2002 (Rowe and Backmeyer 2006). Doig River First Nation (DRFN) shared the following insights on reintroduction of this population during engagement for this Recovery Plan (personal communication, B. Milakovic, Acting Wildlife Director, Doig River First Nation):

> "*Doig members were vehemently opposed to the reintroduction of bison, which are now the Etthithun herd. Similar to Yukon, there were concerns regarding impacts to wildlife, habitat, and traditional practices such as trapping. Doig felt that there was insufficient information and understanding about the ecology of bison in relation to other wildlife to support reintroduction, arguing that the natural conditions since their extirpation have changed to such an extent that their reintroduction would exacerbate cumulative effects from industry that species like moose and caribou were experiencing. Despite these concerns and calls for additional information, BC proceeded with moving bison into the northern portion of Doig's territory, which is an important area for Doig to protect, not only in terms of current use but prophecies that indicate the area will be important in the future. Now, years later, DRFN are observing that their concerns were justified. Members report that while there might not be direct competition, bison do indeed displace caribou and moose, not because of limited forage, but simply because these animals do not want to occupy the same space. Members report that bison 'are large, they smell, they eat everything in their path, they poop everywhere, and they are destructive.' It is no surprise to members that other animals leave areas that bison occupy, and one member has noted significant impacts to their trapline areas. During recent engagements with members, the overwhelming opinion amongst the older generation was that the herd should be culled. More recently, this opinion has softened, recognizing that in the context of current cumulative effects, having some bison around for food security purposes is okay, particularly if moose and caribou are unable to recover to pre-industry levels. Similar to Yukon, the younger generation has expressed an interest in having bison around, increasing diverse hunting opportunities.*"

Overall these learnings highlight the need for early and ongoing engagement to understand potential impacts of reintroduction identified by local residents prior to reintroduction.

2.3.4 Harvest of Hay-Zama Bison

The harvest of the Hay-Zama population has been managed using a provision in the Wildlife Regulation for issuing a Bison Special Licence. This provision enables the Minister to authorize the harvest of bison within identified parts of the Northwest Bison Protection Area in years that a harvest is required to meet population objectives. The specific area of the Hunting Zone is defined in Part 8 of Schedule 10 of the Wildlife Regulation. Indigenous harvesters are also required to possess a Bison Special Licence but do not require payment of a fee. It is extremely uncommon to have a regulated harvest of a species listed as Threatened but it is justified because of the need to manage the risk of disease exposure (Section 2.1.2) and to reduce bison-human conflicts on roadways and local communities (Section 2.4.3). A GoA information sheet regarding the harvest of Hay-Zama bison specifies the hunt objectives as:

- *Strive to maintain the Hay-Zama wood bison population between 400 and 600, and limit expansion eastward, until diseased bison issues, including both bovine brucellosis and tuberculosis, in and around WBNP are successfully resolved; and*

- *Address public safety concerns within the communities of Chateh and Zama and along roads in the area, as there have been vehicle collisions with bison resulting in property damage and the potential for serious injuries to people.*

Prior to the initiation of the 2008-2009 harvest, a Hay-Zama bison hunt committee made of up Dene Tha' First Nation representatives, local municipal, and county representatives, met to discuss how the hunt should be managed. Once appropriate measures were identified, this committee was disbanded. The first hunt occurred in the fall-winter of 2008-09, and has occurred annually when deemed sustainable and necessary to meet the population and hunt objectives (see Section 2.1.4 for more information on population surveys).

In years when annual population surveys found that the population had declined below the objective (2013-14, 2018-2023), the hunt was suspended until sufficient population numbers were achieved. In 2023, after 5 years without a harvest, the population had increased to a sufficient size and a sustainable harvest was reinitiated. For the 2023-24 season, the Indigenous allocation apportionment was issued using a separate draw with the intention of limiting the need for harvesters to travel to receive a licence in person, and to facilitate a random draw for recipients rather than first-come first-serve. For the 2023-24 hunt, of the 120 licence allocation, 80 where apportioned to Indigenous harvesters, and 40 apportioned to Alberta residents (note: Indigenous harvesters could still apply on the 40 resident licence draw). The 2023-24 hunt remained very popular, with 11,934 Albertans entering the draw for the 40 resident licences and 556 Indigenous harvesters entering the draw for the 80 Indigenous licences.

The highly regulated management harvest of Hay-Zama bison has been very successful at:

- achieving the population objectives (see above);
- acquiring samples for disease testing;
- acquiring incisor samples for aging the harvested animals (initiated 2023-24);
- reporting harvest success (given the mandatory registration);
- assessing the age and sex of harvested animals, to assist population modelling and management; and
- providing a unique harvesting opportunity to some Alberta resident and Indigenous hunters.

The Hay-Zama population has been monitored annually since 1993, which includes annual aerial counts and the collection of highly detailed harvest information since 2008-09 as a result of the dedicated and active collaboration with Indigenous and non-Indigenous hunters. GoA's utilization of this robust dataset provides important understanding of the growth and demographic performance in the population. A detailed review of this dataset, including the 2008-2018 harvest that coincided with a decline below population objectives, highlighted the sensitivity of bison populations to the implementation of regular harvest, particularly for accounting for harvest on both age classes and sexes. In response, Fish and Wildlife Stewardship utilizes a dynamic modelling approach to identify discrete thresholds of population growth based on both observed population counts and realized harvest specific to Hay-Zama data collected annually. This model integrates the relationship between late-winter population counts of adults, harvest allocation (ratio of tags per adult), and the proportion of females harvested (ratio of females harvested to adults) to estimate population growth in the Hay-Zama population. The model predictions, including the estimated uncertainty as informed by previous harvest, provides a useful method to objectively frame management decisions based on risk. For example, allocation rates can be developed that result in high certainty that on average populations will either remain stable or expected to result in population increase or declines. While it is not possible to predict stochastic events such as harsh winters or mass mortality events, this new approach provides a useful framework for GoA to evaluate risk objectively when establishing population objectives for a Threatened species that requires discrete harvest objectives for conservation purposes.

Age data acquired from voluntary submissions of incisors (i.e., teeth) in addition to information within mandatory registration of harvested bison (including sex of animal), are being used to further refine harvest and population demographic models by Fish and Wildlife Stewardship staff. The data acquired during a harvest year, in combination with annual population counts, provides a robust and unique opportunity to model wild bison populations. Bison are a long-lived species with unique behavioural and physiological life-history characteristics that result in decreased productivity and higher sensitivity to the impacts of age-structure than most harvested populations. Female bison are not reproductively mature until they are 3 years old, once mature the majority of cows only produce a single calf every second year and females undergo significant declines in fecundity as they age (Wilson et al. 2002; Brodie 2008). Similarly, while male bison are reproductively mature at two or three years of age, siring of calves rarely occurs until they are 5 years of age, and the large majority of calves in wild

populations are sired by males older than 8 years of age (Wilson et al. 2002), and have a much shorter peak siring period and steeper decline in reproductive success than ageing females. Often a single bull can account for siring the majority of calves born in a population (Roden et al. 2003). While much of the limitations in male reproductive success are considered to be due to the strength of their behavioural hierarchy of social dominance, rather than physiological limitations, the effects of a truncated or younger male age-structure in a population (e.g., due to stochastic effects in small populations or higher harvest strategies) on productivity are unknown. However, a small proportion of males in a population will survive long enough to sire a significant number of offspring within a population (Wilson et al. 2002; Roden et al. 2003) and population and recovery strategies to maintain a steady recruitment of prime-age bulls is generally recommended to avoid undesirable declines in social dominance and a potential reduction in population productivity. The ongoing and improving population modeling of this population, has shown how important it is to incorporate age-specific fecundity information when setting harvest targets to avoid inadvertently removing the breeding age-classes of the population, and to avoid large fluctuations in recruitment and total population numbers. Consequently, the estimated total population size required to support a steady desired harvest or allocation may be much higher than would otherwise be predicted based a model that does not include additional age-specific transition rates.

2.3.5 Local Communities and Tourism

The only communities that occur within the home ranges of Alberta wood bison are in the Hay-Zama population range. Co-existing with North America's largest land mammal is a unique feature of these communities. The Hay-Zama population within the Northwest Bison Protection Area are featured in a tourism booklet produced by the Mackenzie Frontier Tourism Association identifying them as one of the wildlife viewing opportunities in the region. This population is mentioned in the Tourism and Outdoor Recreation section of the Bischto Lake Subregional Plan, in addition to bison population size being identified as an Environmental Performance Indicator (AEP 2022). Bison are frequently observed along roads and within and in the communities of Zama City and Chateh (an unincorporated community within the Dene Tha' First Nation's Hay Lake Indian Reserve 209). These encounters sometimes lead to conflict (Section 2.4.3) but they are also part of the regional character and contribute to the other tourism values in the region. Further analysis is required to assess the extent new bison viewing opportunities might increase tourism in northern Alberta. These communities and the organizations that provide tourism opportunities, are important partners in the conservation of the wood bison populations.

2.3.6 Outfitting and Hunting of Diseased Bison

Outfitting (providing guided hunting experience) has been part of Alberta's heritage for well over a century, dating back to the late 1800s. During engagement sessions with the Alberta Professional Outfitters Society (APOS), representatives indicated the listing of wood bison as a Threatened species in 2021 and the protections afforded to the Ronald Lake, Wabasca, and Etthithun populations eliminated hunting for resident hunters and outfitters in the majority of wood bison distribution across northern Alberta. APOS estimates that prior to 2016, there were over 25 outfitters profitably taking bison clientele whereas the closures reduced this number to only four.

Current outfitting for wood bison is somewhat unconventional, because it is currently done in the in the portion of wood bison distribution where wood bison have no status under the *Wildlife Act* and Wildlife Regulation and therefore the harvest is unregulated, meaning that a licence is not required (Section 1.1). Commercial harvest (i.e., allocating licences to outfitters) of the Hay-Zama population is not permitted at this time. This means that opportunities for outfitting would primarily be available for the diseased Wentzel and Garden River populations.

Some guides and outfitters have marketed hunts to hunters who value the opportunity to have challenging hunt in remote northern locations in one of the few places in North America offering fair-chase hunts for free-ranging wild bison. These hunts contribute to conservation by targeting mature bulls which are more likely to make infrequent forays outside of regular population ranges (Jung 2017) and present a significant risk of disease transfer (Section 2.4.1).

2.4 Threats

The purpose of this section is to provide an analysis of the Alberta context for each issue affecting wood bison conservation and management. The focus is on history of management response and activities that have occurred since the detailed status review (AEP and ACA 2017). Key threats identified in the federal Recovery Strategy for Wood Bison in Canada (ECCC 2018b) and Imminent Threat Assessment for Wood Bison (ECCC 2021) will also be referenced. The focus of the analysis is on the disease-free populations and the intention is to provide context for the conservation measures described under the Recovery Strategies and Actions (Section 5.0).

The assessment of threats is based on the International Union for Conservation of Nature – Conservation Measures Partnership Classification of Direct Threats (Version 3.3; IUCN-CMP 2022). Threats have been grouped into nine broad categories for clarity, and associated threats and threat number (e.g., "IUCN-CMP Threat 8.0") are listed at the beginning of each section.

The Imminent Threat Assessment for Wood Bison rated disease (Section 2.4.1) and the Teck Frontier Oil Sands Mine (Section 2.4.2.3) as imminent threats to the Ronald Lake population. The Teck Frontier Oil Sands Mine application has been withdrawn, however the threat of other resource development on Ronald Lake was unknown at the time of the assessment. Disease (Section 2.4.1) and forestry (Section 2.4.2.5) were not considered an imminent threat to the Wabasca population. Unregulated harvest (Section 2.4.5) was rated as an imminent threat to the Wabasca population at the time of the assessment; however protection from harvest of the Wabasca population was instituted in November 2021.

2.4.1 Disease and Non-native Species

Threats:

- *Invasive & other problematic species, genes & diseases (IUCN-CMP Threat 8.0)*
- *Invasive non-native/alien species/diseases (IUCN-CMP Threat 8.1)*
- *Problematic native species/diseases (IUCN-CMP Threat 8.2)*
- *Introduced genetic material (IUCN-CMP Threat 8.3)*

Threats to wood bison populations include invasive species, introduced cattle diseases brucellosis and tuberculosis, anthrax, other diseases, and introduced genetic material. A summary of the GoA's wood bison disease management program (focusing on brucellosis and tuberculosis), and current disease status of Alberta wood bison populations is provided in Section 2.2.2.

2.4.1.1 Invasive Species or Problematic Native Species

Wild boars (*Sus scrofus*) are a provincially regulated invasive pest. The distribution of wild boars is expanding in Alberta, with sporadic reports extending into northwest Alberta. Wild boars are a potential vector for several diseases, including the swine brucellosis (*Brucella suis*; Meng et al. 2009), and the potential risk of transmission of disease from wild boars to livestock is the subject of ongoing research by the Invasive Wild Pig Project at the University of Calgary. The distribution of white-tailed deer (*Odocoileus virginianus*) is expanding in Alberta, and potential of white-tailed deer to transfer diseases to wood bison populations is unknown. Invasive plants have previously been identified as a threat to wood bison (ECCC 2018b). The extent to which invasive plants introduced during industrial disturbance and spread of Canada thistle (*Cirsium arvense*) in WBNP impacts the habitat of Alberta wood bison populations is unknown.

2.4.1.2 Brucellosis and Tuberculosis

The threat of disease transmission is greatest for the Ronald Lake and Wabasca populations, due to their proximity to WBNP. It was assumed that these populations were diseased prior to the Wood Bison Disease Management Program established in 2010 (Section 2.2.1). Lethal disease sampling for tuberculosis was conducted on the Ronald Lake and Wabasca populations between 2012 and 2014 (Section 2.2.1). This sampling

likely had impacts on the Wabasca population, which was not very large at this time. Lethal sampling was not continued once the disease status of these populations was confirmed. The Bison Integrated Genomics (BIG) project has made advances to develop an accurate diagnostic test for tuberculosis in bison that can be used in a field setting and that does not require lethal sampling (Chileshe et al. 2025; Section 4.2.3). These innovations have the potential to dramatically change the management of brucellosis and tuberculosis, though it is still at least 5 years before new tools like a vaccine may be approved and available for use (personal communication, T. Shury, Manager Wildlife Health and Management, Parks Canada).

Interactions between wood bison and sympatric ungulates could result in brucellosis or tuberculosis transmission from diseased wood bison to other non-infected ungulates. Brucellosis is most commonly transmitted between animals when uninfected individuals come into contact with aborted reproductive tissue (Josefsen et al. 2019). Tuberculosis is typically transmitted via direct contact between individuals or use of shared contaminated forage or exposure to excreta. A survey of brucellosis and tuberculosis infection of a variety of wildlife species in and adjacent to WBNP only detected one brucellosis infected moose (Tessaro 1987). The risk of transmission of brucellosis and tuberculosis from diseased WBNP bison to other ungulates is expected to be low, but not non-existent. Therefore, the risk of transmission of brucellosis and tuberculosis to disease-free wood bison from sources other than diseased WBNP wood bison is expected to be low.

Risk of interaction between Ronald Lake and the Delta population is greatest during winter when areas in WBNP south of Lake Claire are used in some years. Proximity between the Ronald Lake and Delta populations is monitored through aerial surveillance surveys. If the populations are in close proximity, a coordinated effort between GoA and WBNP is initiated to determine if mitigations (e.g., redirecting individuals with a helicopter) to prevent interaction between the populations is required. Collars on both the Ronald Lake population, and diseased populations in WBNP has improved understanding of distribution, and timing windows when there is potential for interaction between the populations. However, bulls are more likely to make forays outside of normal population ranges (Jung 2017), and fewer bulls have been collared to date (Section 2.1.2.1), therefore documenting male movements with aerial surveys and remote cameras is necessary.

Parks Canada (PC) is leading a process for developing a disease management plan that will outline specific strategies to be used to mitigate risk of disease transmission between the Ronald Lake and WBNP populations (Section 2.2.2). A feasibility study to install a physical barrier (i.e., fence) between the Ronald Lake population, and WBNP populations has also been conducted (MSES 2024). A fence was not considered a feasible option due to challenges with fence construction, and amount of human effort required to maintain the fence and monitor bison interaction with the fence (MSES 2024).

Risk of interaction between Wabasca and the Garden River population is greatest southwest of WBNP on provincial land (MSES and Roam 2024). Established movement patterns of the Wabasca population may be a factor in limiting their interaction with the diseased Garden River population. EPA monitors collar locations from both populations daily (Figure 4). The strategy related to development of a Disease Containment and Response Plan and Disease Containment Area between these populations is discussed in Section 4.2.2.

2.4.1.3 Anthrax

Bison can become infected by anthrax, a disease caused by spore-forming *Bacillus anthracis.* Vaccines are available, but difficult to administer to wild populations (ECCC 2018b). Spores can remain active in the soil for long periods of time, and environmental conditions can trigger outbreaks (Appendix 8 of AEP and ACA 2017; ECCC 2018b). A summary of anthrax disease ecology is provided in Appendix 8 of AEP and ACA (2017). Although anthrax can cause significant mortality to bison populations when present (ECCC 2018b), GoA has no records of it occurring or causing mortalities within free-roaming bison populations in Alberta outside of WBNP. However, anthrax is known to occur in domestic livestock in northern Alberta and small localized outbreaks within free-roaming bison populations may not have been detected.

Current anthrax surveillance involves testing carcasses from opportunistic reports of unusual bison moralities. No additional measures are being proposed unless a time comes when the disease is more prevalent in the vicinity of Alberta wood bison populations outside of WBNP.

2.4.1.4 Other Diseases

Other diseases that are of potential concern to bison in Alberta include Johne's disease (caused by *Mycobacterium avium, paratuberculosis* subspecies), Malignant Catarrhal Fever (MCF; caused by ovine herpes virus-2 [OHV-2]), and *Mycoplasma bovis* (note: *Mycoplasma bovis* differs from bovine tuberculosis [*Mycobacterium bovis*]). Forde et al. (2013) found presence of *Mycobacterium avium, paratuberculosis* subspecies in nine wood bison populations tested, including the Hay-Zama and Etthithun populations. However, the impact of *Mycobacterium avium, paratuberculosis* subspecies on wild bison populations requires further investigation (Forde et al. 2013). *Mycoplasma bovis* can affect bison joint and respiratory systems (Bras et al. 2017), and outbreaks can result in high mortality rates (Martin et al. 2025). Bras et al. (2017) estimated a 79% herd-level seroprevalence of *Mycoplasma bovis* of domestic bison herds sampled in western Canada. Outbreaks of *Mycoplasma bovis* have not been detected in wild wood bison populations in Alberta. Transmission of MCF to bison typically occurs through direct or indirect (i.e., transmission through air) contact with sheep (ABVMA 2010). MCF is fatal in bison, and transmission between bison does not occur (ABVMA 2010). Outbreaks of MCF have not been detected in wild wood bison populations in Alberta.

There have not been reports of any of these three diseases having impacts on the health of wild bison populations in Alberta. However, continued monitoring of presence these diseases, and associated risk factors is recommended. Maintaining separation between domestic livestock and wild bison populations is warranted to limit potential transmission of these diseases.

2.4.1.5 Introduced Genetic Material

Recent genetic analyses by the BIG project found plains bison introgression into all wood bison populations assessed (Oppenheimer et al., in prep.). Relatively high proportions of plains bison ancestry were observed in the Ronald Lake and Wabasca populations. The Hay-Zama and Etthithun populations were not assessed, however these populations were founded using individuals from EINP, which demonstrated the lowest levels of plains bison introgression of the wood bison populations assessed. Plains bison introgression has not been assessed for the Wentzel population, but it likely has levels similar to Garden River, which are lower than Wabasca and Ronald Lake.

Stroupe et al. (2022) reported finding small, but detectable amounts (0.36% and 0.31%) of domestic cattle introgression in samples from EINP wood bison. However, the BIG project compared neohistoric bison genetic samples to samples from current wood bison populations, and did not find evidence of domestic cattle genetic introgression in the Ronald Lake, Wabasca, WBNP, and EINP populations (Oppenheimer et al., in prep.). Preliminary results suggest that what Stroupe et al. (2022) reported introgression that was in fact genes that were shared by bison and domestic cattle (Oppenheimer et al., in prep.).

GoA has a policy prohibiting domestic bison from grazing on provincial Crown lands north of township 95, west of the Peace River, and north of township 88, east of the Peace River. While the purpose of this policy is to reduce the risk of disease transmission, it has also mitigated further genetic introgression into wild wood bison populations from domesticated plains bison that may also have domestic cattle genes (Hedrick 2009). However, there are no restrictions of bison on private lands and domestic plains bison occur throughout the White Area in northern Alberta. Therefore, there is risk of interbreeding if wild wood bison foray outside of their regular range towards agricultural land, or if domestic plains bison escape and foray towards wild wood bison populations.

2.4.2 Land-uses and Designations

Alberta's northern regions are an active landscape, supporting communities, agriculture, natural resource industries, and a variety of recreation, subsistence and traditional uses. Development, modification, alteration and disturbance of habitats in northern Alberta may influence wood bison populations directly through the creation, alteration or loss of habitats and indirectly through changes in habitat quality, which may influence bison distribution, movement, survival and/or reproductive success. Wood bison responses to different land-uses are discussed in Section 2.4.2.

Potentially relevant natural resource use agreements in the vicinity of the Alberta Wood Bison Ranges include oil sands agreements, petroleum and natural gas agreements, rock-hosted minerals agreements, and timber dispositions (i.e., forest management agreement areas and timber quotas). These agreements are areas where

exploration and development of these resources might eventually occur; they do not represent areas of confirmed future development.

Populations vary in the amount of their range that is currently in a provincial or national park. The Wabasca population range is entirely within the Wabasca Bison Protection Area. The entire Hay-Zama population range, and the majority of the Etthithun range is within the Northwest Bison Protection Area (Figure 1). The Ronald Lake and Wentzel populations partially overlap WBNP. The Etthithun, Hay-Zama, Wentzel, and Ronald Lake population each overlap wildland provincial parks.

The collection, assessment, and incorporation of bison population and habitat information into land-use decision making and planning will play an important role in identifying, understanding, and mitigating threats and limitations relative to bison management.

2.4.2.1 Residential Development

Threats:

- *Residential & commercial development (IUCN-CMP Threat 1.0)*
- *Housing & urban areas (IUCN-CMP Threat 1.1)*

Threats to people and property are potential barriers to the acceptance of wild bison on the landscape. In Alberta, human conflict concern is greatest for the Hay-Zama population, whose range overlaps the communities of Zama City and Chateh. Green spaces within residential areas can attract bison, who heavily use them for grazing. Presence of bison within these communities are a cause of safety concern and property damage. Reducing human conflict in these residential areas, and reducing bison-vehicle collisions (Section 2.4.2.4) is one of the objectives of the Hay-Zama harvest (Section 2.4.3).

Bison have been reported in the communities of Chateh and Zama City on an ongoing basis. Individual animals have been removed by GoA staff where the animal poses a public safety threat. Bison in the community of Chateh remains a chronic problem and bison continue to frequent the community creating safety concerns as well as property damage. Bison are frequently observed in the Zama City townsite, and while they are generally viewed favorably by residents, there are sometimes complaints.

Expansion of wood bison population ranges, or movements of wood bison outside of regular ranges increase potential for conflict. For example, the continued expansion of the Etthithun bison population into Alberta, may lead to real and perceived threats to people and property to settlements in and around the Paddle Prairie area. In 2020, AEP (now EPA) received unverified reports of bison on roads outside of the bison protection area. It is plausible that these bison will continue to utilize existing road networks and move closer to agricultural areas and settlements. Pre-emptive actions to mitigate such risks are important to implement prior to bison population expansion. Conversion of provincial Crown land to private land could also increase risk of bison-human conflict (Section 2.4.2.2; Section 2.4.3).

2.4.2.2 Agriculture

Threats:

- *Agriculture & aquaculture (IUCN-CMP Threat 2.0)*
- *Annual & perennial non-timber crops (IUCN-CMP Threat 2.1)*
- *Livestock farming & ranching (IUCN-CMP Threat 2.3)*

Interaction between wild bison and agricultural land is undesirable, due to potential for consumption and damage to crops, damage to fencing, and potential for interaction livestock and the associated risk of disease transmission between wild wood bison and domestic cattle or bison. Alberta wood bison populations do not currently overlap developed agricultural lands. The Etthithun population's range boundary does occur in proximity to grazing leases on the easternmost edge of the population range (Figure 1). However, no bison location data has been observed in proximity to grazing leases[6]. Provincial efforts towards managing conflict and disease risks have included removal of high risk animals prior to coming in contact with some agricultural areas, or facilitating their removal

[6] Note: Wood Bison ranges may include area beyond current extent of observations due to methodology used. See Section 2.1.2

(Section 2.2.1; Section 2.4.3). The GoA does not enable the issuance of dispositions for domestic bison grazing on provincial Crown lands north of township 95, west of the Peace River, and north of township 88, east of the Peace River (Public Lands Administration Regulation 187/2011). However, similar limits are not in place for domestic cattle and other livestock.

Risks for disease transmission occur in two ways, from wild bison to domestic animals and vice versa. Direct interaction between Alberta wood bison populations and domestic cattle or wood bison has not been documented to date (Section 2.2.2.2). There is also risk of transmission of diseases other than tuberculosis and brucellosis from domestic cattle or bison to wild wood bison (Section 2.4.1.4). These include Johne's disease, *Mycoplasma bovis,* and Malignant Catarrhal Fever. There have not been reports of these diseases affecting wild bison populations in Alberta, however continued monitoring of presence these diseases, and associated risk factors is warranted (Section 2.4.1.4).

Use of agricultural lands by bison can have negative impacts on wood bison populations, as bison that foray into agricultural lands are often removed, or at higher risk of harvest. Animals habituated to agricultural crops would be difficult to haze or exclude via fencing and have been shown to continue negative behaviors despite human intervention. Ultimately, removal would be the required approach and is difficult for herd animals like bison. A study of plains bison use of agricultural lands near Prince Albert National Park demonstrated that bison were drawn to forage in agricultural lands, despite increased risk of harvest outside of Prince Albert National Park (Simon and Fortin 2019). This ongoing conflict has resulted in large population declines and threats to population sustainability. In northwestern Canada, dispersing bulls have also been removed due to agricultural conflict (Jung 2017).

Increase in risk of wood bison interaction with agriculture could occur due to either expansion of wood bison population distribution, dispersal movements of wood bison outside of regular ranges, or expansion and conversion of provincial Crown land to agricultural and grazing land-uses within or near Wood Bison Ranges. Increased conversion of provincial Crown land to agricultural land began in northwest Alberta in the early 1980s (Bowen 2002). Although the amount of land conversion fluctuates between years, there have been high rates of provincial Crown land sales in this region in comparison to other regions in Alberta between 1990 and 2022 (AWA 2023). LRRCN knowledge holders have identified conversion of public land to agricultural land east of Highway 88, between the Peace River and Highway 58 since the 1970s as a threat to wood bison (LRRCN 2015).

Lands that have soils suitable for annual or perennial crops, and in close proximity to existing roads, infrastructure or communities are at higher probability of conversion. In addition to increasing risk of interaction between wood bison and agricultural land, conversion of provincial Crown land to agricultural land could also result habitat loss and fragmentation of connected populations or habitats. Bison management responses such as exclusion zones implemented in proximity to agricultural areas and private lands could increase potential habitat loss or fragmentation. It is anticipated that proposals for sales of provincial Crown lands will continue in northern Alberta and in some areas may present elevated risks for conflict between wood bison conservation and management objectives and the expansion of agriculture land use.

2.4.2.3 Energy Production and Mining

Threats:

- *Energy production & mining (IUCN-CMP Threat 3.0)*
- *Oil & gas drilling (IUCN-CMP Threat 3.1)*
- *Mining & quarrying (IUCN-CMP Threat 3.2)*

Populations vary in the amount of existing mining, and oil and gas development in their range (e.g., industrial sites, wellsites, seismic lines). For example, the Hay-Zama and Etthithun ranges contain higher proportions of certain types of anthropogenic disturbance than other populations, and bison heavily use these linear features, well sites, and other disturbances within their range (Beaver First Nation 2015; EPA, unpublished data). Certain active or reclaimed features related to natural resource extraction can attract bison due to presence of suitable forage. The Etthithun and Nordquist populations in northeastern BC are attracted to vegetated road edges, and sites for petroleum and natural gas exploration and extraction due to presence of forage (Leverkus 2015).

Linear features associated with energy production and mining can also act as movement corridors for bison. A previous analysis found selection of linear features (e.g., roads, seismic lines) by the Ronald Lake population was

variable depending on habitat type, with only evidence for selection of linear features in habitats other than upland deciduous, pine, and treed-rich fen in summer (DeMars et al. 2020). However, movement rates were found to increase along linear features (DeMars et al. 2020). Given that bison use linear features as movement corridors, there is risk that development of linear features in certain areas could increase risk of contact between disease-free and diseased populations, or interaction with agriculture (Section 2.4.2.2), residential areas (Section 2.4.2.1) or transportation corridors (Section 2.4.2.4). Linear features within or near Wood Bison Ranges could also increase human access.

Large mines and in-situ developments effectively remove wood bison habitat until these disturbances are effectively reclaimed. Ronald Lake is the only population that overlaps oil sands agreements and the oil sands Surface Mineable Area. However, there are no existing oil sands mines or large in-situ developments within the current Ronald Lake range, and activities in the range have only included exploration to date. However, multiple sources of Indigenous Knowledge indicate that the Ronald Lake population once ranged closer to areas where current oil sands mines exist (Candler et al. 2015; FMFN SD 2018; Olson et al. 2018). The Imminent Threat Assessment identified the Teck Frontier Oil Sands Mine as an imminent threat to the Ronald Lake population (ECCC 2021). Although this application has been withdrawn, potential for future development in oil sands agreement areas within the population range exists. Development in the areas of these agreements would involve a project approval process.

2.4.2.4 Transportation and Service Corridors

Threats:

- *Transportation & service corridors (IUCN-CMP Threat 4.0)*
- *Roads & railroads (IUCN-CMP Threat 4.1)*
- *Utility & service lines (IUCN-CMP Threat 4.2)*

Populations vary in the amount of existing roads within their range, and proximity to major highways. Bison can be attracted to roads because they can be used as movement corridors, and vegetated road edges can be a source of forage (Leverkus 2015; Jung 2017). The Hay-Zama population displays the greatest degree of interaction with roadways with monitoring data and local observations indicating high use and presence on roadways. In 2020, EPA received unverified reports of bison on roads east of the Northwest Bison Protection Area, presumably from the Etthithun population.

A key consideration in implementing a hunting season for the Hay-Zama population was the public safety factor associated with bison-vehicle collisions. Bison-vehicle collisions occur on Highway 58, the Zama Highway and local oilfield or resource roads. As a preventative measure, additional warning signage has been installed and the addition of flashing amber lights occurred in 2023. Conflicts along roadways continue within the Hay-Zama range, with reduction in collisions in some years following a hunt. However, documenting mortalities from ungulate-vehicle collisions can be challenging if individuals do not die near the location where the collision occurred (Jung et al. 2024). The total number of Hay-Zama bison-vehicle collisions is unknown due to the reporting structure of Royal Canadian Mounted Police, Fish and Wildlife Enforcement, and municipal data bases, as well as a lack of reporting.

Indigenous Knowledge holders indicated that development of the John D'Or Prairie and Garden River road in the 1970's resulted in migratory changes in the Wentzel population (Schramm 2005). Roads associated with industrial development also facilitate human access to the Ronald Lake population (FMFN SD 2018; Olson et al. 2018).

2.4.2.5 Forestry

Threats:

- *Biological resource use (IUCN-CMP Threat 5.0)*
- *Logging & wood harvesting (IUCN-CMP Threat 5.3)*

Alberta wood bison populations vary in the amount of existing forestry harvest in their range, as well as the amount of their range in a Timber Disposition (i.e., a Forest Management Agreement area or timber quota).

Forested habitats are used by wood bison for insect refuge, resting, thermal refuge and foraging (ECCC 2018b; Belanger et al. 2020). However, less information exists on wood bison response to forestry harvest.

A previous analysis of the Ronald Lake population found avoidance of cutblocks (not categorized by age) relative to coniferous forest in both snow, and snow-free seasons (DeMars et al. 2020). However, the Nahanni population were found to select anthropogenic clearings, but the analysis lumped cutblocks with oil and gas clearings, making the specific response to cutblocks less clear (Thomas et al. 2021). Since there are only a few years of collar data from some Alberta wood bison populations, there has been limited opportunity to compare the use of areas before and after forestry harvest, or response to different silvicultural practices. Future opportunities to examine wood bison response to forestry harvest and silvicultural practices should be available given that there are now individuals collared from all wood bison populations in Alberta (Section 2.2.1.5; Section 5.8).

Young regenerating harvested stands may initially have more suitable summer forage for wood bison than mature deciduous stands (Redburn et al. 2008). However, neither mature stands or harvested areas provide suitable winter forage for bison (Redburn et al. 2008). LRRCN knowledge holders indicated that bison will use cutblocks in summer for foraging (Schramm 2005). However, some Indigenous Knowledge holders expressed that cutblocks could displace bison (Schramm 2005). Indigenous knowledge holders have also indicated that forestry cutblocks can be a source of forage for the Ronald Lake population, but they are not considered ideal foraging habitat (Olson et al. 2018).

The impact of additional development to support forestry, such as roads, and lumber storage yards should also be considered. For example, Hay-Zama bison congregate at times at a forestry company deck yard for log sorting and storage near Highway 35. The threat of additional roads related to forestry on the Ronald Lake population has been identified by Indigenous Knowledge holders (Olson et al. 2018).

2.4.3 Human Conflict

Threats:

- *Biological resource use (IUCN-CMP Threat 5.0)*
- *Persecution/control (IUCN-CMP Threat 5.1.3)*

The threat of human conflict, which can ultimately result in removal of animals, is closely linked to residential (Section 2.4.2.1), agriculture (Section 2.4.2.2), and transportation (Section 2.4.2.4) land-uses. The presence of bison in close proximity to people can lead to a real or perceived, current, or future threat of conflict with people, property and livelihoods. Conflict can take the form of direct bodily harm, which has resulted in injuries and deaths in Yellowstone National Park (Cherry et al. 2018) and the Yukon. Outside of EINP, Alberta hasn't had any reported injuries as a result of bison encounters. The key factors leading to bison aggression are prolonged disturbance and unsafe approach distances (Haidt et al. 2018), and appropriate educational outreach should be considered to limit future conflicts.

One bull bison was removed from the agricultural surveillance area in 2014, and two individuals were removed in 2021. In 2022, there were a minimum of 6 instances where bison had crossed or were in proximity to Highway 35. The response was to haze the bison west of km 10 on the highway. Two of these individuals were eventually euthanized, and the meat was provided to the residents of Meander River.

2.4.4 Sensory Disturbance

Threats:

- *Human intrusion & disturbance (IUCN-CMP Threat 6.0)*
- *Recreational activities (IUCN-CMP Threat 6.1)*
- *Work & other activities (IUCN-CMP Threat 6.3)*
- *Excess energy (IUCN-CMP Threat 9.6)*

This threat is meant to represent the impact of sensory disturbance (e.g., excess noise) on wood bison. Potential sources of sensory disturbance to wood bison include recreational activities, industry activities, and research and monitoring (e.g., aerial surveys and collaring). Sensory disturbance is often associated with land-uses (e.g.,

energy production and mining), and it can be difficult to separate the impacts of sensory disturbance from habitat alteration related to these land-uses and different populations likely vary in tolerance levels.

Wood bison populations in Alberta are not currently subject to significant volumes of recreational activity, due to their remote locations. Recreational activities within Wood Bison Ranges could include use of off-highway vehicles and snowmobiles (ECCC 2018b). Off-highway vehicles and snowmobiles may also be used for industry related activities within wood bison populations in Alberta (notably the Hay-Zama and Etthithun ranges), as well as access to traplines. The behavioural response of bison to approach on foot, snowmobile, or truck was examined in Prince Albert National Park (Fortin and Andruskiw 2003). A flight response was more likely when herds contained young, especially when herds were approached within 260 m. Bison displaced following disturbance, but sensory disturbance did not appear to influence overall habitat use. Borkowski et al. (2006) examined the response of bison and elk to snowmobiles in Yellowstone. Small groups, and groups near roads were more likely to display a disturbance response. Disturbance responses were more likely if groups were approached. Bison demonstrated some habituation to snowmobiles, and fitness or demographic impacts due to snowmobile disturbance were not evident.

Response of Alberta wood bison populations to disturbance caused by helicopters has not been fully assessed. Study of the Banff population found avoidance of areas where helicopter-based hazing occurred (Verzuh et al. 2024a). Bison movement rates were examined pre and post collaring for the Aishihik population in Yukon. Responses of individual bison varied, but overall, movement rates returned to baseline levels within 10 days of collaring (Jung et al. 2019a). However, most individuals returned to normal behaviour after 5 days (Jung et al. 2019a). Outside of GoA population surveys and collaring efforts which are limited to a short duration to limit stress and disturbance, it is not anticipated that helicopter disturbance is more than occasional disturbance to bison populations in Alberta.

There is potential for sensory disturbance related to various industrial activities (e.g., forestry harvest, oil and gas development) within Wood Bison Ranges within Alberta (Section 2.4.2). Some types of industrial activities could result in longer term or chronic sensory disturbance, while some activities could result in more temporary sensory disturbance. The response of wood bison to certain forms of sensory disturbance requires further investigation. There is evidence that avoidance of anthropogenic disturbances (e.g., active forestry harvest and oil and gas development) by the Ronald Lake population was stronger when these disturbances were active (DeMars et al. 2017). Indigenous knowledge holders have indicated that the Ronald Lake population is sensitive to sensory disturbance (e.g., noise), and will avoid certain forms of sensory disturbance (Candler et al. 2015; FMFN SD 2018; Olson et al. 2018). A remote camera study comparing an area exposed to oil sands related activity and a control area found that Ronald Lake females and young were more likely to avoid industrial activity compared to mature males (MSES 2017). However, populations may differ in their response to sensory disturbance. The Hay-Zama and Etthithun populations occur in working landscapes, and due to their use of different disturbances (Section 2.4.2.3), they are likely partially habituated to some level of industry related sensory disturbance. There are relatively low levels of activity within the Wabasca range, and there is limited information on how the Wabasca population would respond to sensory disturbance. However, the precautionary approach is to assume the Wabasca population would be sensitive to sensory disturbance, as observed in the Ronald Lake population. Given the proximity of the Ronald Lake and Wabasca populations to diseased populations in WBNP, there is potentially concern that sensory disturbance within these population ranges could influence distribution of these populations, potentially encouraging use of areas where they are exposed to higher disease risk.

2.4.5 Overharvest

Threats:

- *Biological resource use (IUCN-CMP Threat 5.0)*
- *Hunting & collecting terrestrial animals (IUCN-CMP Threat 5.1)*

The GoA purposefully encourages harvest in order to restrict the distribution of diseased populations by withholding the protections typically afforded to wildlife under the *Wildlife Act* and Wildlife Regulation. This is referred to in the Recovery Plan as “unregulated harvest.” Currently, unregulated harvest can legally occur to individuals who move outside of the current protection areas, into areas where wood bison are not listed as Threatened under the Wildlife Regulation (Figure 1; Section 1.1). This is separate from the managed Hay-Zama hunt where the harvest rate is controlled by limiting the number of Bison Special Licences issued (Section 2.3.4).

Unregulated harvest is most likely to occur for the diseased Wentzel and Garden River populations (Figure 1), where harvest is desirable because it can help to limit risk of disease transmission to disease-free populations (Section 2.1.2; Section 2.3.6). Individuals from disease-free populations in northwest Alberta may infrequently move outside of the area where wood bison are listed as Threatened, where it is legal to harvest them. However, there have been few reports of individuals from the disease-free populations moving outside of the status area, and infrequent harvest of these individuals is not expected to have population level impacts. There have been no verified reports of illegal harvest of wood bison in the area they are listed as Threatened since it was established in 2021 and overharvest is not considered to be a significant current threat.

However, prior to status changes, most wood bison populations in Alberta were not protected from harvest (Section 1.1). The amount of harvest that occurred prior to status changes cannot be quantified, as a licence was not required. Unregulated harvest was identified as an imminent threat to the Wabasca population prior to status changes (ECCC 2021). Indigenous Knowledge holders also identified harvest prior to status changes as a threat to the Ronald Lake population (MSES 2018). In recent years, some of the Indigenous representatives on the RLBH CMB have asked their members to voluntarily abstain from harvest and it is unknown to what extent this may also be contributing to the recent increases in population size (Section 2.1.4). The Wabasca population is currently protected from all hunting within the Wabasca Bison Protection Area.

2.4.6 Natural Systems Modifications

Naturally occurring wildfire is the dominant natural disturbance agent in the boreal forest (Stocks et al. 2002). Post-fire early successional habitats may provide attractive forage to wood bison during summer months (COSEWIC 2013), but more analysis on wood bison use of burned habitats in Alberta is required. Changes to hydrology could have implications on important wood bison habitats, like graminoid wetlands. Additional information and analysis are required to fully understand the implications of fire and flood cycles as a result of a changing climate (Section 2.4.7) on bison habitat as well as the potential use of prescribed wildfire to create or enhance wood bison habitat in northern Alberta.

2.4.6.1 Fire

Threats:

- *Natural systems modifications (IUCN-CMP Threat 7.0)*
- *Fire & fire suppression (IUCN-CMP Threat 7.1)*

A natural fire regime should not be detrimental to wood bison habitat, and may promote establishment of open meadow habitats for wood bison (ECCC 2018b). However, the impact of fire on wood bison should be considered under the current fire regime in Alberta, which is influenced by fire suppression and a changing climate (Section 2.4.8; ECCC 2018b). Prescribed burning has been used as a tool for bison habitat improvement by Indigenous peoples, as well as both provincial and territorial governments (ECCC 2018b).

The impact of fire on forage quality and quantity, and the importance of the relationship between fire and grazing has been examined for plains bison (Fuhlendorf et al. 2009; Raynor et al. 2015). However, less information exists on the influence of wildfire, and prescribed burning on wood buffalo forage in boreal ecosystems. Buffalo in WBNP have been observed grazing in burned areas (Carbyn et al. 1993). Wildfire in the Farwell herd range, an introduced buffalo herd in Alaska, reduced the amount of black spruce forest, which is generally less preferred by buffalo, and increased the amount of preferred sedge meadow habitat (Campbell and Hinkes 1983). Quinlan et al. (2003) measured vegetation response in meadows that received zero, one, or three prescribed burns over a six-year period with the intention of improving wood buffalo habitat in the Slave River Lowlands. Prescribed burning had moderate impacts on reduction in shrub encroachment, but actually reduced some preferred buffalo forage species, measured approximately three years following the most recent burn (Quinlan et al. 2003). Jorgensen et al. (2023) examined plant communities following fire in Northwest Territories, and suggested that new burns should provide grass and sedge forage for buffalo. However, the amount of forage contributed to wood buffalo by burns remains a knowledge gap, as many studies have focused on vegetation community composition (i.e., what plants species are present after fire), rather than forage biomass (i.e., amount of certain plants after fire) following burns.

According to Beaver First Nation knowledge holders, wood bison use post-burned areas due to growth of new vegetation (Beaver First Nation 2015). However, there are also instances of wood bison being displaced by fire

(Beaver First Nation 2015). Indigenous Knowledge holders for the Ronald Lake population have observed increased fire frequency seen in recent years, and potential for displacement of population due to severe wildfires. Although fires may displace bison, they have beneficial effects for bison as areas regenerate (Olson et al. 2018). Indigenous Knowledge holders have also reported that a decrease in cultural burning, and bison grazing over time has resulted in a decrease in the amount of prairie near the Wabasca population range (ShagowAskee Foundation 2023).

A previous RSF of the Ronald Lake population found use of burns variable, depending on the sex of animal, season, and severity of burn (DeMars et al. 2016, 2017). General findings were that males selected burns more strongly than females; selection for burnt areas was strongest during the spring compared to other seasons; and higher severity burns were selected in comparison to lower severity burns (DeMars et al. 2016). The Richardson Fire in the Ronald Lake range occurred in 2011, therefore there wasn't opportunity to examine response of the Ronald Lake population to newly burned areas (i.e., <2 years old), when selection of burned areas is expected to be strongest (DeMars et al. 2016). There has been relatively limited opportunity to compare use of areas before and after wildfire, or response to newly burned areas since collaring began. However, a large portion of the Wabasca, Garden River, and Wentzel ranges were burned in 2023, and the Wentzel range was again burned in 2024, providing opportunity to examine response to habitats before and after wildfire.

2.4.6.2 Dams and Water Management

Threats:

- *Natural systems modifications (IUCN-CMP Threat 7.0)*
- *Dams & water management/use (IUCN-CMP Threat 7.2)*

Changes in hydrology can alter the availability of important buffalo habitats. This can occur through flooding or drying, both of which can change access to foraging habitats (Carbyn et al. 1993; Korosi et al. 2017). These issues have most recently been reviewed and considered as part of the Wood Buffalo National Park World Heritage Site Action Plan (PC 2019). Understanding the dynamic between the Peace River, Athabasca River, dams, and climate change requires ongoing monitoring and investigation (PC 2019). These impacts are primarily within WBNP and dams and water management are not expected to be a significant current threat to wood bison outside of the park.

There are sources of Indigenous Knowledge that highlight the detrimental impacts that changes to hydrology have on wood bison habitat in Alberta, such as drying of wetlands used for foraging. Potential changes to water quantity and quality related to industry, and related impact on the Ronald Lake population have been identified by local Indigenous knowledge holders (FMFN SD 2018; Olson et al. 2018).

2.4.7 Pollution

Threats:

- *Pollution (IUCN-CMP Threat 9.0)*
- *Industrial & military effluents (IUCN-CMP Threat 9.2)*
- *Agricultural & forestry effluents (IUCN-CMP Threat 9.3)*
- *Air-borne pollutants (IUCN-CMP Threat 9.5)*

Types of air and water pollution that could impact wood bison are summarized in the federal recovery strategy (ECCC 2018b). Due to proximity of the Ronald Lake population to the oil sands, potential contamination of the herd and their habitat has been identified as a threat by local Indigenous knowledge holders (FMFN SD 2018; Olson et al. 2018).

A recent review identified exposure of wood bison in the Peace-Athabasca region to various contaminants (Wilcox et al. 2023). Additional information is required to determine the impact of these contaminants on wood bison health and associated public health impacts related to consumption of wood bison meat. Environment and Climate Change Canada is conducting ongoing work to monitor contaminants, and their impact on wood bison reproduction and population viability.

2.4.8 Changing Climate and Severe Weather Events

Threats:

- *Climate change & severe weather (IUCN-CMP Threat 11.0)*
- *Habitat shifting & alteration (IUCN-CMP Threat 11.1)*
- *Droughts (IUCN-CMP Threat 11.2)*
- *Temperature extremes (IUCN-CMP Threat 11.3)*
- *Storms & flooding (IUCN-CMP Threat 11.4)*

Drowning risk for Alberta wood bison populations is more likely during winter, when individuals could break through ice on smaller lakes and waterbodies within their range. For example, an individual in the Wabasca population drowned in November 2020 (personal communication, N. Melnycky, Senior Wildlife Biologist, Alberta Environment and Protected Areas). Given the small size of the Wabasca population, single morality events can have detrimental impacts on persistence of the population. Higher winter temperatures could decrease thickness of ice, increasing drowning risk, or limiting access to wetland food sources. Indigenous Knowledge holders identified that changes to winter conditions, like snow depth, and the freeze-thaw cycle can influence movement of the Ronald Lake population, and increase risk of falling through frozen waterbodies (Olson et al. 2018).

More severe winter conditions could have negative impacts on wood bison. Winter movement rates of the Ronald Lake population are impacted by snow depth and temperature (Sheppard et al. 2021). Movement rates were negatively associated with cumulative snow depth, and positively associated with increasing temperatures, with more rapid increases seen above -6.4ºC (Sheppard et al. 2021). Predation of the RLBH by wolves occurred primarily in later winter (i.e., March), when snow depths exceeded 30 cm (Dewart 2023). Snow depth also plays an important role in foraging; areas with depths greater than 30 cm are generally avoided (Rawleigh et al. 2024). In the Ronald Lake population, predation by wolves occurred primarily in later winter (i.e., March), when snow depths exceeded 30 cm (Dewart 2023). Severe winter conditions in 2013 resulted in an estimate 95% calf mortality and 10% adult mortality in the Hay-Zama population (GoA 2013).

Natural fire, and cultural or prescribed burning can have positive impacts on bison habitat, as it can increase the amount of preferred meadow habitat (Section 2.4.6.1). However, changes to the natural fire regime, due to fire suppression, or weather events could have detrimental effects on wood bison. Severe wildfires could displace bison from their range while the fire is active (ECCC 2018b).

Summer temperature extremes can also have negative impacts on bison. Summer temperature extremes can also impact buffalo movement and behaviour. A study of the Ronald Lake and Aishihik populations focused on the 2021 Western North American Heat Wave identified 21ºC as a threshold, above which wood buffalo movement rates decrease (Sheppard et al. 2025). High temperatures also shifted the timing of peak wood buffalo activity to early morning (Sheppard et al. 2025). In Alberta, an individual from the Wabasca population died in the summer of 2021 during an extreme heat event. Extreme temperatures could not be confirmed as the direct cause of mortality, as there could have been underlying health issues that prevented the individual from dealing with the heat, however extreme temperatures were likely a factor (personal communication, N. Melnycky, Senior Wildlife Biologist, Alberta Environment and Protected Areas).

2.4.9 Other Threats – Loss of Genetic Diversity

Threats:

- *Other options (IUCN-CMP Threat 12.0)*
- *Loss of genetic diversity (IUCN-CMP Threat 12.1)*

Wood bison meet the criteria to be considered a Designatable Unit (Section 2.1.3). However, all wood bison went through a genetic bottleneck following the rapid decline in population size between 1873 and 1904 (COSEWIC 2013), as well as genetic introgression as a result of plains bison being released into WBNP in the 1920s (Wilson and Strobeck 1999). It is suspected that founder effects are likely present in wood bison (ECCC 2018b). However, the genetic diversity of all wood bison in Alberta has been assessed, and there are no immediate concerns of inbreeding depression at this time (personal communication, G. Wilson, Bison Ecologist, Parks Canada). Genetic

diversity should continue to be monitored, especially in the Wabasca population, which is at greater risk of inbreeding depression than other populations due to its small population size.

The Etthithun and Hay-Zama populations both arose from translocations of EINP bison (AEP and ACA 2017). The captive EINP wood bison population was founded by 11 individuals that were offspring of bison captured within WBNP (COSEWIC 2013). While the potential for inbreeding depression and a reduction in the ability to adapt to environmental change remains a concern (McFarlane et al. 2006), thus far it has not been observed as a limiting factor in reintroduced wood bison populations in Canada (Wilson and Zittlau 2004).

The BIG project compared genetic samples from modern bison to neohistoric bison genetic samples (Oppenheimer et al., in prep.). Some degree of plains bison ancestry was observed in all modern wood bison populations assessed (Oppenheimer et al., in prep.). This project has been contributing to research to develop the techniques to harvest ovum and sperm from wild bison (including diseased wild bison) that have important genetic diversity in order to better preserve the ancestral wood bison genotype in a gene bank similar to what was recently done for Yellowstone bison (Benham et al. 2021). Support amongst local Indigenous organizations for these types of interventions will need to be garnered, due to its invasiveness. However, continued engagement and discussions with local community organizations increases support for the project (personal communication, G. Wilson, Bison Ecologist, Parks Canada).

2.5 Potential Limiting Factors

In addition to threats outlined in Section 2.4, there are additional potential limiting factors that were investigated that could affect recovery of Alberta wood bison populations. Limiting factors were considered based on the COSEWIC definition:

"*Activities and processes that may not cause a population level decline, but limit growth, resilience, or recovery of the Wildlife Species* (COSEWIC 2023)."

None of the potential limiting factors assessed are expected to prevent the recovery goals and objectives (Section 3.0) being met for any of Alberta's wood bison populations. The potential for recovery of wood bison to impact other species is also discussed.

2.5.1 Carrying Capacity and Limitations on Range Expansion

Some Alberta wood bison population ranges are close to geographic (e.g., large watercourses, topography, large wetland complexes) and anthropogenic (e.g., highways, oil sands mines) features, that limit potential for range expansion. Expansion of wood bison populations towards WBNP increases the risk of disease exposure. Dispersal or range expansion could also increase potential of human conflict through interaction with highways, agricultural areas, residential areas, or industrial development. Expansion into undesirable areas could ultimately result in removal of individuals. Examination of the factors that could promote range expansion or dispersal to new areas in other bison populations, such as population density, can provide insight for management of the Alberta wood bison populations.

In established populations, dispersal/range expansions become more likely at higher densities (Matthysen 2005). Nudds (1983) used the statistical relationship between body size and population density (Peters and Raelson 1984) to suggest that a long-term population density for wood bison could be expected to be on the order of 0.41 bison/km^2. Gates and Larter (1990) demonstrated in the Mackenzie Bison Sanctuary that dispersal/range expansion occurred when densities were in the range of 0.5-0.8 bison/km^2 which is consistent with the prediction that dispersal/range expansion events are more likely to occur at densities above 0.41 bison/km^2. Plumb et al. (2009) observed that exceeding the population density of 0.41 bison/km^2 was consistent with the observed range expansion and dispersal event in the Yellowstone National Park bison population and this event occurred before food limitation thresholds (i.e., nutritional carrying capacity) were exceeded. For reference, a value of 0.41 bison/km^2 would equate to approximately 800 bison in the smallest disease-free Wood Bison Range (Ronald Lake; ~1,935 km^2), and over 10,000 bison in the largest disease-free Wood Bison Range (Etthithun; ~26,229 km^2).

Several nutritional carrying capacity analyses have been completed for the Ronald Lake population (ECCC 2018a; Teck 2018; Gould 2025). Reynolds et al. (1982) estimated carrying capacity of the Hay-Zama wetland complex, which makes up a small portion (362 km^2) of the current Hay-Zama range (approximately ~7,852 km^2). Further investigation is required to validate these estimates, as they were based on assumptions (e.g., for offtake proportion and wood bison forage requirements) and are subject to some level of uncertainty. Nutritional carrying capacity estimates have not been completed for the Etthithun and Wabasca ranges. To date, there hasn't been evidence that Alberta wood bison populations are limited by available forage (e.g., evidence of winter starvation, overgrazing, low reproductive rates). It is expected that dispersal or range expansion events would occur prior to forage becoming a limiting factor in Alberta Wood Bison Ranges.

2.5.2 Predation

Wolves and bears are natural predators of wood bison. Evidence from the literature suggests that bison must be present on the landscape for long periods of time for wolves to adjust hunting behaviour in order to successfully prey upon wood bison (Jung et al. 2023). Wolf predation or scavenging of bison populations in Alberta has been documented in WBNP populations (Carbyn and Trottier 1987), Hay-Zama, and Ronald Lake populations (Dewart 2023). Early information based on Alberta's bison collaring and mortality investigations to date has not identified wolf predation as a primary factor for adult female survival. To date, mortality of one collared cow from the Hay-Zama population was determined to be the result of a wolf predation event (personal communication, N. Melnycky, Senior Wildlife Biologist, Alberta Environment and Protected Areas).

A study of wolf predation of the Ronald Lake population found that predation primarily in later winter (i.e., March), when snow depths exceeded 30 cm (Dewart 2023). Investigated bison kill sites included calves, yearlings, and mature individuals (Dewart 2023). However, the overall predation rate on the population was estimated to be low (Dewart 2023). Joly and Messier (2004b) assessed the relative impacts of disease and predation on the decline of wood bison in WBNP and suggest that wolf predation may regulate bison populations in the presence of disease in the wood bison population, whereas disease-free populations like the Mackenzie Bison Sanctuary, increased despite predation occurring.

In areas of Alberta where grizzly bears are sympatric with wood bison, predation on calves could occur, as documented elsewhere (Varley and Gunther 2002). This currently only applies to the Etthithun population, which overlaps Bear Management Area 1, which has a relatively low density of 0.70 grizzly bears/1000 km^2 (Hughes et al. 2021). No instances of grizzly bear predation on the Etthithun population has been documented to date. Documentation of black bear predation on bison is lacking, suggesting this is a rare phenomenon notwithstanding there has likely been very little investigation of it. Research to document black bear predation on the Ronald Lake population is ongoing. The Ronald Lake population migrates shortly after giving birth to their neonatal range. An increase in black bear activity in the vicinity of the neonatal range is observed when bison are present, but limited evidence of black bear predation on the Ronald Lake population has been observed (Sharp et al. 2025). However, potential for predation in the short window of time following calving prior to migration to the neonatal range has not been assessed.

Overall, understanding the proportion of bison mortality attributed to predation can inform bison management in that it provides information on one factor, among many, affecting bison population growth rates.

2.5.3 Direct Competition

Direct competition focuses on the potential impact of wood bison recovery on other species (apparent competition is discussed in Section 2.5.4). Potential impacts of the recovery of bison on other species include demographic impacts of competition, or displacement of these other species by bison. In areas where wood bison are sympatric with other large mammals, there could be potential impacts on other species, notably cervids (Clark et al. 2016). Given the conservation issues for woodland caribou (Environment Canada 2012) and cultural importance of moose (Garibaldi 2009), these two species are anticipated to be the focus of any competitive impacts of wood bison in northern Alberta, notwithstanding wood bison impacts on other culturally important species, such as muskrat (Jung et al. 2019b).

Moose are ubiquitous throughout the area where wood bison occur in Alberta at relatively low densities. Several Wood Bison Ranges overlap with woodland caribou ranges. The greatest overlap is seen with the Etthithun population and the Chinchaga caribou range. The Wabasca population partially overlaps with Red Earth caribou range, and the Hay-Zama population partially overlaps with Bischto caribou range. The Ronald Lake population range located between two caribou ranges (Red Earth and Richardson) and has minimal overlap with the Red Earth range. However, caribou and bison also differ in their habitat selection patterns, and within these overlapping ranges, there is expected to be low overlap in the habitats used by caribou and bison.

According to Beaver First Nation knowledge holders, wood bison displace other ungulates (e.g., moose) that are more preferred food sources of some of their community members (Beaver First Nation 2015). DRFN knowledge holders also reported displacement of moose, as well as caribou by bison (Section 2.3.3). Indigenous Knowledge holders have also described high overlap in *habitats* used by the Wabasca population, and moose (ShagowAskee Foundation 2023).

Considerable scientific research has been conducted on potential competitive interactions between bison and other species, primarily in Yukon. Fischer and Gates (2005) assessed competition potential between wood bison and northern mountain caribou and found low levels of range overlap between each population's core distribution and very low (10%) overlap in winter diet, suggesting low potential for competition. Jung et al. (2015b) also reported low levels of dietary overlap between wood bison and northern mountain caribou in winter, and moderate overlap (~ 50%) on high elevation summer ranges. However, the seasonal nature of caribou distribution in that system (i.e., summer range in alpine and sub-alpine habitats) in the southwest Yukon is considerably different than found in boreal ranges in northern Alberta.

Jung et al. (2015b) also reported low (23%) to moderate (42%) levels of dietary overlap between sympatric wood bison and moose in low elevation habitats, while moose and bison in EINP demonstrated virtually no overlap in

winter diet (Telfer and Cairns 1986). As with caribou, wood bison and moose exhibited low levels (< 7%) of range overlap during winter as predicted from fine-scaled resource selection patterns (Jung et al. 2018). Co-occurrence analysis indicated that wood bison did not influence the winter distribution patterns of either caribou or moose (Jung et al. 2015a). Research on seasonal diets of the Ronald Lake population (Hecker et al. 2021) indicated a higher proportion of browse in their summer diet (> 50%) than reported for bison elsewhere in North America, suggesting a higher *potential* for competition with moose. Further, roughly 50% of the Ronald Lake bison winter diet, and 30% of the spring diet also consisted of browse (Hecker et al. 2021). However diets can be variable across years and across individuals. Winter diet information (EPA, unpublished data) from 2021 and 2024 indicated higher proportions of sedges, horsetails (*Equisetum* spp.), and willow (*Salix* spp.) in sampled individuals' diets.

A requirement of exploitative interspecific competition is that shared food resources of sympatric species must be limiting (de Boer and Prins 1990). Given their more similar diets elsewhere (Telfer and Cairns 1986) and the level of browse in Ronald Lake bison diets, moose-bison niche overlap is likely higher than that of caribou-bison. However, there is relatively low overlap in broad-scale distribution, fine-scale resource selection, and diets. Potential competition between wood bison and moose or woodland caribou is deemed low, and at this time wood bison are not considered to be influencing other ungulate population dynamics via direct competition.

2.5.4 Apparent Competition

Apparent competition (Holt 1977) occurs when the abundance of one prey species indirectly influences the abundance of another via a shared predator (DeCesare et al. 2010). In the current context, for wood bison numbers to indirectly influence either woodland caribou or moose abundance via predation, a key condition is that predators, primarily wolves, numerically respond to increased wood bison density.

Joly and Messier (2000) reported a positive relationship between wood bison abundance and an index of wolf abundance (wolf pelts) in WBNP, suggesting wolf populations numerically respond to wood bison abundance. In the Northwest Territories, wolf numbers increased in response to an irrupting wood bison population (Larter et al. 1994), and Gates and Larter (1990) suggested the increasing bison population may increase predation rates on moose and caribou (i.e., apparent competition). Whether or not wood bison abundance indirectly influences either moose or woodland caribou abundance in Alberta is a knowledge gap.

Historically, both wood bison and woodland caribou co-existed within unique habitat niches and at self-sustaining levels where predation played an important role in regulating populations for both species. Greater understanding of the role that bison currently play as a potential source of alternative prey for wolves and impacts to woodland caribou should be assessed, as well as the potential impact of wolf population reduction in caribou ranges on overlapping Wood Bison Ranges (e.g., the Chinchaga caribou range with the Etthithun population). Efforts to monitor population trend in both species and identifying the sources of mortality, particularly in juveniles is a key monitoring need as bison populations recover.

Habitat management activities or enhancements for wood bison should consider potential impacts to woodland caribou. Some bison populations (e.g., Hay-Zama, Etthithun) heavily use linear features. The potential impact of bison on maintaining these linear features due to grazing and travel should be considered in the context of habitat restoration focused on caribou.

Due to the conservation urgency around woodland caribou, the potential impact of wood bison recovery actions on recovery of woodland caribou will be considered prior to establishing new populations.

3.0 Recovery Goals and Objectives

The long-term goal for wood bison recovery is to achieve self-sustaining[7] wild, disease-free populations that provide ecological benefits, contribute to food security for Indigenous peoples, and harvest opportunities for Albertans. Fully achieving this long-term goal will be constrained by the need to manage for disease-risk until such time that bovine brucellosis and tuberculosis have been eliminated from the WBNP population (Section 2.2). Each population of wood bison in Alberta occurs in a unique conservation and socio-cultural context requiring that each have its own recovery objective.

These objectives should be viewed as interim (20 year) objectives, until the risk from brucellosis and tuberculosis has been eliminated.

Indigenous organizations and communities in northern Alberta collaborated in developing this Recovery Plan and they have expressed an aspiration for more direct participation in the conservation and management of wood bison in Alberta. It is a strategic direction of this recovery plan to increase the involvement of Indigenous peoples and local communities in the management of bison and plan implementation.

3.1 Population and Distribution Objective for the Hay-Zama and Etthithun Bison Populations

Objective

The combined population objective for the Hay-Zama and Etthithun Bison populations found within areas where wood bison are considered a Threatened species, is a self-sustaining population of at least 1,000 individuals. The harvest of wood bison within the Hay-Zama/Etthithun populations will be managed to:

- maintain a self-sustaining population;
- minimize the risk of undesirable range expansion that increases the risk of disease exposure;
- reduce bison-human conflict;
- contribute to the food security of Indigenous peoples;
- provide hunting opportunities for Albertans; and
- provide economic benefits to local communities.

Rationale

With the population growth of the expanding Etthithun population (Section 2.1.4.1) it is expected that the Hay-Zama and Etthithun populations will merge within the Northwest Bison Protection Area and have the potential to exceed 1,000 individuals within the next decade. Achieving this objective is contingent on effective management of bison-human conflict and minimize the risk posed by undesirable range expansion that increases the risk of disease exposure.

Alberta's bison monitoring program includes aerial surveys, GPS collaring, harvest reporting and biological sample collection which provide necessary information on bison movement, distribution, habitat use, vital rates, and estimation of population growth which informs assessments of population status and trends. Over time it will also provide the necessary information on the impacts of stochastic events (e.g., severe winters or accidental deaths from falling through the ice) and better estimates of the interannual variation in vital rates. This information can then be used to assess whether this population is achieving the definition of self-sustaining using population-specific parameters in a population viability analysis (Morris et al 2002).

[7] The words "self-sustaining" in this context means that the population on average demonstrates stable or positive population growth over the short-term (≤ 20 years) and is large enough to withstand stochastic events and persist over the long-term (≥ 50 years), without the need for ongoing active management intervention (Environment Canada 2011). It will not be possible for Alberta's disease-free wood bison populations to be fully self-sustaining until the threat of tuberculosis or brucellosis infection has been eliminated.

This objective would also contribute to the federal wood bison recovery strategy (ECCC 2018b) long-term population objective of five independent populations, each consisting of 1,000 individuals. Significant amounts of unoccupied habitat are available to both the Etthithun and Hay-Zama populations (Section 2.5.1) so available habitat will not limit achieving this objective. The potential limiting factor will be gaining local social acceptance (Section 2.3.3) which will require developing successful strategies to limit undesirable range expansion, vehicle-bison collisions along roads and bison-human conflicts in local communities (Section 4.3) so that harvest can be managed to allow for population growth and range expansion.

Actions

1) Continue to monitor the population abundance and distribution of the Hay-Zama and Etthithun population and coordinate the surveys with the B.C. government to the extent possible.

3.2 Population and Distribution Objective for the Wabasca Population

Objective

The Wabasca population stabilizes and become self-sustaining, while the disease risk from brucellosis and tuberculosis from neighboring diseased populations is either effectively contained *or* both diseases have been eliminated. As the Wabasca population progresses towards becoming self-sustaining, it will be managed to:

- minimize the risk of disease exposure;
- minimize the risk of undesirable range expansion that increases the risk of bison-human conflict;
- contribute to food security for Indigenous peoples; and
- provide opportunities for Alberta resident harvest and regional tourism.

Rationale

There is also little evidence in historical records that there were ever large numbers of animals in this population. The current population density is very low, so it is unlikely they are food limited. Determining what has been limiting this population is a knowledge gap. Preventing further population declines or extirpation will likely require management interventions beyond the protections this population currently has from harvest (Section 1.1). While it is possible that the population might increase on its own, the concern is that the population is sufficiently small that it could become extirpated from the demographic factors (e.g., loss of breeding adults, unbalanced sex ratios, declining fecundity as females age) and genetic factors (e.g., inbreeding depression or loss of genetic diversity) that all small populations are vulnerable to (Gilpin and Soulé 1986; Akçakaya et al. 2003; Blomqvist et al. 2010). It has been determined as part of Imminent Threat Assessment (ECCC 2021), that the Wabasca population, as a wild disease-free wood bison population, is important for the recovery of wood bison in Canada and is a priority for conservation. Due to conservation urgency, this population requires population reinforcement with additional wood bison added to the population (Section 5.5.1). Achieving sustained growth towards a self-sustaining population which remains disease-free requires implementing an enhanced disease containment strategy (Section 4.2.2), continued monitoring of population growth and distribution and intervening as required to reduce the risk of disease exposure or conflicts with humans.

Actions

1) Continue to monitor the Wabasca population abundance and distribution.

3.3 Population and Distribution Objective for the Ronald Lake Population

Objective

The Ronald Lake population is stable or increasing and of sufficient size to be self-sustaining and able to contribute to cultural connections, traditional practices, and sustainable use for future generations. The population will be managed for health, with measures in place to prevent interaction with diseased bison in WBNP, maintain habitat within its current range, and provide opportunities to expand its distribution.

Rationale

The objective for the Ronald Lake population was developed based on outcomes and objectives developed by the RLBH CMB for the Ronald Lake Buffalo Herd Management Plan. A key outcome identified during development of the Management Plan is that the Ronald Lake population is able to support cultural connections, traditional practices, and sustainable use for future generations.

In recent years, the Ronald Lake population appears to be increasing in population size (Section 2.1.4). The RLBH occurs in close proximity to the diseased animals in WBNP (Figure 1). Encouraging population growth and potential range expansion needs to be balanced with ensuring that the risk of disease exposure is being appropriately managed. The objective of a “stable or increasing” population size was chosen to allow flexibility in responding to the need to manage the risk of disease exposure. Managing the risk of disease exposure requires cooperation between PC and the Indigenous organizations it works with, the RLBH CMB, and GoA (Section 4.2.2). The RLBH CMB has also emphasized that the overall health of the population is necessary to maintain, through maintaining access to clean food and water, free from contamination.

Achieving the Ronald Lake objective also requires that habitat be maintained within the population range to the extent possible (Section 4.1). A large portion of the population range is currently within protected areas, however other land designations, including oil sands agreements, are present in the southern portion of the Ronald Lake range. Over time, if the Ronald Lake population size increases, it may expand its distribution beyond its current range. The RLBH CMB has identified a Support Area that will provide the best opportunities for future expansion.

Actions

1) Continue to monitor populations abundance and distribution of the Ronald Lake population and coordinate population surveys with Wood Buffalo National Park to the extent possible.

3.4 Population and Distribution Objective for the Wentzel Population

Objective

Continue to manage the risk and spread of brucellosis and tuberculosis by restricting the population’s distribution and abundance through harvest.

Rationale

The Wentzel population is known to be infected with brucellosis. The policy of enabling the unregulated harvest of this population and delivery of control measures has been effective at limiting the expansion of this population (Section 2.2.1) and should be maintained.

Actions

1) Continue to monitor the population abundance and distribution

4.0 Habitat Needed to Support Recovery

The purpose of this section is to identify habitat needed to support recovery of wood bison in Alberta, including recommendations on land-use. Wood bison occur over a broad area in Alberta, and areas have been spatially defined to support recovery (Section 3.0; Table 5). Habitats used by wood bison within these areas are outlined in Section 2.1.1. Within these areas, important habitat features (e.g., winter foraging habitats, natural movement corridors) should be identified and considered in land-use planning (Section 4.3). In addition to land-use recommendations made that are applicable to all wood bison populations, recommendations were also developed considering population specific context and conservation urgency. Conservation urgency determined based on population status, disease risk, existing land-use and important habitat features within Wood Bison Ranges (Section 4.1; Table 6). The Ronald Lake and Wabasca populations are of higher conservation urgency, therefore a more precautious approach to land-use within these population ranges is warranted.

4.1 Wood Bison Spatial Designations

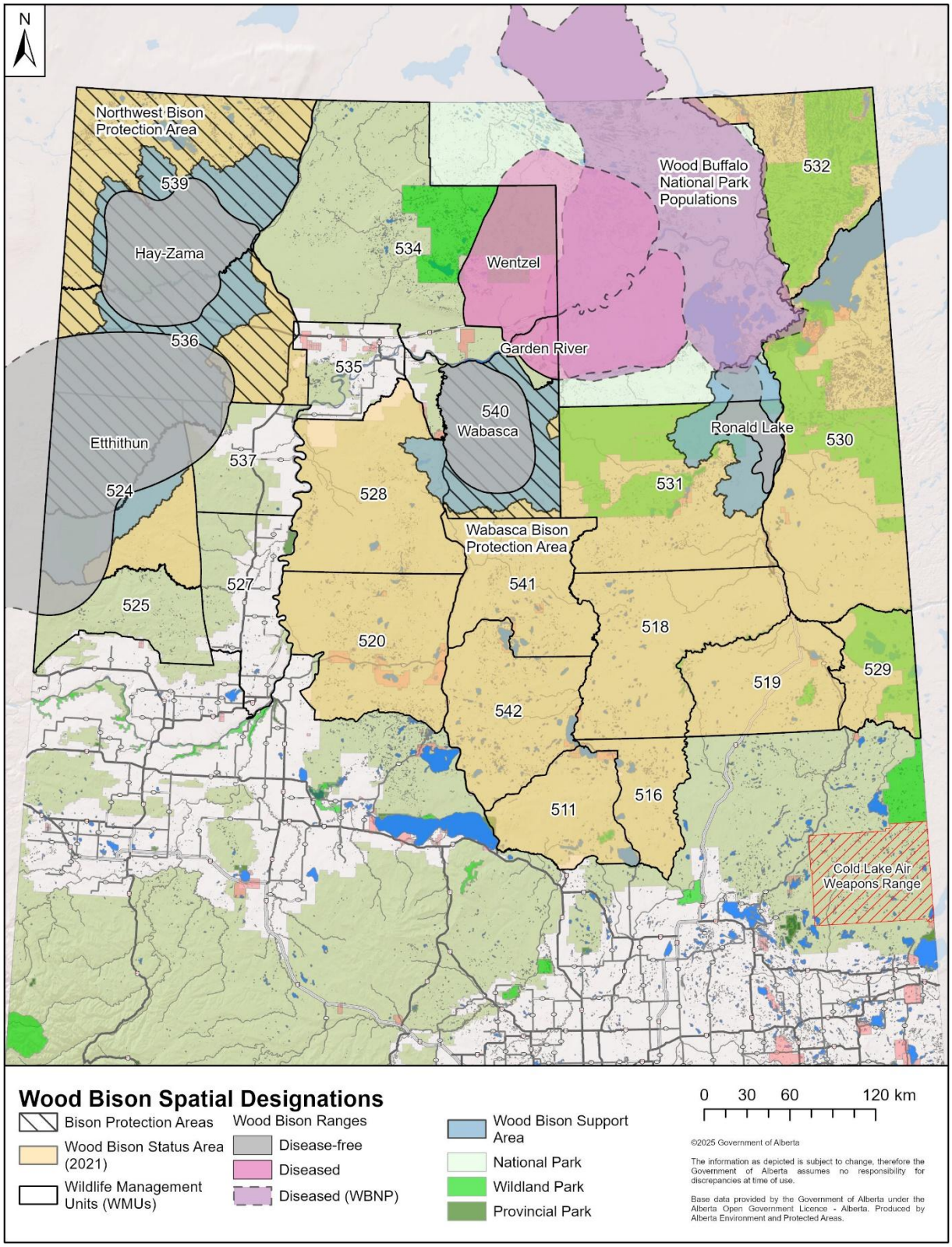
The population objectives for each of the disease-free populations (Section 3.0) call for modest increases in population size over the next 20 years as long as disease risk and, for some populations, bison-human conflict can be effectively managed. Wood Bison Ranges represent the spatial distribution of populations based on contemporary knowledge and monitoring. Support Areas are intended to incorporate a larger area around Wood Bison Ranges to support potential future range expansion and long-term recovery of wood bison in Alberta.

Development of Support Area perimeters was guided by watershed boundaries (hydrologic unit codes [HUC-8]) that intersect with Wood Bison Ranges (Figure 6). Wood bison are highly reliant on wetland habitats for winter forage and use of hydrologic units allows for an ecological basis for incorporating habitats beyond the range of each population. In some cases, Support Area boundaries were adjusted when part of the HUC-8 watershed did not align with management intent or an incompatible land-use. The details of how Support Areas boundaries were adjusted is provided in Appendix A. A description of spatial designations applicable to wood bison is provided in Table 5.

Table 5. Description of spatial designations applicable to wood bison, identified in Figure 6.

Spatial Designation	Description
Wood Bison Status Area	The area where wood bison are listed as Threatened in Alberta, and protected under the Wildlife Regulation Schedule 6. See Section 1.1 for more information on wood bison status in Alberta.
Bison Protection Areas	Areas that represent a regulatory designation for the management of bison harvest, established under the Wildlife Regulation. Hunting is prohibited in the Northwest Bison Protection Area and the Wabasca Bison Protection Area without a Bison Special Licence. Currently licences are not issued in the Wabasca Bison Protection Area. Section 1.1 provides more information on wood bison status in Alberta.
Wood Bison Support Area	Achieving recovery objectives for all disease-free populations may require an area extending beyond Wood Bison Ranges. Support areas are intended to incorporate a larger area around Wood Bison Ranges to support potential future range expansion and long-term recovery of wood bison in Alberta. HUC-8 watersheds overlapping Wood Bison Ranges were used to provide an ecological basis for developing Support Area boundaries where possible. Wood Bison Support Areas should inform specific mitigations and considerations available to support wood bison recovery in higher level land-use planning (e.g., sub-regional and regional planning, land sales) and long-term or permanent development (e.g., major roadways, agricultural areas, or residential areas).
Wood Bison Ranges	Area representing current extent of wood bison distribution as determined by provincial survey and monitoring data. Details on development of ranges are provided in Section 2.1.2. Ranges are meant to represent likely observed distribution of wood bison populations that are not constrained by regulatory boundaries (e.g., the Wood Bison Status Area) and may extend beyond where wood bison are currently observed.

Figure 6. Spatial designations relevant to wood bison (see Section 1.1 and Table 5 for further explanation).



4.2 Population-specific Context for Consideration in Land-use Planning

When determining habitat needed to support recovery, and related land-use considerations within and near Wood Bison Ranges, population-specific context is important. Populations vary in their conservation urgency. Conservation urgency is determined based on several factors including population viability (i.e., population size and risk of extirpation), population trend (growth, stable or decline), disease status and risk, land-use context (i.e., the state of the landscape they occur within), and available habitats within Wood Bison Ranges.

Focus will be on maintaining the status and viability of disease-free of populations (Etthithun, Hay-Zama, Ronald Lake, and Wabasca) that are important for overall recovery of wood bison in Canada. Land-use considerations around the diseased Wentzel and populations shared with WBNP (i.e., Garden River) should focus on limiting distribution of diseased bison to their current ranges. Based on the factors considered below, the Ronald Lake and Wabasca populations are considered higher conservation urgency, and specific recommendations are made for these populations in Section 3.0. A summary of population specific considerations is provided in Table 6.

Table 6. Summary of population specific context to inform land-use recommendations.

Population	Population Status	Disease Risk	Land-use Context	Important Habitats and Habitat Features	Conservation Urgency
Hay-Zama/ Etthithun	Stable or increasing population trends with potential to merge.	Low; not in close proximity to Wood Buffalo National Park	Occur within working landscape and show some evidence of habituation to anthropogenic disturbance; additional anthropogenic disturbance could result in increased risk of human conflict with risk of removal.	Further investigation required to understand areas of seasonal use. Larger amount of graminoid wetland important for winter foraging in Hay-Zama compared to other population ranges.	Moderate
Ronald Lake	Historically small population, but recent increasing population trend.	High; in close proximity to Wood Buffalo National Park	Occur in area of relatively low anthropogenic disturbance; additional anthropogenic disturbance could increase risk of displacement and therefore increase risk of disease exposure.	Established movement patterns and consistent use of post-calving area. Relatively small amount of graminoid wetland important for winter foraging.	High
Wabasca	Declining and small population size; at risk of extirpation.	Moderate; in close proximity to Wood Buffalo National Park	Occur in area of relatively low anthropogenic disturbance; additional anthropogenic disturbance could increase risk of displacement and therefore increase risk of disease exposure.	Established movement patterns and areas of seasonal use. Relatively small amount of graminoid wetland important for winter foraging.	High
Wentzel	Unknown population trend	Diseased	Occur in area of relatively low anthropogenic disturbance; additional anthropogenic disturbance could increase risk of disease transmission to disease-free populations or domestic livestock.	Further investigation required to understand areas of seasonal use. Moderate amount of graminoid wetland important for winter foraging.	Not Applicable

4.2.1 Population Status (Viability, Trend, and Risk of Extirpation)

The Wabasca population is small (9 individuals observed in 2025), declining in size, and at high risk of extirpation (Section 2.1.4.1). Additional interventions are required to prevent extirpation. The Ronald Lake population has been historically small, but has shown recent population increases to a current population size of 424 (95% confidence interval: 321 - 588) in 2024 (Section 2.1.4.1). The Hay-Zama (678 individuals in 2025) and Etthithun (200 individuals in Alberta in 2021) populations have stable or increasing population trends and potential to form a large, merged population. Achievement of the Hay-Zama and Etthithun population objective of 1,000 individuals is conceivable in the short-term (≤ 20 years).

4.2.2 Disease Risk

The Wabasca, Ronald Lake, Hay-Zama, and Etthithun populations are considered brucellosis and tuberculosis free (Section 2.2.2). The Wabasca population and Ronald Lake populations have moderate and high risk of exposure to brucellosis and tuberculosis respectively, due to their proximity to diseased populations in WBNP. Risk of exposure to brucellosis and tuberculosis for Hay-Zama and Etthithun populations is low, as they are not in close proximity to WBNP. For the diseased Wentzel population, and diseased populations that may extend outside of WBNP onto provincial land (i.e., Garden River), the objective is to continue to manage for a low risk of spread of brucellosis and tuberculosis by restricting these population's distribution and size through harvest, surveillance and other control actions as required (Section 3.4; Section 2.2.2).

There are diseases in domestic livestock (Section 2.4.1) that could potentially be transferred to wild wood bison. The risk of transmission of these diseases to wild wood bison has yet to be evaluated, however the consequence of transmission could be high. The Etthithun, Hay-Zama, and Wabasca populations occur in proximity to agricultural lands, which increase potential for interaction with domestic livestock. Conversion of provincial Crown land into agricultural land in proximity to Wood Bison Ranges could increase risk of interaction between livestock and wild wood bison, and therefore increase the risk of disease transmission.

4.2.3 Land-use Context

Wood bison populations in Alberta vary in the amount of land-use activities and existing anthropogenic activities within their range. Populations also appear to differ in their behavioural response to anthropogenic disturbance footprint. Therefore, different levels of precaution for type and location of disturbance should be taken based on population specific context. Wood bison are known to use linear features, such as roads, pipelines and transmission lines as travel corridors. Additional anthropogenic footprint, especially linear features on periphery of ranges, or connecting into key areas of bison ranges (e.g., heavily used trails or foraging patches), could facilitate movement to areas of higher disease risk, or areas of higher potential bison-human conflict (e.g., roads where collisions could occur, agricultural areas, residential areas). Linear features also could facilitate human access to Wood Bison Ranges and key seasonal habitats.

The Hay-Zama and Etthithun populations, both re-introduced populations, can occur within areas of higher anthropogenic footprint, and have been exposed to some level of disturbance since their establishment. The extent of the Etthithun range continues to be dynamic and has expanded into Alberta over time. It appears that the Hay-Zama and Etthithun populations utilize anthropogenic footprint as movement corridors. The overall size of Etthithun and Hay-Zama ranges is much larger than the Ronald Lake and Wabasca populations, and one explanation for this is that interconnected anthropogenic disturbances facilitate greater movement throughout their range. The Hay-Zama and Etthithun populations are also drawn to certain anthropogenic disturbances (e.g., well sites, pipeline right of ways) due to presence of attractive forage species. Vegetated edges of major roadways attract bison, they may increase risk of vehicle collisions, which are both a human safety risk, and a cause of bison mortality (Section 5.3). Establishment of anthropogenic footprint in key areas (e.g., heavily used trails or foraging patches) of bison ranges could facilitate undesirable expansion to residential areas, agricultural areas, or highways where increased occurrence of bison-human conflict and mortality could occur.

The Ronald Lake population overlaps the Surface Mineable Area, and existing oil sands agreements. Although oil sands development has been proposed in the population range in the past, oil sands related development within the Ronald Lake range to date has been limited to exploration activity. Oil sands surface mining or large in-situ developments would result in direct loss of wood bison habitat until these disturbances are effectively reclaimed; however wood bison response to reclamation is a knowledge gap. Development of oil sands agreement areas

would involve a project approval process according to applicable legislation. Exploration activities may occur within oil sands agreement areas, and the impact of sensory disturbance and alteration of habitat related to these activities on the Ronald Lake population should be considered.

Due to their proximity to diseased wood bison populations in WBNP, there is concern that anthropogenic disturbance footprint within the Ronald Lake and Wabasca ranges could promote movement of these populations to areas of higher disease risk. Therefore, a precautionary approach to managing additional disturbance within the Wabasca and Ronald Lake population ranges is warranted. Development of linear features and habitat modifications in Wood Bison Ranges and the periphery of these ranges, particularly in the areas separating diseased and non-diseased populations could increase risk of movement towards diseased populations, and vice versa. Linear features could also increase potential for human access to Wood Bison Ranges. For the diseased Wentzel population, linear features or habitat alterations on the periphery of their range could facilitate movement towards undesirable areas where risk of disease transmission to other wood bison populations, or domestic livestock is greater.

Wood Bison Ranges do not currently overlap agricultural land. Establishment or expansion of agricultural areas within Wood Bison Ranges, or adjacent to Wood Bison Ranges within Support Areas would increase the likelihood, or create the potential for bison-human conflict with crops, facilities and infrastructure. Conversion to agricultural land could also increase the risk of interaction of domestic livestock, increasing risk of disease transmission between livestock and wild wood bison (Section 2.4.2.2). When bison discover that agricultural areas are a source of forage, it can be very difficult to discourage them from using these areas. Ongoing bison-human conflict could result in removal of bison, other mitigations, and overall reduced support for wood bison on the landscape.

There is both scientific and Indigenous Knowledge evidence indicates avoidance of active anthropogenic disturbance (e.g., active oil and gas development and forestry harvest) by the Ronald Lake population (Section 2.4.4). Local land users and knowledge holders reported that the Wabasca population did not return to areas following forestry harvest (personal communication, ShagowAskee Foundation). These changes in behaviour could be related to both habitat alteration as well as sensory disturbance. Monitoring of Wabasca's movement using GPS collars was not initiated until 2020, after much of the most recent anthropogenic disturbance had already been undertaken. Wood bison response to certain types of sensory disturbance related to anthropogenic disturbance remains a knowledge gap, and the responses to novel sensory disturbance cannot be easily predicted. The Etthithun and Hay-Zama populations appear to be habituated to some level of anthropogenic disturbance and associated sensory disturbance that has been present within their ranges since establishment of these populations. However, the Wabasca and Ronald Lake populations have been exposed to lower levels of certain types of anthropogenic disturbance. A precautionary approach should be taken to limit novel or additional sensory disturbance to these populations that aren't frequently exposed to anthropogenic disturbance. There is concern that additional sensory disturbance could encourage movement of these populations to areas of higher disease risk, or have stress related impacts on fitness.

4.2.4 Important Habitats and Habitat Features within Current Wood Bison Ranges

Additional focus should be placed on land-use in the context of habitats and habitat features, such as winter foraging habitats, frequently used sites (e.g., wallows, mineral licks, upland forested cover), calving and post-calving areas, rutting areas, and natural movement corridors. The established behaviours observed in each population should also be considered when planning land-use.

The Ronald Lake and Wabasca populations demonstrate strong seasonal movements (Section 2.1.2.2), while further investigation is required to document seasonal movements in the Hay-Zama and Etthithun populations. The established movement patterns of the naturally occurring Ronald Lake and Wabasca populations likely represent learned behaviour to seek out key foraging areas, such as large patches of graminoid wetlands, connections between upland sites or along ridges for travel, or the upland meadow used by the Ronald Lake population during the post-calving season (Section 2.1.2.2). Maintaining these existing natural movement corridors is important for persistence of these populations. Graminoid wetlands, (e.g., meadow marsh), are important habitats for wood bison, due to reliance on these habitats for forage during the winter season (Section 2.1.1). Maintaining winter foraging habitats, especially for populations that only have a small percentage of these habitats within their range is important for supporting these populations through the winter season.

Availability of important habitats should be considered in relation to land-use context and wildfire. Understanding of availability of wood bison habitat in relation to widespread landscape change due to wildfire is a knowledge gap that requires further investigation.

4.3 Recommendations for Land-use Planning

The following are recommendations intended include wood bison recovery into land-use planning and decisions under Alberta's system of land-use management:

- Incorporation of wood bison recovery considerations into regional, sub-regional, and issue-specific planning occurring for areas that overlap **Wood Bison Ranges** and **Support Areas**. This should include land management plans or associated implementation plans such as access or recreation management.
- Conversion of provincial Crown lands to agricultural land-uses should be well planned so the risk of disease exchange and conflict between domestic livestock and bison (Section 2.4.2.2; Section 2.4.1.4) and bison-human conflict (Section 2.4.2.1; Section 2.4.2.2; Section 2.4.3) is minimized. The review of land-use decisions on public lands falling within the **Wood Bison Ranges,** and **Support Areas** should consider wood bison recovery as a part of the existing government review process.
- No new domestic livestock grazing dispositions should be considered within **Wood Bison Ranges** and **Support Areas**.

The following are recommendations intended to include **Wood Bison Ranges** and accompanying considerations in land-use planning and decisions under Alberta's system of land-use management:

- Incorporation of wood bison into provincial land management regulatory systems, approvals and decision support tools. Guidance and conditions should be developed to address the conservation of wood bison and habitats including standards and/or conditions within the Master Schedule of Standards and Conditions (MSSC), Crown Land Reservations (CLRs) and Wildlife Sensitivity Layers where appropriate. Similarly, bison are to be incorporated into Forest Management Plans and the associated Non-timber Assessment as a fine-filter species. A consistent set of Operating Ground Rules (OGRs) should be developed to guide forest harvest operations.
- The specific recommendations in Table 7 are intended to apply to **Wood Bison Ranges**. Additional recommendations specific to the Ronald Lake population will be provided in the Ronald Lake Buffalo Herd Management Plan.

Table 7. Recommendations for land-use in Wood Bison Ranges.

Recommendation	Context for All Wood Bison Populations	Context for Populations of Higher Conservation Concern (Ronald Lake and Wabasca)[1]
Consideration of Important Habitats and Habitat Features: Apply mitigation strategies such as avoidance of important habitats, and enhanced access management and alternative routing, in order to limit habitat disturbance, and reduce potential conflict and disease transmission risk	• Important habitats and habitat features, such as winter foraging habitats, frequently used wallowing sites, calving and post-calving areas, rutting areas, and natural movement corridors should be identified (Section 5.8) to avoid conversion, mitigated from disturbance and to maintain bison habitat on provincial Crown land. • Consideration should be placed on the routing and placement of new linear features or enhancement of existing features that could connect wood bison to other areas of conflict or increase mortality (e.g., residential areas, agricultural areas, transportation corridors where collisions could occur). • Identify and incorporate key bison habitat features into land-use decisions and work with stakeholders, local government and government agencies to develop and implement guidelines and best management practices to reduce impacts to bison and avoid conflict.	• Linear features and habitat disturbance could facilitate movement of the Ronald Lake and Wabasca population to areas of higher disease risk. Linear features could also increase human access to the Ronald Lake and Wabasca ranges. Special attention should be made to limit linear features that could connect the Ronald Lake and Wabasca populations to WBNP, where disease transmission could occur. • The loss and disturbance of bison habitats and important sites such as winter foraging areas, calving grounds and disruption of movement corridors should be avoided. Displacement of Wabasca bison from key seasonal habitats and features may also increase the risk for population displacement or decline.
Sensory Disturbance: Apply mitigation strategies such as work windows or restricted activity periods, to limit sensory disturbance, especially to populations of higher conservation urgency.	• This recommendation is focused on populations of higher conservation concern (Ronald Lake and Wabasca).	• The Ronald Lake and Wabasca populations are not habituated to anthropogenic disturbance, and their response to additional anthropogenic disturbance is unknown. There is potential that anthropogenic disturbance and associated sensory disturbance could promote movement of these populations towards areas of higher disease risk. • The response of wood bison to different forms of sensory disturbance should be investigated further (Section 5.8).
Forestry: Explore use of silviculture systems (planning, harvesting, reforestation) that mitigate potential impacts of forestry harvest and related activities on wood bison.	• For the Hay-Zama and Etthithun populations, consideration should be placed on the potential for forestry related disturbance footprint to increase risk of human conflict. • The response of wood bison to different silviculture systems and practices should be investigated further (Section 5.8).	• Potential of anthropogenic disturbance footprint and sensory disturbance related to forestry and associated activities to displace individuals towards areas of higher disease or human conflict risk requires consideration.

Recommendation	Context for All Wood Bison Populations	Context for Populations of Higher Conservation Concern (Ronald Lake and Wabasca)[1]
Linear Feature Restoration: Explore potential alternative methods to reduce bison use of roads and other linear features, such as gates and linear restoration techniques.	• Use of roads, linear features, and other anthropogenic features can facilitate movement to undesirable areas, such as areas of higher disease risk or human conflict. Limited trials have been performed to develop best management practices or methods to reduce bison use of roadways. • Exploration of gates, fencing, linear feature restoration (mounding, tree bending), or other deterrents should be explored and trialed and implemented where appropriate (Section 5.8).	
Habitat Enhancement: Explore opportunities to enhance important bison habitats and sites through habitat restoration, prescribed burning or alternative habitat enhancement techniques.	• Opportunities to implement existing methods of wood bison habitat enhancement, or test the efficacy of new habitat enhancement methods should be explored and trialed and implemented where appropriate (Section 5.8).	

[1]Additional recommendations specific to the Ronald Lake population will be provided in the Ronald Lake Buffalo Herd Management Plan.

5.0 Recovery Strategies and Actions

This section describes the strategies and actions needed to mitigate the key threats and other barriers to recovery (Section 2.4; Section 2.5) and achieve the population and distribution objectives for each population (Section 3.0)

5.1 Manage Bovine Brucellosis and Tuberculosis

5.1.1 Maintain Current Disease Surveillance and Containment Activities

Rationale

The CFIA estimated that on average the introduction of brucellosis and tuberculosis into the cattle population from free-ranging bison in WBNP and surrounding area would occur not more frequently than once every 555 years (i.e., 0.2% annual probability) and once every 107 years (i.e., 0.93% annual probability), respectively (CFIA 2016b; Section 2.2.1). The models used by the CFIA did not incorporate the surveillance and outreach activities undertaken as part of the wood bison disease management program (Section 2.2.1) or the fact that lack of protections from harvest could facilitate the removal of diseased bison before they have reached agricultural areas. These additional disease management activities would make the risk of disease transfer even lower (CFIA 2016b). Maintaining the ongoing disease surveillance and management activities discussed in Section 2.2.1 is covered under this strategy. While implementation of Strategy 5.1.1 will benefit disease-free wood bison populations, it is primarily intended to keep the risk of transfer of brucellosis and tuberculosis to domestic livestock low. Additional disease management activities are required to lower the risk of disease transfer to disease-free wild bison because of the proximity to diseased animals. These new activities are addressed in Strategy 5.1.2.

There are refinements to current activities that would assist in disease containment. Wood bison in WMU 532 were given status as a Threatened species as an oversight in the 2021 status change even though they are WBNP animals that are diseased and venture from the park. While these diseased bison are not a significant risk to domestic livestock or disease-free populations of wood bison, it would be consistent with management on other sides of WBNP if the Threatened status of bison in this WMU was removed.

Currently it is unknown how many bison are harvested by clients of guides and outfitters and hunters in the area where bison have no status. It would be advantageous to have this information to better evaluate how much this activity contributes to disease containment and to refine surveillance and monitoring activities. It would also be beneficial to better understand this form of harvest in order understand how it can be facilitated.

Desired Outcome

The risk of transfer of brucellosis and tuberculosis to domestic livestock and the wild wood bison in the Northwest Bison Protection Area is maintained at a low risk**.**

Progress Measures

1) The number of bison that breach the surveillance area and enter an agricultural area before they are removed.
   - **Target:** There are no wild wood bison that reach an agricultural area.

Actions

1) Maintain the regulated harvest of the Hay-Zama population as required, based on EPA annual monitoring metrics to determine risk of dispersal and disease transmission and human-conflict. Continue to facilitate voluntary submission of blood samples by hunters for testing for brucellosis (Section 2.2.2). Continue to monitor the Etthithun population and determine whether implementing a harvest regime may be required to manage the risk of animals dispersing outside of the Northwest Bison Protection Area or areas where wood bison are considered a Threatened species (Figure 1).

2) Maintain unregulated harvest in areas where wild bison are not protected (Section 1.1) to facilitate the suppression of populations infected with brucellosis and tuberculosis, and to facilitate the removal of wood bison that foray into, or close to agricultural areas.
3) Opportunistically and regularly test for diseases in wild wood bison populations when animals are being handled. This includes when GPS satellite collars are deployed or from hunter harvested carcasses or other sources of mortality. Enhanced sampling might be required when deemed necessary. Disease status of each population should be assessed at regular intervals and a formal disease risk analysis (e.g., Wildlife Disease Risk Analyses [OIE and IUCN 2014]) should be completed.
4) Continue the Bison Watch program (Section 2.2.1), public reporting and surveillance for wood bison east of Highway 35 and respond to reports of bison in or near the agricultural areas in this region. A corresponding management response to any confirmed bison detected will be determined and actioned according to risk criteria within an approved bison response guide.
5) Maintain a representative sample of GPS satellite collared bison within each bison population and explore methods (e.g., remote cameras) to enable monitoring of male bison and their movements. Continue to use this information from collars to refine the surveillance program.
6) Maintain the existing exclusion of domestic bison from grazing on provincial Crown lands to reduce potential for interaction and disease transmission.
7) Remove the Threatened status of wood bison in WMU 532.
8) Consult with outfitters and hunters that regularly harvest bison in the portions of the province where bison are not given regulatory protection to better understand how to facilitate the harvest and the collection of harvest information including disease samples.

5.1.2 Reduce Probability of Disease Transmission to Disease-free Wood Bison Populations

Rationale

The wood bison disease management program was initiated to minimize the risk of brucellosis and tuberculosis transfer to domestic livestock and the Hay-Zama bison population (Section 2.2.1). Since testing has established the disease-free status of the Wabasca and Ronald Lake populations, there has been recognition of the need to increase efforts to maintain separation from the diseased populations in WBNP (Section 2.4.1) and this strategy describes additional disease containment actions.

There has been recognition between representatives of PC, ECCC, and the GoA that there may be a need to establish a “Bison Control Zone” between WBNP and the Wabasca and Ronald Lake populations where management interventions would occur. The risk for interaction between the Ronald Lake and Delta populations is more likely to occur within WBNP because Ronald Lake population range straddles the southern boundary of WBNP and their seasonal movements bring them into proximity to diseased bison within the park (Figure 1). PC is currently developing a disease management plan focused on the Ronald Lake and Delta populations that includes engagement with the GoA and RLBH CMB (personal communication, P. Robinson, Bison Project Manager, Parks Canada). In contrast, the risk for interaction between the Wabasca and Garden River populations is more likely to occur on lands under provincial management as the Garden River bison move out of WBNP and towards Wabasca’s range. Limiting potential for interactions will require a provincial or local response to maintain separation between these populations. For both regions, successful disease management planning and response will require collaboration between GoA and PC.

For this strategy, the concept of Disease Control Zone has been broadened and called a “Disease Containment Area” so that a broader range of disease management activities might be considered such as monitoring along with active removal through lethal and/or non-lethal means. Figure 7 illustrates this concept for the Wabasca population. The draft Disease Containment Area includes sub-zonation into a Monitoring Zone and Response Zone.

The Monitoring Zone would identify areas where enhanced surveillance[8] and monitoring may be beneficial and where trials of various deterrence or harvest mechanisms may be deployed. Reducing bison use and occupancy in areas outside of WBNP is beneficial to reduce risk of exposure to Wabasca however the specific tools deployed will require input and collaboration with local land users, communities and land managers. The concept of

[8] Monitoring is regularly scheduled while surveillance is a more targeted response because of heightened level of concern.

including areas within WBNP for monitoring or potential response requires discussion with PC and its' partners on measures that can be taken to facilitate reduced risk for disease exposure.

The Response Zone would be an area where bison use would be high risk and if either a Wabasca or Garden River animal was detected, a management response (e.g., hazing, relocation or lethal removal) would be triggered. The designated response would consider the source of the animal and likelihood or degree of uncertainty for exposure. Additional management activities such as enabling increased harvest outside of the Wabasca Bison Protection Area to reduce duration or prevalence of bison would be explored and would become a priority if forays into the response zone were being frequently detected. The determination of the Disease Containment Area boundaries and the specifics on the management actions in the Monitoring Zone and Response Zones will be developed as part of the Disease Containment and Response Plan (Action 1).

Desired Outcome

Ensure that diseased wood bison populations are contained. Forays into the Disease Containment Areas are detected and responded to based on the level of risk to both disease-free bison and domestic livestock.

Progress Measures

1) The number of detected wood bison occurrences in the Response Zone.
- **Targets:**
  - Neither Wabasca or Garden River animals cross, or interact within the Response Zone;
  - A declining trend in the number of animals detected in the Response Zone.

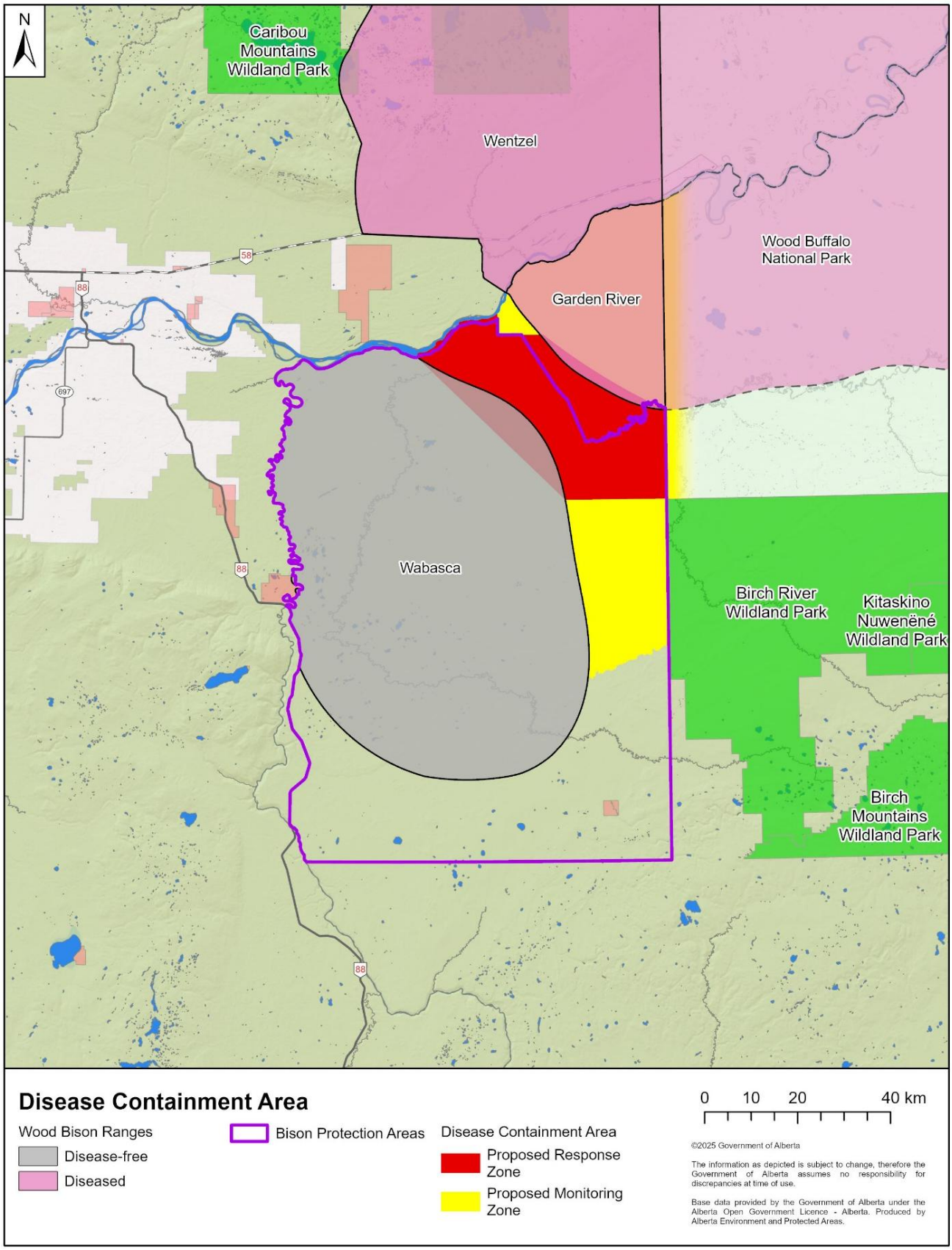
Actions

1) Collaborate with PC and other program delivery partners (Section 5.1.2) to develop and implement a Disease Containment and Response Plan that addresses the following elements:
   - Monitoring and communication plan.
   - Identification of disease containment areas to address risks for interaction between Garden River and Wabasca population (Figure 7) and the Ronald Lake and Delta populations.
   - Develop bison response matrix with clear accountabilities that includes activities ranging from hazing to lethal removal.
   - Explore opportunities for placement of strategically located barriers or monitoring sites.
   - Evaluate the effectiveness of habitat enhancement/attractants (e.g., prescribed fire) to attract bison away from undesirable areas, intercept undesirable forays, or attract bison to areas where they can be more readily detected and removed.
   - Promote the proactive harvest of diseased populations to limit their distributions.
2) Maintain a sample of GPS collars within Wabasca, Ronald Lake, and the nearby WBNP populations to continue to monitor movement, dispersal, distribution and diseases.
   - Collect blood samples when handling animals from disease-free populations during collaring and tested for brucellosis and tuberculosis (using a non-lethal test, such as interferon gamma release assays [IGRA]; Chileshe et al. 2025) with data and results stored as part of an ongoing disease testing program and database.
   - Implement a geofence notification when collared animals move into a disease containment area (Figure 7).
   - Continue to monitor bison habitat use, movements, distribution, demographic vital rates and sources of mortality.
   - Understanding the movements of male bison is a priority. Encourage investigations and trials of different technologies to enhance collar retention for male bison or alternative marking and tracking technologies.
3) Maintain a surveillance and monitoring program to detect bison movements within designated response zones or potential conflict areas. EPA will review and update designated areas and surveillance actions as needed and informed by dialogue with other jurisdictions, local land users such as local communities, trappers, hunters and industry to ensure program effectiveness.
4) Work with local communities and land users (e.g., local Registered Fur Management Area holders, hunters, guide-outfitters, or Guardian Programs (Section 2.3.1) to improve understanding of bison movements, distribution (especially of non-collared individuals) and levels of harvest from diseased populations. Types of information of interest would include:

- Seasonal bison distribution, movement and habitat use outside of WBNP.
- Known travel routes, trails or key habitat features.
- Information on the ongoing and potential bison harvest activities of the Garden River population by local land users.
- Potential containment options using local knowledge. This could include identification of geographic features (e.g., pinch points), potential for intercept feeding, and gathering information using cameras.
- Bison observations other than EPA's wood bison collaring and surveillance programs (e.g., detection of males and individuals that are not collared).

5) Review the implementation of the Disease Containment and Response Plan program to evaluate program effectiveness.

Figure 7. Illustration of a Disease Containment Area for the enhanced protection of the Wabasca population. The specifics of the management of the Disease Containment Area will be developed in a Disease Containment and Response Plan (Section 2.2.2, Action 1).



5.2 Eliminate Brucellosis and Tuberculosis from Wild Wood Bison

All aspects of this strategy should be viewed holistically as part of an adaptive management approach that is founded on improved relationships between Indigenous people, local communities, stakeholders, and the government jurisdictions that have an interest in the complex issue of wood bison disease management. It is imperative that while we continue to work towards a long-term solution to eliminate tuberculosis and brucellosis from wild populations of wood bison, that initiatives to contain and mitigate current disease risk be continued and enhanced as part of a systems thinking approach (Nishi 2010).

5.2.1 Develop Diagnostic Tests and Vaccines for Wild Wood Bison

Rationale

Brucellosis can be detected using serological tests for antibodies in blood. In contrast, conventional disease testing using caudal fold testing for tuberculosis in wild bison is impractical because it involves holding the animals and retesting (Joly and Messier 2004a). Lesions can be detected, sampled post-mortem, and cultured to detect tuberculosis. However, this requires lethal sampling which would only be appropriate in disease-free populations if animals are being killed for other reasons such as harvest, or if there is a concern that contact has been made with a potentially diseased animals. A recently developed blood-based IGRA test holds promise for detecting tuberculosis exposure in wild bison (Chileshe et al. 2025).

Efforts are also underway for development of vaccines for these diseases (see Niroula et al. 2025), including a combined brucellosis and tuberculosis vaccine for use in wood bison. This strategy also requires development of delivery methods for wild populations (e.g., oral vaccine administered through hay or pelleted feed). While recent advances in vaccine development by the BIG project are promising, approval for widespread use in wood bison populations is expected to still take several years. Prevalence of these diseases in diseased wood bison populations is high (Section 2.2.2.1). The effectiveness of vaccines to decrease disease prevalence and build population immunity in wild wood bison populations is unknown but the approach has tremendous potential.

Desired Outcome

Tools are developed that will improve diagnosis and eliminate or greatly reduce the prevalence of brucellosis and tuberculosis in wild wood bison populations.

Progress Measures

1) The number of new tools to manage disease that have been developed and implemented.
2) The prevalence of brucellosis and tuberculosis in diseased populations.

Actions

1) Collaborate with projects (e.g., the BIG project) that are developing vaccines for brucellosis and tuberculosis that can be used on wild bison populations, including minimally invasive vaccines delivered orally in food.
2) Collaborate with projects (e.g., the BIG project) that are developing better detection tools that allow for non-lethal sampling of wild bison to detect tuberculosis.

5.2.2 Replace Diseased Wild Wood Bison with Disease-free Genetically Appropriate Wood Bison

Rationale

The GoA continues to advocate for the complete elimination of bovine brucellosis and tuberculosis form wood bison populations in Alberta, including from populations in the federally managed WBNP. While this plan focuses on managing the disease risk around disease-free populations, removing the diseased wood bison populations and repopulating with disease-free individuals remains a valid option. Removing diseased wood bison and repopulating with disease-free animals was recommended by a federal panel in 1990 (FEARO 1990) but was never implemented (Section 2.2.1) in part because of opposition from residents around WBNP, WBNP staff, and the general public (McCormack 1992). Since 1990, there have been various attempts to try to engage local

Indigenous communities and the different jurisdictions on this issue and all have been unsuccessful for various reasons (Nishi et al. 2006).

A 2005 workshop with 32 experts examined the conditions under which bovine tuberculosis and brucellosis could be eradicated from WBNP (Shury et al. 2006). The workshop concluded that it would be technically feasible to remove all the diseased bison and that it would take approximately 10 years. The ability to salvage the wood bison genetics from the large and genetically diverse diseased WBNP population and use them as part of the repopulation program was a key precondition. Since this workshop, the methodology to collect sperm and eggs from free-ranging bison populations, develop viable embryos in-vitro, wash the brucellosis bacteria off the embryo (tuberculosis is not transferred by embryos), and implant the embryos into captive wood bison is now technically possible (Palomino et al. 2014; Zwiefelhofer et al. 2022). The BIG project continues to refine these techniques on wild wood bison populations as part of its program to develop a "genome bank" of frozen embryos.

While the technical challenges of this approach have been addressed at least in part, the social, cultural and ecological concerns still remain. While there is broad agreement that tuberculosis and brucellosis should be removed from all wild wood bison, there remains significant disagreement on how to achieve this and whether the social, cultural and ecological consequences are justified (Pybus and Shury 2015; Will 2015).

Desired Outcome

Diseased wood bison populations are successfully removed from Alberta (including WBNP) and repopulated with disease-free genetically appropriate wood bison.

Progress Measures

1) The prevalence of brucellosis and tuberculosis in wild wood bison populations.
2) Successful repopulation with disease-free wood bison in WBNP and suitable areas identified in Alberta.

Actions

1) Build relationships through implementation of all the disease containment and management strategies in Strategy 5.1 and use these improved relationships to engage management authorities (Parks Canada, Government of Northwest Territories), Indigenous communities and organizations, and stakeholders to identify areas of support for a removal and repopulation strategy.
2) Work with Parks Canada, Northwest Territories, and Indigenous and resident harvesters to develop a diseased animal eradication strategy. Consideration should be given for how animal removal could be used in combination with vaccination and improved diseased testing.
3) Support efforts (e.g., the BIG project) to develop a genome biobank and conserve the genetic diversity of the diseased wood bison populations.

5.3 Reduce Bison-human Conflict

Rationale

Wood bison will sometimes congregate in residential areas (Section 2.4.2.1), on roadways (Section 2.4.2.4), or industrial areas (Section 2.4.2.3). They can come into direct conflict by intimidating human inhabitants, damaging property, or causing collisions with vehicles. Once bison have become accustomed to using an area, particularly if it is a relatively rich food source, or an easy movement corridor, it can be difficult to shift behaviour and move them to new areas (Simon and Fortin 2019; Simon and Fortin 2020). It is important to intervene quickly before undesired behaviors become conditioned and to prevent risks to human safety.

Harvest to achieve population and distribution objectives can assist in reducing bison-human conflicts because the behaviors of the bison causing problems (e.g., use of movement corridors, or areas near anthropogenic development) typically increase their vulnerability to hunters. However, harvest of the population may not be necessary every year (Section 2.3.4) and this strategy is primarily about developing new more targeted approaches to dealing with bison-human conflicts.

Desired Outcome

Conflicts are communicated to GoA before bison are habituated to an area and appropriate action is implemented that successfully mitigates conflict.

Progress measures

1) The number of conflicts and responses that require a site visit by GoA staff.
2) The number of bison that have to be euthanized.

Actions

1) Work with local community organizations and industry to develop or enhance a Bison Watch program for reporting bison occurring in undesired locations. Continue to work with local communities by developing and maintaining forums to help guide plan implementation and reporting on progress.
2) Develop a bison conflict management pilot program with local communities in the Northwest Bison Protection Area.
3) Update the draft bison response matrix to guide both GoA, enforcement and local governments as well as any future guardian or patrol activities.
4) Develop a pilot conflict mitigation program that includes education and proactive interventions such as fencing and attractant management.
5) Manage the roadways in ways that make them less attractive to bison and explore new methods or techniques such as intercept fencing, alternative reclamation/reseeding of roadsides, cattle gates, etc.
6) Manage the harvest of bison to target animals in high conflict areas.
7) Use the regulated harvest of the Hay-Zama population for disease risk management to complement other more targeted human conflict activities.

5.4 Manage Harvest

Rationale

A Bison Special Licence has been used in the Northwest Bison Protection Area to successfully manage the distribution of bison. Using harvest as a tool to achieve a population objective (Section 3.0) for a Threatened species is unusual and reflects the conservation imperative of being able to restrict its distribution in order to manage disease risk (Section 2.1.2; Section 2.4.1; Section 5.1) and maintain social licence by minimizing bison-human conflicts (Section 2.4.3; Section 4.3). The Bison Special Licence specifies mandatory registration to record hunter success, age and sex of harvested bison, and location of harvest, which enables wildlife managers to monitor the progress of the harvest and evaluate whether management objectives are being achieved (Section 2.3.4). During all previous harvests, both Indigenous and Alberta Resident harvesters have been very cooperative in voluntarily providing blood samples for disease testing and, starting in the 2023-24 hunt, incisor bars for aging. These voluntary sample submissions should continue in years where a harvest is required.

In the future, the allocation of Bison Special Licences will be managed by the Hunting and Fishing Branch, Forestry and Parks with input provided from Fish and Wildlife Stewardship, EPA on the population size and harvestable surplus available for the management of bison-human conflict (Section 2.3) and disease risk (Section 2.2).

In engagement sessions for this Recovery Plan, Indigenous community organization representatives identified that there are aspects of the current process that remain unsatisfactory. The desire to move towards co-management of bison was expressed by Beaver First Nation in their consultations with the federal government on the federal recovery strategy (Beaver expressed by the Indigenous community organization representatives that contributed to the development of this Recovery Plan. In general, there was clear desire for more involvement by local Indigenous communities in the planning of the hunt and the management of wood bison.

Desired Outcome

A well-managed regulated harvest that achieves the conservation objectives and is supported by Indigenous harvesters, Alberta Resident hunters, and concerned Albertans.

Progress Measures

1) The level of satisfaction with the management of the harvest by Indigenous harvesters and Alberta Resident Hunters based on feedback received through engagement on the implementation of the Recovery Plan (Section 5.6).

Actions

1) Provide feedback to Hunting and Fishing Branch on the level of satisfaction on the management of the harvest expressed during engagement sessions.
2) Maintain mandatory registration, which includes the sex, age, and location of each harvested animal.
3) Continue to encourage hunters to submit blood samples for testing for disease and tooth samples for aging.
4) Publish annual reports summarizing population survey and harvest information.
5) Continue to incorporate and advance population monitoring and modelling using harvest information and population-specific vital rate demographics to identify sustainable harvest levels and inform harvest targets to achieve the desired population and management objectives (Section 2.3.4).

5.5 Maintain and Enhance Disease-free Populations

5.5.1 Reinforce the Wabasca Population

Rationale

The Wabasca population is a small disease-free population that has experienced recent declines (Section 2.1). The causes of the decline are high levels of human-caused mortality, in part due to lethal sampling for disease testing and unregulated harvest prior to status changes (Section 1.1). Lethal sampling established the disease-free status but no longer occurs as non-lethal sampling was implemented once the population was confirmed to be disease-free (Section 2.2). While disease-status was determined with high certainty following lethal sampling, updated non-lethal sampling has continued to provide negative results. However, risk for exposure will remain for the foreseeable future and certainty of disease-status requires ongoing testing and risk analyses. All hunting of wood bison within the Wabasca Bison Protection Area is also now prohibited as a part of regulatory changes in 2021 (Section 1.1). Despite cessation from these removals, the population shows limited and depressed signs of recovery and remains at high risk of extirpation in the short-term. While it is possible that the population might increase on its own, concerns remain over the small population size as lack of resiliency to natural losses or suppressed recovery (e.g., loss of breeding adults, unbalanced age or sex ratios, low calf recruitment, declining fecundity, genetic bottlenecks) are risks faced by small populations globally (Gilpin and Soulé 1986; Akçakaya et al. 2003; Blomqvist et al. 2010).

Increasing the size of the breeding population is a key step to ensure the Wabasca population's persistence. Potential strategies include captive breeding, maternal penning or conservation salvage and relocation. These strategies are resource intensive, remove bison from the local landscape and do not ensure that beneficial behaviors and movement patterns displayed by Wabasca are maintained. Capture efforts are highly disruptive and stressful and could interrupt annual migratory movements of the resident group. It is uncertain whether these behaviors would be expressed again when the animals are released back to the region and could result in potential for increased conflict or disease exposure. Other actions such as supplemental feeding or predator management presumes that nutrition or predation are limiting factors and the benefits of each are uncertain given the lack of information and study on these topics specific to Wabasca. Trade-offs between various actions must be considered both against risks and benefits to the population as well as desired outcomes and timelines for recovery.

Increasing population size through augmentation of new animals has the potential for increased probability of survival and recovery of the Wabasca population. If animals are introduced, it is highly desirable that they join the existing population so they benefit from the adaptive learned behaviors of the resident animals. Bison learn and remember where there are high-value foraging sites, trails or wallows and will revisit these sites (Merkle et al. 2014). This type of learning is an important part of how a population establishes its home range (Verzuh et al. 2024b). Efforts and release techniques that enable this learning would maximize the likelihood for adoption of the

resident animals' annual seasonal movements within the existing Wabasca range – a key factor that has kept the Wabasca population away from the diseased animals in WBNP despite the close proximity (Section 2.1; Section 2.4.1). Adding animals to an existing population to improve the population's chances of survival is called a conservation reinforcement (IUCN/SSC 2013). EINP has been the source population for almost all wood bison reintroductions (Figure 8; ECCC 2018b). Recent genetic work and translocation history has confirmed they remain one of the best source populations for conservation translocations (personal communication, G. Wilson, Bison Ecologist, Parks Canada). Given the limited number of current breeding individuals, sourcing new animals from EINP enables pre-selection of animals optimized based on age, sex, behavioral traits and genetic diversity – all aspects that are highly challenging or unfeasible for other source populations. Reinforcing the Wabasca population with new animals is challenging due to the remoteness of the area. There are a number of successful examples of reintroductions into remote areas such as plains bison in Banff National Park (BNP; PC 2023) and Alaska's wood bison reintroductions and reinforcement currently underway within the Lower Yukon/Innoko Rivers and Minto Flats bison herds (Lower Innoko-Yukon River Wood Bison Management Planning Team 2024). These projects have demonstrated successful techniques and strategies to release bison in remote areas and in the case of Alaska, reinforcement of an existing population using young animals to maximize bonding to resident herds.

Following these examples, a proposed reinforcement of Wabasca bison would look to select a small number of young wood bison from EINP where they would be confirmed free from disease, assessed for health and pre-selected for optimal genetics and behavioral traits. Animals would be transported to the Wabasca range during late winter (February-March) and held within a small temporary holding pen that is proximal to the known seasonal migratory pathway of the resident Wabasca population. New animals would be held for a few weeks, provided with food and water while acclimating and anchoring them to the area and its environment before being released when the resident animals are in close proximity. Additional strategies such as use of supplemental feed and aligning the release area with natural movement corridors may also increase the likelihood that the released animals connect with the resident Wabasca animals. It will be important to have the ability to track the fate and movement of all released animals and to have protocols in place if the released animals do not join the population as expected and or disperse from the Wabasca Bison Protection Area. All individuals would be marked, collared and monitored following release. Action would be taken following pre-established responses (monitor, haze, relocate, remove) to undesirable forays depending on the level of concern and risk. Even though the area is remote, bison are often successfully hazed by helicopter to avert conflict in other populations such as the Hay-Zama and BNP populations (Verzuh et al. 2024a). When necessary, bison may also be captured and relocated or removed.

Desired Outcome

The Wabasca population is successfully reinforced. The Wabasca population is increasing because of successful reproduction by resident and reintroduced animals without significantly increasing the risk of disease exposure.

Progress Measures

1) The annual total abundance and cow:calf ratios of the Wabasca population.
   - **Target:** Stable or increasing population trend.
2) The number of reintroduced animals that have joined the resident Wabasca population.
   - **Target:** All reintroduced animals have joined the resident population and no shifts in distribution towards diseased populations.

Actions

1) Prepare for and implement immediate reinforcement of the Wabasca population using disease-free bison from EINP. Assess and employ multiple strategies to integrate new and resident animals to maintain Wabasca bison in its established range and ensure disease-free status.
2) Continue or increase monitoring and assessment of Wabasca population size, distribution (Section 3.2) and disease status (Section 5.1.1).
3) Increase knowledge of potential limiting factors in population recovery, including incorporation of best available information into reinforcement plans such as updated disease-risk analysis, population status, behaviour and alternative approaches.

Figure 8. Wood bison being held at Elk Island National Park in preparation for transport as part of a conservation reintroduction. Photo credit: Parks Canada.

5.5.2 Establish Additional Disease-free Populations

Rationale

Large areas of northern Alberta that are within the historical range of wood bison remain unoccupied and fall within the area where wood bison are listed as Threatened in Alberta (Section 1.1; Figure 1). However, there will be limited opportunities to expand wood bison populations into many of these areas until the disease issue originating from WBNP (Section 2.4.1) is fully resolved. Resolution of the disease issue through active removal remains an option (Section 5.2.2) but in the past it was assessed as impractical or socially unacceptable (Pybus and Shury 2012; Will 2015). More recent solutions such as vaccination remain under development and are likely several decades away for having a significant impact on disease prevalence in wild populations (personal communication, T. Shury, Manager Wildlife Health and Management, Parks Canada). The establishment of an additional bovine brucellosis and tuberculosis free wood bison population would improve overall resilience to mass mortality events from accidents (e.g., large numbers of bison falling through ice) or disease outbreaks (e.g., anthrax). Restoration of additional populations of this ecologically important species to northern landscapes would also increase opportunities for tourism and harvest. Proactive actions in partnership with communities and stakeholders will enable Alberta to assess and identify appropriate areas that could support bison populations while avoiding potential for conflict (e.g., avoiding communities, transportation corridors, agricultural areas, infrastructure, etc.).

Due to the immediate conservation concerns for Wabasca, the establishment of another conservation population in proximity to the Wabasca population would help secure the probability that a resilient and disease-free population is maintained in the region. Allowing the reintroduced population to remain separate, but close enough to the Wabasca population that there is the occasional exchange of breeding individuals, would greatly improve the probability of persistence of both populations (Ruggiero et al. 1994). Indigenous Knowledge shared during development of this Recovery Plan identified key historic bison areas including an area north of Peerless Lake as well as south and west of the Wabasca population range (personal communication, W. Houle, Peerless Trout First Nation). There are also a number of historic reports of wood bison within WMU 528, near Talbot Lake and west into the Buffalo Head Hills. Regions to the west and south of the Wabasca population range have high reintroduction potential because they are farther away from diseased populations in WBNP (Figure 1). Each of

these areas represent significant opportunities to collaborate with Indigenous communities and stakeholders to identify opportunities based on knowledge of where bison were formerly and where there might be social acceptance considerations that need to be factored into planning for a reintroduction (Section 2.3.3).

Successful recent reintroductions of bison in North America provide viable blueprints for potential wood bison reintroduction in northern Alberta. Alaska is currently undertaking a large and ambitious wood bison restoration project within western and interior Alaska with the goal to establish multiple free-ranging bison populations. The release of plains bison into a remote area of BNP has also produced important learnings that will inform future reintroductions. A brief description of key learnings and considerations that should be addressed as a component of planning for a future release is provided below:

1) Engagement: Concern that a bison reintroduction could reduce the prevalence of other species like moose was expressed by representatives of some Indigenous communities during the engagement on this Recovery Plan. This has been raised in other reintroductions and underscores the importance of doing appropriate engagement before releasing animals into a new area with an analysis of interests of affected groups (Bath et al. 2022). As part of the BNP reintroduction extensive consultation was done with Indigenous communities (Heuer et al. 2023) and local stakeholder groups (PC 2023). Developing and implementing an engagement plan will be important when planning for the reintroduction of a new population. Engagement and early collaboration with local land users and Indigenous communities is identified as a key component of successful wood bison reintroductions. Meaningful engagement with community members and Elders as well as establishment of partnerships were also key recommendation identified as a part of advancement on both disease containment and population reinforcement under this recovery plan (Ecoborealis 2024; MSES and Roam 2024).

   Successful reintroductions must consider multiple factors and potential trade-offs, beyond those just outlined below. Meaningful and early engagement with local communities and stakeholders enables identification of concerns, risks and benefits. Utilizing approaches (e.g., Structured Decision Making) that can identify competing values and acknowledge differences can result in increased clarity and transparency for decision making as well as help map out and organize objectives in a manner that reveals priorities and criteria to explore consequences and trade-offs of alternatives (Ecoborealis 2024).

2) Identify Suitable Reintroduction Areas: The identification of potential and suitable release sites must consider a variety of factors to support wood bison in the long-term, and within environments that do not increase the risk of conflict (e.g., human, livestock, infrastructure and private lands) or risk of exposure to brucellosis and tuberculosis. Additional considerations should be placed on existing land-users and land-use conflicts (including future potential land-uses), including maximizing distance from agriculture and livestock, and avoidance of conflict with major transportation routes. Identifying trade-offs between optimizing low conflict zones with suitable bison forage, habitat needs, and project implementation and access requirements are all key aspects of reintroduction planning.

3) Area Requirements: The home range sizes of the Hay-Zama and Ronald Lake populations can be used to help inform the approximate home range size of a large population of wood bison within boreal forests. The BNP reintroduction project identified a geographic area (1,200 km^2) that could potentially support 400 to 600 animals (PC 2023; Steenweg et al. 2016) and was primarily based on genetic and population viability guidance (Steenweg et al. 2016). As part of the assessment, habitat quality and carrying capacity were determined (Steenweg et al. 2016). Ideally, a reintroduction area would have the potential to support a long-term objective of at least 400 to 600 if other constraints on the population like risk of disease exposure and bison-human conflict are not constraining.

4) Identify Areas of High-quality Habitat: Wood bison need areas with suitable (Section 4.0), interconnected foraging patches with habitats that enable movement to optimize forage availability across seasons. During the exploratory phase, reintroduced bison in BNP were seeking out high quality foraging patches. Patches that had a higher probability of being discovered had lower traveling costs, were larger, and were more connected to other patches (Verzuh et al. 2024b).

   Belanger et al. (2020) found that secure footing was a key feature of habitat selection in the summer for the Ronald Lake population. Consequently, a key feature of home range formation in a boreal forest is learning where the secure footing with appropriate upland vegetation that can be used as travel corridors between higher quality food patches is located (Hecker et al. 2023). While it is not possible to predict

where a bison population will develop these travel corridors, it will likely be an important component of home range formation and appropriate upland is an important feature of a home range. For example, eskers in the Ronald Lake range are important travel corridors that are used extensively (Belanger et al. 2020). Studies of habitat selection across Alberta's bison populations highlight key habitat features that are similar across populations as well as features which may be disproportionately important for specific populations (Section 4.0; MSES and Roam 2024). For example, Wabasca bison highly select mature upland coniferous and deciduous stands as well as ridges and riparian features. Upland stands are shown to have high repeated use across years and may be important calving, wallowing and travel routes enabling movement through highly wet areas while use of streams and adjacent riparian tree cover provide both thermal cover and bedding.

Once a high-quality foraging patch is discovered, bison are able to remember where these patches are and will revisit them in future years (Merkle et al. 2014; Verzuh et al. 2024b). The process of forming a home range is the trade off between the higher energy costs of finding a new foraging patch versus revisiting a forage patch that they know the location of (Merkle et al. 2015; Verzuh et al. 2024b). A reintroduction area needs to have a mix of winter and summer habitats that are well connected. Of particular importance are graminoid dominated wetlands even though they may only constitute a small percentage of potential reintroduction area (Section 2.5.1).

5) Source Animals: EINP is the most appropriate source for animals for a conservation reintroduction due to disease-free status, regular handling, suitable genetic variability and ongoing efforts to maintain representative wood bison genetic profiles. The size of past initial release varies across projects and is typically biased towards younger and pregnant females. Benefits of using pregnant females as source animals enables pre-selection of the genetic diversity of sires that may not be included in the founders (Wilson et al. 2023), expedited population growth, and greater site fidelity post-calving. Relevant examples include: Hay-Zama (AB; 29 bison; 14 female/15 male; ECCC 2018b), Etthithun (BC; 19 animals), BNP (AB; 16 animals; 12 female/4 male), Minto Flats (Alaska; 58 animals), and Lower Yukon/Innoko Rivers (Alaska; 130 animals).

6) Holding Facility: The BNP reintroduction held plains bison in an 18 ha fenced area for 18 months allowing the females to calve twice before releasing them in the summer. This approach can help inform future reintroductions due to its success in anchoring most of the animals to their reintroduction area (Zier-Vogel and Heuer 2022; PC 2023). Alaska's recent Lower Yukon/Innoko Rivers and Minto Flats reintroductions used temporary fencing of natural meadows to contain bison within temporary enclosures, where they were held for periods for up to one year before release.

7) Post-Release Movement: Bison introduced into novel environments need to explore their environment before settling and forming a home range. Based on the behavior of the animals in BNP we can expect that most of the exploration will occur in the first year, but it can be expected that some form of exploration will continue for several years (Zier-Vogel and Heuer 2022).

It is likely that anthropogenic linear features like roads, cutlines, and pipeline rights-of-way could be adopted as travel corridors which is problematic if it leads animals into areas where they are not desired (Section 2.4.2). Once bison discover a high-quality foraging site within an agricultural area, it can be very difficult to shift them away and these areas become population sinks because of the bison-human conflicts that will inevitably occur (Simon and Fortin 2019). Having the ability to carefully monitor the movements of released bison and proactively shift them away from agricultural areas before habituation occurs will be critical. Once the reintroduced animals have set up a stable home range and increased sufficiently in population size, it will be less problematic if a few animals, likely young males (Jung 2017), disperse into agricultural areas and are removed from the population.

BNP staff were able to shape the distribution of the reintroduced population by using strategical located fencing and hazing when bison moved out of the predetermined 1,200 km^2 release area (PC 2023). Use of a helicopter was the most effective hazing tool (Verzuh et al. 2024a) and the method most relevant to a reintroduction in a remote boreal forest setting.

Desired Outcome

Potential wood bison reintroduction sites are identified and at least one new population is established in collaboration with local community representatives.

Progress Measures

1) The identification of suitable reintroduction sites.
2) The establishment of new wood bison populations.

Actions

1) Collaborate with Indigenous communities whose activities on the land intersect with the area of interest to better understand traditional bison occurrence and identify the best opportunities for reintroducing bison.
2) Identify and assess potential reintroduction sites. Evaluated based on:
   - Risk of disease exposure to diseased bison populations (Section 2.4.1).
   - Risk of bison-human conflict with land users (Section 2.4.3), communities (Section 2.4.2.1), roadways (Section 2.4.2.4), and agricultural areas (Section 2.4.2.2).
   - Sufficient seasonal forage habitat potential with a particular focus on winter forage (Section 2.1.1).
3) Collaborate with local communities to develop an operational plan that supports long-term bison reintroduction at a suitable reintroduction site, submitted for approval and implementation with local land users and interested parties.
   - Engage with local Indigenous communities and stakeholder groups to identify and appropriately address concerns in the operational plan.
   - Conduct field validations of sites with high potential to confirm that they likely have the desirable habitat characteristics.
   - Develop opportunities for partnerships with local community organizations.
4) Once a potential site has been identified, engage with local Indigenous community organizations and stakeholder groups to verify that local considerations have been identified and appropriately addressed in the operational plan.
5) Potential sites should also be evaluated to limit the potential that reintroducing a bison population in the target area will not significantly affect other species at risk, with special attention given to woodland caribou.

5.6 Engage with Delivery Partners and Stakeholders

Rationale

During the development of the Recovery Plan, representatives from Indigenous groups and stakeholders indicated that there was a high degree of interest in being involved in implementation of the Recovery Plan. This level of interest reflects the cultural and symbolic values of bison, interest in harvest opportunities, concern about disease risk, and the need to manage bison-human conflict. Wood bison populations in Alberta occur over a wide area with different issues and program delivery partners associated with each population. There are also issues that are more provincial in scope that would benefit from engagement with, and advice from, organizations with a broad interest in wood bison recovery and management. This strategy proposes a two-pronged approach:

1) Provincial Wood Bison Recovery Implementation Group (RIG):
   Establish a provincial group that is a forum for information exchange on recovery progress, discussion of emerging issues, and opportunity for representatives to provide their organization's input on implementation of the Recovery Plan.

2) Population-specific RIGs:
   Establish groups organized around the three disease-free populations (Ronald Lake, Wabasca, and Hay-Zama/Etthithun) with a focus on recovery planning activities. The existing Ronald Lake Buffalo Herd Cooperative Management Board is already expected to play a role in coordination of recovery actions for the Ronald Lake population, including additional actions identified in the Ronald Lake Buffalo Herd Management Plan. It is recommended that two RIGs be set up for the Wabasca and Hay-Zama/Etthithun populations. The purpose of these groups is to provide a forum for discussion of recovery implementation for the population

and the coordination and delivery of recovery actions by the local communities and organizations that may be involved.

Desired Outcome

Wood bison recovery and management activities benefit from the timely input of stakeholders and program delivery partners.

Progress Measures

1) The participation rates in RIGs.
2) The number of recovery actions implemented in cooperation with RIG participants.

Actions

1) Establish a provincial wood bison RIG.
2) Establish RIGs for the Wabasca and Hay-Zama/Etthithun populations.

5.7 Educate, Increase Awareness and Social Acceptance

Rationale

Wood bison are culturally important to Indigenous communities and valued by many stakeholders. However, societal acceptance is a potential barrier to recovery of populations, due to concerns around disease transmission and potential for human conflict (Section 2.4.1, Section 2.4.3). The intent of this strategy is to increase public understanding of the issues facing wood bison, increase social acceptance of wood bison on the landscape, and to help secure the long-term societal commitment that will be necessary to recover wood bison and achieve the recovery objectives (Section 3.0). Engagement outlined in Section 5.6 will help to inform target audiences, key messages, and methods of delivery for the education program.

Desired Outcome

Albertans are aware, supportive and engaged in recovery efforts for wood bison.

Progress Measures

1) The frequency that existing online communication products are updated and new products (e.g., fact sheets, short reports) are published.

Actions

1) Continue to publish updated information on wood bison in Alberta (e.g., population surveys and disease testing).
2) Keep public informed of successful conservation actions, including reintroductions (Section 5.5.2).
3) Keep public informed of ongoing disease management activities, and development of vaccination and testing efforts by partners (Section 4.2).

5.8 Address Knowledge Gaps

Rationale

EPA continues to monitor Alberta's wood bison populations through regular aerial surveys, deployment of GPS satellite collars, and remote cameras (Table 1). Efforts are underway to improve assessment of wood bison population trends and distribution, such as trialing new methods and technologies to gather information on movements of male bison, and collection of additional wood bison demographic information. EPA is also collaborating with partners to produce high resolution landscape level habitat data to improve understanding of wood bison habitat use and movements. However, there are several knowledge gaps that GoA and collaborators could address to improve conservation and recovery of wood bison. This section includes knowledge gaps that are not addressed by actions under other strategies in this Recovery Plan.

Desired Outcome

There are improvements in understanding of wood bison ecology that contribute to the future conservation and management.

Progress Measures

1) The number of wood bison knowledge gaps addressed.

Actions

Indigenous Knowledge

1) Collaborate with Indigenous communities to identify and fill gaps in documentation of Indigenous Knowledge on Alberta wood bison populations.

Population and Distribution Monitoring

2) Investigate factors that affect establishment and expansion of wood bison distribution. Develop a standard methodology to monitor changes in range size and distribution.
3) Explore opportunities and feasibility to enhance population monitoring and information on sex and age-specific bison demographic rates. Continue to monitor important demographic parameters (e.g., age, calf recruitment) and sources of bison mortality to inform these models. Improve understanding of factors that may influence population dynamics (e.g., snow depth, predation, forage limitations).

Habitat and Habitat Change

4) Identify important habitats and features including winter foraging habitats, calving and post-calving areas, rutting areas, key repeated use sites such as wallows and natural movement corridors within Wood Bison Ranges. Develop guidance to assist with identification of these key habitat features.
5) Use collar data from all Alberta wood bison populations to evaluate habitat selection. Continue to refine habitat mapping and assessment as updated habitat data become available.
6) Explore opportunities to enhance important bison habitats and sites through habitat restoration, prescribed burning, or alternative habitat enhancement techniques.
7) Increase understanding of wood bison response to wildfire, and the effect wildfire has on forage quality and abundance. Consideration should be given to developing partnerships with organizations undertaking long-term studies of wildfire in the boreal forest.

Land-use and Sensory Disturbance

8) Improve understanding of wood bison use of linear features and habitats that facilitate movement. Explore and evaluate methods that would reduce bison use of features such as closure, reclamation (e.g., reseeding species along roadsides that are unpalatable to bison), strategic barriers or other methods of limiting bison distribution and movement.
9) Improve understanding of wood bison responses to different silvicultural systems, forestry harvest operations, and cut block regeneration. Explore and evaluate opportunities for strategic habitat management to maintain population segregation.
10) Improve understanding of wood bison response to sensory disturbance. Develop guidelines or best management practices to limit sensory disturbance of wood bison.

Disease Containment and Mitigation

11) Develop movement and selection models to simulate likely movement paths to identify connectivity and interactions zones to assess disease transmission risk as informed by disease prevalence rates.

Disease and Health

12) Work with partner agencies and jurisdictions to assess the risk of domestic livestock diseases being transferred to disease-free wood bison, such as Johne's disease, *Mycoplasma bovis*, and Malignant Catarrhal Fever.
13) Work with partner agencies (e.g., ECCC) to improve understanding of potential impacts of contaminants on wood bison health.

Human Conflict

14) Explore opportunities to standardize bison-vehicle collision reporting, particularly for the Hay-Zama population.

Other Factors

15) Assess the role wood bison as an alternate prey source for wolves, and potential impacts to woodland caribou. Explore opportunities to assess potential competition between bison, moose, and caribou.

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Appendices

Appendix A: Wood Bison Support Areas

The purpose of Support Areas is described in Section 4.1 of this Recovery Plan. Development of Support Area perimeters was guided by watershed boundaries (hydrologic unit codes [HUC-8]) that intersect with Wood Bison Ranges. Wood bison are highly reliant on wetland habitats for winter forage and use of hydrologic units allows for an ecological basis for incorporating habitats beyond current range of each population. The intention was to create three continuous Support Areas to align with Recovery Goals and Objectives (Section 3.0); one for each of the Hay-Zama/Etthithun, Ronald Lake, and Wabasca populations. We initially selected all HUC-8 watersheds that overlapped Wood Bison Ranges, and recent GoA and Indigenous Knowledge occurrence records (Figure 1). The specific refinements made to each of the Support Areas are described below. The final Support Areas are shown in Figure 10.

Hay-Zama and Etthithun

The initial overlapping HUC-8 watersheds naturally created a connected Support Area between the Hay-Zama and Etthithun populations. The watersheds were cropped to the status area (i.e., the area where wood bison are listed as *Threatened* in Alberta). Watersheds that only overlapped the periphery of Wood Bison Ranges were not included in the Support Area. Portions of *Roe and Hay River* watershed that became discontinuous from the Support Area when cropped to the status area were removed during this time.

Wabasca

Overlapping watersheds were cropped to the status area, and Wabasca Protection Area, with the exception of a small portion of the *Lower Wabasca River* and *Senex Creek* watersheds, to acknowledge areas of recent wood bison occurrence identified through Indigenous Knowledge. Portions of the *Lower Wabasca River* watershed extending south of the *Senex Creek* watershed were removed.

Ronald Lake

The Ronald Lake Support Area was developed by the RLBH CMB. Portions of watersheds east of the Athabasca River were removed. The portion of the *Lower Athabasca and Delta* watershed extending far north of the Ronald Lake range was cropped to align approximately with the northern edge of the adjacent *Buckton Creek* watershed. Expansion of the Ronald Lake population farther into WBNP is undesirable due to increased risk of disease exposure. The southern boundary of the *Athabasca Above Firebag River* watershed was adjusted based on areas of extensive industrial development that not currently wood bison habitat. The Ronald Lake population partially overlaps the *Lake Claire* watershed, and a small area of this watershed east of the Steepbank River was included.

Figure 9. Development Of wood bison Support Areas.

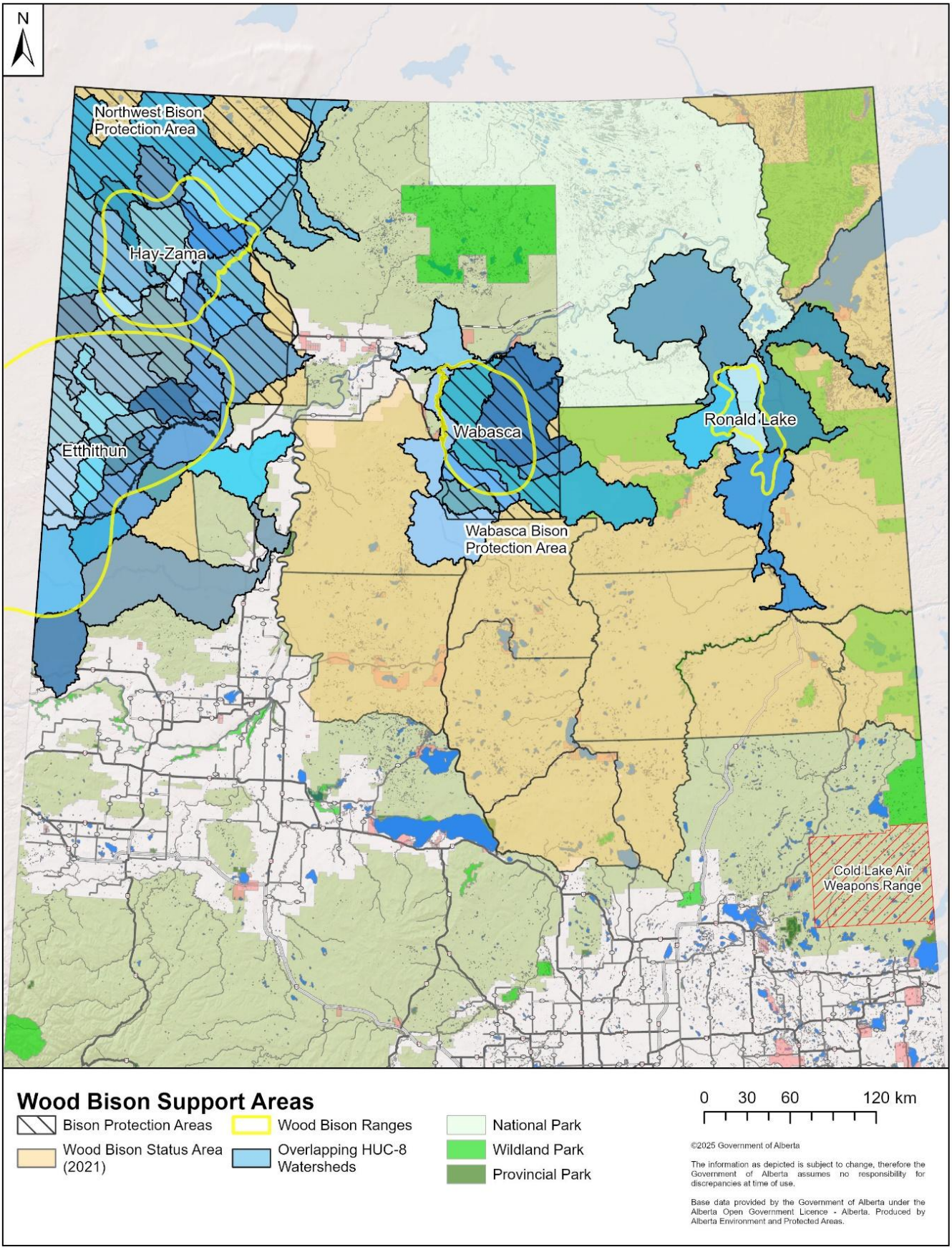

Figure 10. Wood bison Support Areas.