Yellowstone National Park
Idaho, Montana, Wyoming

U.S. Department of the Interior
National Park Service

Yellowstone National Park Bison Management Plan Final Environmental Impact Statement

June 2024

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National Park Service
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Final Environmental Impact Statement

Lead agency: National Park Service (Yellowstone National Park)

Cooperating agencies: State of Montana (Governor's Office, Montana Department of Livestock, Montana Fish, Wildlife and Parks), Animal and Plant Health Inspection Service (Veterinary Services), US Forest Service (Custer Gallatin National Forest), InterTribal Buffalo Council, Confederated Salish and Kootenai Tribes of the Flathead Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and the Yakama Nation

The National Park Service (NPS) prepared this plan/environmental impact statement (plan/EIS) for bison management at Yellowstone National Park to provide park staff with tools to manage bison that reflect the best available information and current circumstances. The purpose of taking action is to preserve an ecologically sustainable population of wild, migratory bison while continuing to work with partners to address brucellosis transmission, human safety, and property damage, and fulfill tribal trust responsibilities.

The plan/EIS presents three alternatives that consider various approaches and tools for managing bison within the park; it also describes actions common to all alternatives. The alternatives also consider external actions that could affect management efforts inside the park, while acknowledging the NPS does not have jurisdiction or control over actions beyond the park boundary, including public hunting and tribal harvests, construction of capture or quarantine facilities, or tolerance for bison. Descriptions of external actions are not an endorsement or commitment from partners. The plan/EIS analyzes the beneficial and adverse impacts on the human environment, including physical, natural, cultural, and socioeconomic resources that would result from implementing the different alternatives.

The Notice of Availability for the draft plan/EIS was published in the *Federal Register* and online at the National Park Service (NPS) Planning, Environment, and Public Comment (PEPC) website at https://parkplanning.nps.gov/YellowstoneBisonEIS on August 10, 2023. The public comment period for the draft plan/EIS was open for 60 days, from August 10, 2023, to October 10, 2023. A summary of and responses to public and agency comments received on the draft plan/EIS are included in appendix G. Where needed, text was changed in this final plan/EIS to address comments. The publication of the US Environmental Protection Agency's Notice of Availability of this final plan/EIS in the *Federal Register* will initiate a 30-day wait period before the Regional Director will sign the Record of Decision documenting the selection of an alternative to be implemented. After the NPS signs the Record of Decision, implementation of the selected alternative can begin.

For more information, visit https://parkplanning.nps.gov/YellowstonebisonEIS or contact the park at: Park Headquarters, Superintendent, Attn: Bison Management Plan, P.O. Box 168, Yellowstone National Park, WY 82190.

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Executive Summary

The National Park Service (NPS) manages Yellowstone bison in coordination with other federal, state, and tribal agencies pursuant to an Interagency Bison Management Plan (IBMP) signed in 2000 by the Secretaries of Agriculture and Interior and the Governor of Montana. The IBMP originated from concerns that bison migrating outside Yellowstone National Park (YNP or the park) would transmit the bacterial disease brucellosis to cattle and jeopardize interstate and international trade. Members of the IBMP include the Animal and Plant Health Inspection Service (APHIS; Veterinary Services), Confederated Salish and Kootenai Tribes of the Flathead Nation, US Forest Service (Custer Gallatin National Forest), InterTribal Buffalo Council, NPS (YNP), Nez Perce Tribe, and State of Montana (Department of Livestock [MDOL]; Fish, Wildlife and Parks [MFWP]).

Scope, Purpose, and Need

This plan/environmental impact statement (plan/EIS) focuses on actions the NPS may take to manage bison within YNP and consolidates various environmental compliance analyses conducted over the past two decades into a contemporary plan. Other tribal and governmental agencies have important roles and responsibilities in bison management outside the park, and the NPS intends to work cooperatively with these groups. The purpose of the plan/EIS is to preserve an ecologically sustainable population of wild, migratory bison while continuing to work with partners to address brucellosis transmission, human safety, and property damage, and fulfill tribal trust responsibilities.

Action is needed because new information obtained since the approval of the IBMP in 2000 indicates some of the premises regarding brucellosis transmission in the initial plan were incorrect or have changed over time. In addition, fewer cattle range near the park, and federal and state disease regulators have taken steps to reduce the economic impacts of brucellosis outbreaks in cattle. Since 2006, several American Indian Tribes, including the Confederated Salish and Kootenai Tribes of the Flathead Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, Yakama Nation, Blackfeet Nation, Shoshone-Bannock of the Fort Hall Reservation, Northern Arapaho Tribe, and Crow Nation have harvested bison on national forest lands adjacent to the park pursuant to long-standing treaties with the federal government.

Disputed issues on bison management raised by federal, state, and tribal agencies and the public during consultation, IBMP meetings, and scoping include: How many bison is too many (or too few)? Where and when will bison be tolerated outside the park? How, when, and where should public hunting and tribal harvest occur, while respecting tribal rights and the concerns of nearby residents, businesses, and other stakeholders? What should be done to preserve existing genetic diversity? How can Yellowstone bison be used to restore viable populations of bison on tribal and public lands? What should be done and what can be done to suppress brucellosis and/or reduce transmission risk to cattle? Should management of brucellosis in elk be considered in the plan? How intensive should management be to minimize risks to human safety and property? What intensity and types of management are appropriate for migratory wild bison whose core range occurs within a national park? Should humans intervene to manipulate habitat conditions or control bison numbers and grazing effects?

This analysis process will result in a new Record of Decision (ROD) regarding how the NPS would manage bison within YNP. The NPS will continue to meet with the other federal, state, and tribal agencies under the existing framework for the IBMP to coordinate bison management and meet the principal purpose identified in 2000. This plan/EIS discusses brucellosis transmission risk, bison migration, cooperative management, and the importance of a bison population range that is healthy for the ecosystem. This planning process also allows the NPS to consider changed circumstances, such as fewer cattle near the park, federal and state disease regulators taking steps to reduce the economic impacts of brucellosis outbreaks in cattle, a warming climate, and American Indian Tribes exercising tribal treaty rights on federal lands outside the park. Bison management is a complicated topic. Partners have long

recognized the importance of learning, communication, and adjusting the plan to improve it over time. The IBMP, as adjusted, includes the idea of adaptive management as one tool to address this complexity, including the use of protocols and agreements to codify adjustments to bison management over the last two decades. Adaptive management will continue to be an element of the bison program in the park.

Background

Bison are extremely adaptable and quickly respond to management actions and environmental changes. They also are prolific with high survival of calves compared to other ungulates in YNP and lower rates of predation due to their large body size and group defensive tactics. As a result, bison numbers can increase quickly when conditions are favorable. Most bison migrate to some extent along elevation gradients in response to forage production and snow accumulation or melting. In spring, they move upslope as snow melts and highly nutritious vegetation begins growing to spend summer in higher-elevation areas of YNP. When snow cover becomes deep, however, foraging efficiency in higher-elevation areas decreases, and bison generally move to lower elevations where less snow accumulates and more food is more accessible. Since YNP is primarily mountainous with limited areas of low-elevation winter range for ungulates, some of these migrating bison move across the park boundary into the State of Montana (Montana or the state). The timing and extent of these movements depend on snow conditions, available forage, and the density of bison in the park.

Brucellosis can be transmitted between bison, elk, and cattle. When the IBMP was negotiated during the 1990s, bison were believed to be the primary risk of brucellosis transmission to cattle and, as a result, Montana has limited tolerance for them. Bison are allowed to migrate from YNP during winter and spring into relatively small management (tolerance) areas in Montana adjacent to the northern and western boundaries of YNP. Given existing political and social constraints, however, it is unlikely these management areas will be increased if bison numbers continue to increase, and there remains a possibility that management areas outside the park may decrease, which may require the NPS to take additional management measures. Thus, under the IBMP, NPS personnel have captured bison near the northern boundary of YNP during winter to reduce bison numbers and prevent movement outside the designated management areas in Montana. Captured animals have been shipped to processing facilities or placed in quarantine as part of a Bison Conservation Transfer Program (BCTP) to provide live, brucellosis-free bison to American Indian Tribes for restoration on their lands.

Federal and state disease regulators initially thought elk played a minor role in brucellosis transmission to cattle, but elk have transmitted the disease to cattle more than two dozen times since 2000 (National Academies of Sciences, Engineering, and Medicine 2020). No transmissions to cattle have been directly attributed to bison, though bison frequently mingle with elk and likely transmit brucellosis to them at times, and vice versa. The agencies involved with bison management have adjusted the 2000 IBMP many times through consensus decisions and annual operations plans to address these and other changes. This document updates new information and changed circumstances since 2000, describes adaptive management adjustments and environmental compliance implemented over time, and evaluates the effects of alternative approaches for preserving and managing bison. The alternatives were developed taking into consideration management actions that could occur on lands outside the park. Ideally, the plan would create opportunities to improve bison management in and outside the park. Expected outcomes of the process include a ROD and plan that incorporates new information, changed circumstances, and two decades of lessons learned; an enhanced ecological role for bison; increased tribal harvest opportunities outside the park; and more brucellosis-free bison restored to tribal lands.

Per statute and policy, the NPS manages wildlife populations to sustain them in their natural condition, which is defined as what would occur in the absence of human dominance over the landscape. Thus, to the extent feasible, the NPS would allow bison to move freely and unpursued within the interior of the park with their behaviors, movements, reproductive success, and survival primarily affected by their decisions and natural selection, more commonly known as survival of the fittest. Since 2013, bison

numbers have ranged between about 4,400 and 5,900 after calving, with consensus agreements among IBMP members on annual operations plans through 2020. However, numbers likely would increase with less intrusive management. Research indicates there is sufficient forage in the park to sustain about 10,000 bison during summer and 6,500 during winter although large variations in weather and grass production from year to year add complexity to this estimate. Near these estimates foraging efficiency and bison condition should decrease and more bison should migrate to lower-elevation areas in and outside the park.

Range of Alternatives

This document analyzes three alternatives for managing Yellowstone bison in the park, with numbers expected to range between about 3,500 and 7,000 bison after calving depending on the alternative. This range is sufficient to sustain the important ecological role bison play in terms of manipulating plant communities; redistributing nutrients across the landscape; and providing meat for predators, scavengers, and decomposers. Each alternative would support American Indian Tribes' harvest activities outside the park. Based on current information, it is also sufficient to maintain the persistence of a genetically diverse bison population. Under all alternatives, some bison would continue to migrate outside the park where state agencies and the national forest have jurisdiction and work with private landowners to determine levels of tolerance, hazing, captures, and public hunting, and with American Indian Tribes with tribal treaty rights to coordinate the location and extent of their harvest. Throughout this document, the term "tribal harvest" refers to bison shot during hunts outside the park by members of American Indian Tribes pursuant to long-standing treaties with the federal government and "harvest" or "hunt" refers to bison shot by public hunters with permits from MFWP. The word "culled" refers to bison captured in the Stephens Creek Administrative Area and shipped for processing or dispatched on-site. The word "removals" refers to the combined numbers of harvests, culls, and bison placed in the BCTP.

Alternative 1 (No Action)

This alternative prioritizes maintaining a negligible risk of brucellosis transmission from bison to cattle to assure other states and countries that management will prevent the transmission of brucellosis from bison to livestock (State of Montana 2000). The NPS would continue current management pursuant to the IBMP, as adjusted and implemented since 2000 through consensus decisions and annual operations plans by the agencies involved with bison management. Bison numbers are expected to range between about 3,500 and 5,000 after calving. Bison could move to the park boundary and into established northern and western management areas in Montana where their numbers would be limited by captures in the park for the BCTP (quarantine) or transferred to American Indian Tribes for shipment for processing (transferred for processing), as well as public hunting and tribal harvests outside the park, primarily on national forest lands. Only bison testing negative for exposure to brucellosis are eligible for the BCTP, which could include bison of either sex, any age, and pregnant or non-pregnant bison. Within YNP, the management of bison, such as capture and quarantine, would generally occur near the north boundary. However, the NPS may work with partners outside the park, as requested and appropriate, to reduce conflicts with cattle, people, and property. Hazing in or outside the park would involve moving bison away from an area where they are not wanted, such as developed areas, highways, or private property, using people walking, on horseback, or in vehicles. Park staff would conduct brucellosis screening and subsequent testing on bison placed in the BCTP.

Park staff would capture some migrating bison inside the Stephens Creek Administrative Area near the northern boundary of the park and ship them for processing to decrease numbers (if desired) and provide meat to American Indian Tribes. If space is available, some bison testing negative for brucellosis exposure would be placed in the BCTP to increase the number of live brucellosis-free animals relocated to suitable tribal or public lands. If space is not available, these bison would be transferred to American Indian Tribes for processing (transfer for processing). The NPS is working with APHIS and nongovernmental organizations (NGOs) to increase the capacity of the BCTP and reduce the number of

animals transferred for processing. These efforts included doubling the size of quarantine pastures near the Stephens Creek Administrative Area pursuant to the park's 2018 environmental assessment (EA) on *The Use of Quarantine to Identify Brucellosis-free Yellowstone Bison for Relocation Elsewhere* (USDOI, NPS 2016a) and shortening quarantine timelines. The NPS would continue to coordinate captures in the park with tribal and public hunter harvests outside the park to reduce the effects of capture on hunter harvest opportunities and continue discussions with American Indian Tribes and other agencies to improve communication, safety, and management.

Alternative 2 (Preferred Alternative)

This alternative would prioritize using the BCTP to restore bison to tribal lands and tribal harvests outside the park to provide American Indian Tribes with access to traditional resources. Bison are expected to range between about 3,500 and 6,000 bison after calving and may expand into new areas of the park. Larger numbers also could occasionally result in larger migrations into designated management areas in Montana, including portions of the Custer Gallatin National Forest that would support conservation and increase tribal harvest opportunities. The NPS would capture bison when there is available space in the BCTP and release brucellosis-negative animals that do not qualify for the program. The NPS would selectively transfer for processing brucellosis-positive animals identified when selecting for the BCTP, giving food and hides to American Indian Tribes. The NPS would work with tribal partners to increase tribal treaty harvest outside the park to provide American Indian Tribes with access to traditional food, cultural, and material sources. The NPS would shift away from transfer for processing as a primary tool for population management. The NPS would establish 5,200 bison in early winter as a population assurance threshold. When there are more bison, the NPS would manage for a decreasing population, where the post-calving population is smaller than the early winter population. The NPS would first rely on harvests to reduce numbers but would resume shipments for processing when necessary.

Alternative 3

This alternative would prioritize treating Yellowstone bison more like elk that have been exposed to brucellosis but are not subject to intense disease management like bison. Captures of bison for transfer for processing would immediately cease, with natural selection and public hunting and tribal harvests in Montana being the primary factors limiting bison numbers. The NPS would continue captures in YNP to maintain the BCTP, but release bison not suitable for the program. Bison numbers likely would be substantially higher than under Alternative 1 and are expected to range from about 3,500 to 7,000 bison after calving. Increasing bison population numbers may force bison to use new areas of the park and could result in more bison migrating out of the park. The NPS may haze bison within YNP when necessary to protect people and property. Montana could implement hazing outside the park at its discretion. There should be substantially more tribal harvest opportunities for American Indian Tribes outside the park, provided members allow bison to distribute across a larger landscape before harvesting them. The risk of brucellosis spreading from bison to cattle might increase compared to Alternative 1 as more bison migrate outside the park and potentially mingle with cattle if they surpass management efforts to keep them in the existing management area. If the population exceeded a population threshold, even with more harvest opportunities, the NPS would reinstitute transfer for processing as described for Alternatives 1 and 2, with large captures and hazing events occurring more frequently to reduce numbers and alleviate conflicts with property and improve safety.

Environmental Consequences

Inside the park, expected impacts from the implementation of bison management actions include potential changes in population structure and bison behavior from removals; maintenance of the ecological role provided by bison; potential for staff injuries related to bison management operations; potential impacts on vegetation from intense grazing in some areas (including outside the park); and potential impacts to visitor experience from closures and bison management operations in and around the capture and quarantine facilities. Outside the park, partners could collaborate in the construction of additional

quarantine facilities that could be used in partnership with the NPS, reducing the risk of private property damage, increasing the availability of bison for harvest opportunities, and increasing the availability of brucellosis-free bison to be sent to tribal lands. Due to mitigation measures currently in use among federal and state partners, there is generally a low risk of brucellosis transmission from bison to cattle outside the park.

Under all alternatives, the NPS would continue to meet the principal purpose of the 2000 IBMP, as adjusted. Since 2012, the NPS and other IBMP partners have met these goals while averaging about 4,800 bison after calving. There has been no documented transmission of brucellosis from bison to cattle, fewer conflicts with people and property, high visitor enjoyment and economic contributions to gateway communities, increased hunting opportunities, and more brucellosis-free bison sent to tribal lands. If the risk of bison mingling with livestock increases in the future, the NPS would take more aggressive management actions in collaboration with other IBMP partners, such as increasing captures, hazing, hunting, and removals to reduce the risk of bison mingling with cattle. Montana uses these techniques to manage brucellosis transmission risk from elk mingling with livestock in the Paradise Valley and, for over two decades, the IBMP partners have demonstrated these same techniques work for bison.

Under all alternatives, the NPS would work with tribal partners to increase their tribal harvest opportunities and the number of live bison sent to tribal lands through the BCTP given weather influences on the extent of migration each year. The NPS would continue engaging with American Indian Tribes associated with Yellowstone bison to explore ways to increase the efficiency and safety of harvest activities outside the park and the restoration of brucellosis-free bison to tribal lands through the BCTP. Staff from other federal and state agencies could inform these discussions with the Custer Gallatin National Forest and MFWP participating in consultations about hunting and APHIS and the MDOL participating in consultations about the BCTP. The NPS also would work with partners to explore other management options outside the park, including streamlining testing protocols for the BCTP, more bison year-round on the Custer Gallatin National Forest per the 2022 Land Management Plan (LMP), and the construction of additional quarantine facilities and temporary capture facilities outside the park.

Adaptive management is a key concept incorporated into all alternatives to evaluate current conditions, identify undesired trends, implement management actions, monitor progress toward desired conditions or objectives, and adjust actions to improve progress. The NPS and other federal and state agencies and American Indian Tribes involved with the IBMP have used this process to inform decision-making and adjust bison management. The NPS would continue to implement monitoring and research to obtain timely information and adjust preservation and management activities. Under the IBMP, as adjusted, operations plans have served as the main mechanism for describing and implementing commitments and agreements for the cooperative management of Yellowstone bison across jurisdictions. Under each alternative, the NPS would continue to meet with the other federal, state, and tribal agencies to coordinate bison management using the existing framework for the IBMP, as adjusted. The NPS would continue to prepare annual assessments of the status of the bison population and propose adjustments to adaptive management and operations plans based on the selected alternative resulting from this process.

When Yellowstone bison cross the boundary of the park into surrounding states, they are no longer under the jurisdiction of the NPS. Instead, their management falls to the respective state; the US Forest Service (USFS) manages their habitat on National Forest System lands. Hundreds of bison have occupied suitable winter range near the park boundary in Montana, with tolerance linked to the successful management of disease, property, and safety risks. Several American Indian Tribes have rights reserved by treaties with the US government to harvest bison migrating outside the park onto portions of the Custer Gallatin National Forest. The NPS would continue to work with American Indian Tribes and tribal organizations, US Department of Agriculture, Montana, NGOs, and private landowners to increase tolerance for bison on suitable lands outside YNP where a low risk of brucellosis transmission to cattle can be maintained.

Consultation and Coordination

Scoping is an essential component of the National Environmental Policy Act (NEPA) planning process. The formal scoping process for the plan/EIS consisted of public scoping and consultation with federal, state, and local agencies and tribal governments. The formal NEPA process and 30-day public scoping period was initiated on January 28, 2022, with the publication of a Notice of Intent (NOI) in the *Federal Register* (87:4653). In addition to the NOI, preliminary information regarding the plan/EIS was provided to the public and other interested parties through a press release and public scoping newsletter. During public scoping, the NPS hosted two virtual meetings and received more than 2,540 pieces of correspondence. The Notice of Availability for the draft plan/EIS was published in the *Federal Register* on August 10, 2023. The public comment period for the draft plan/EIS was open for 60 days, from August 10, 2023, to October 10, 2023. During this time, the NPS hosted two virtual meetings and received approximately 27,150 pieces correspondence, which are summarized in this plan/EIS in chapter 4. A full summary of and responses to substantive public and agency comments received on the draft plan/EIS are included in appendix G.

Agency consultation is the early involvement of federal and state agencies and tribal governments that may be affected by the federal action. This allows affected agencies or tribal governments to comment and contribute early to the decision-making process and helps the NPS to identify key issues or requirements to be considered in the NEPA process. Prior to and following the release of the NOI, the NPS had discussions with the cooperating agencies regarding their recommendations on bison management related to the actions being considered in this plan/EIS. The following consultations will need to be completed prior to implementation of the selected action: Endangered Species Act (ESA), section 7 – US Fish and Wildlife Service (FWS).

Section 106 of the National Historic Preservation Act (NHPA) requires that federal agencies consider their effects to historic properties. This process requires agencies to determine whether they have an undertaking that has the potential to cause effects to a historic property. The alternatives were reviewed for their potential to affect historic properties. The implementing regulations for section 106, 36 Code of Federal Regulations (CFR) 800, define an undertaking as, ". . . a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval" (36 CFR 800.16(y)). The management of bison is an undertaking according to this definition. The no--action alternative would result in the park continuing to manage bison in the same manner as they are currently managed. Both action alternatives consist of using existing facilities and are based on the number and frequency of bison captured or permitted to pass by the capture facility to be harvested by American Indian Tribes and the state outside the boundary of the park. No new construction or other activities that would have the potential to cause effects to historic properties are part of this plan. Bison do not meet the definition of a historic property at 36 CFR 800.16(l)(1). The alternatives in this plan do not have the potential to cause effects to historic properties per 36 CFR 800.3(a)(1); therefore, no further section 106 review is needed. The NPS will continue to consult with American Indian Tribes per other laws, policies, and regulations, given the significance of bison to the Tribes.

Next Steps

The Notice of Availability for this final plan/EIS will initiate a 30-day waiting period. After the waiting period, the NPS will issue a ROD, and project implementation can begin.

Yellowstone National Park Bison Management Plan / Environmental Impact Statement

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Acronyms and Abbreviations

Abbreviation/Acronym	Full Term/Description
APHIS	Animal and Plant Health Inspection Service
BCTP	Bison Conservation Transfer Program; quarantine
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DNA	deoxyribonucleic acid
DSA	Designated Surveillance Area for brucellosis
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
et al.	and others
et seq.	and what follows
°F	degrees Fahrenheit
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
GonaCon™	gonadotropin-releasing hormone immunocontraceptive vaccine
GYA	Greater Yellowstone Area
IBMP	Interagency Bison Management Plan
ITBC	InterTribal Buffalo Council
LMP	Land Management Plan
MCA	Montana Code Annotated
MDOL	Montana Department of Livestock
MFWP	Montana Fish, Wildlife and Parks
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NOI	Notice of Intent
NPS	National Park Service
RB51	*Brucella abortus* vaccine strain RB-51
park	Yellowstone National Park
ROD	Record of Decision
UM&R	Uniform Methods & Rules
US	United States
USC	United States Code
USDA	US Department of Agriculture
USDOI	US Department of the Interior
USFS	US Forest Service
VS	Veterinary Services
YNP	Yellowstone National Park

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Chapter 1: Purpose and Need for Action

Introduction

This plan/environmental impact statement (plan/EIS) for bison management at Yellowstone National Park (YNP or the park) analyzes the impacts that could result from implementing updated bison management actions on more than 500,000 acres (2,020 square kilometers) of National Park Service (NPS) lands. This chapter describes the reasons the NPS is proposing to act by outlining the mission of the NPS and the purpose and significance of YNP, thereby giving context to the management framework for bison within the park. This chapter also describes the history of bison management, important changes in circumstances and new information, the purpose and need for action, the project location and area, and impact topics retained for further analysis.

This analysis process will result in a new Record of Decision (ROD) regarding how the NPS would manage bison within YNP. The NPS would continue to meet with the other federal, state, and tribal agencies to coordinate bison management using the existing framework for the Interagency Bison Management Plan (IBMP), as adjusted, which has been in place since 2001. The new bison plan for YNP would continue to advance the principal purpose of the IBMP, as adjusted.

Background

Purpose and Significance of Yellowstone National Park—Units of the national park system are established by Congress to fulfill specified purposes. A park's purpose provides the foundation for decision-making as it relates to preserving park resources and providing for the "enjoyment of future generations." Congress established YNP in 1872 to "dedicate and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people; … for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition" (Park Protection Act of 1872; 16 United States Code [USC] 21 et seq., 17 Stat. 32).

On May 7, 1894, Congress passed *An Act to Protect the Birds and Animals in Yellowstone National Park, and to Punish Crimes in said Park, and for Other Purposes*. The April 4, 1894, House of Representatives Report that accompanied this Act, states "out of the vast herds of millions of buffaloes [bison] that a few years ago coursed the plains of America a few hundred only remain, and they are now all in the Yellowstone Park, and one of the purposes of setting aside this park has been to preserve this little herd." It also indicates "[a] few days ago, poachers entered the park and commenced the slaughter of these animals. Prompt action is necessary, or this last remaining herd of buffalo will be destroyed." As a result, section 4 of the 1894 Act established "[t]hat all hunting, or the killing, wounding or capturing at any time of any bird or wild animal, except dangerous animals, when it is necessary to prevent them from destroying human life or inflicting an injury, is prohibited within the limits of said park."

In addition, the Organic Act of 1916 (54 USC 100101(a, b)) directed the Secretary of the Interior and the NPS to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." This mission supports allowing natural processes to regulate wildlife numbers rather than human controls provided there is no evidence that ecological limitations on population growth, such as food limitation, predation, dispersal (range expansion), disease, and severe weather are inadequate (USDOI, NPS 2006a).

The park's purpose and significance are rooted in its enabling legislation; subsequent legislation; and current knowledge of its natural, cultural, and visual resources. Statements of a park's significance describe why the park is important within a global, national, regional, and ecosystem-wide context and are directly linked to the purpose of the park. YNP is significant because it is the world's first national park and preserves geologic wonders, including the world's most extraordinary collection of geysers and hot springs and the underlying volcanic activity that sustains them. The park preserves abundant and

diverse wildlife in one of the largest remaining intact and wild ecosystems on earth, supporting surrounding ecosystems and serving as a benchmark for understanding nature. It also preserves an 11,000-year continuum of human history, including sites, structures, and events that reflect a shared heritage. This history includes the birthplace of the national park idea—a milestone in conservation history. In addition, YNP provides for the benefit, enjoyment, education, and inspiration of this and future generations. Visitors have a range of opportunities to experience the essence of the park's wonders and wildness in a way that honors the park's value to the human spirit and deepens the public's understanding and connection to it (USDOI, NPS 2014a).

History of Bison Management—Tens of millions of plains bison once ranged across western North America. They were an important food source for American Indian Tribes[1] living in, or traveling through, the Yellowstone area before colonization by European American settlers. After westward expansion by European Americans, treaties with the US government limited the use of lands within the Greater Yellowstone Area (GYA) by indigenous people (Nabokov and Loendorf 2002; Wallen et al. 2015b).

Archeological evidence indicates bison have lived in the GYA for more than 10,000 years, and historical narratives suggest they were abundant and widely distributed into the 1830s (Cannon et al. 2020; Whittlesey and Bone 2020). Bison were much more numerous at lower elevations in river valleys and on the surrounding plains, but many apparently migrated into the mountains during summer to access nutritious forage, and a smaller number lived year-round in the mountains, including the area encompassed by present-day YNP (Cannon et al. 2020; Whittlesey and Bone 2020). Numbers of bison using mountainous areas, like present-day Yellowstone, may have increased when bison were being hunted to near extinction (Beschta and Ripple 2019). Around 1,000 animals were estimated within the park near the time of establishment in 1872 (Meagher 1973). About 600 bison were reported in 1880 as poaching reduced numbers (NPS 1880; Meagher 1973). By 1902, only 23 bison were counted in the park.

Bison numbers increased after protection from hunting and poaching due to husbandry and the reintroduction of bison to various locations, including the northern and central portions of YNP. The NPS fed bison in the northern portion of YNP during winter at the Buffalo Ranch in the Lamar Valley and herded them to the Mirror Plateau and upper Lamar River area during summer (Meagher 1973). The remaining native bison spent winter in the Pelican Valley in central YNP but also moved to the Mirror Plateau and upper Lamar River area during summer. Bison numbers increased rapidly to about 1,100 by 1930 (Meagher 1973).

Managers stopped feeding and herding bison in the Lamar Valley in 1952, after which bison moved about freely. However, managers shot or captured and shipped about 3,500 bison from this herd between 1930 and 1966 to reduce numbers and take out individuals with the disease brucellosis. For similar reasons, managers removed about 1,000 bison from the central portion of YNP between 1954 and 1966. These removals reduced numbers to about 70 bison in the northern herd and 350 bison in the central herd by the winter of 1968 (Meagher 1973). Thereafter, managers stopped removing bison and allowed numbers to vary in response to forage availability, predation, and weather. Bison numbers increased rapidly to about 1,700 during the 1970s and 3,000 during the 1980s. By 1994, bison numbers increased to about 4,100, with almost 3,000 bison in central YNP and larger winter movements toward the park's northern and western boundaries (White et al. 2022b).

By the summer of 2005, about 3,500 bison were in central YNP and 1,500 bison were in northern YNP. Since then, there has been a large decrease in the number of bison in central YNP, a rapid increase in the number of bison in northern YNP, and more movements of bison from central to northern YNP (Wallen and White 2015). These movements were likely in response to high bison numbers in central YNP,

[1] American Indian Tribes include bands, nations, or other organized groups the Secretary of the Interior includes in the Federally Recognized Indian Tribe List Act of 1994, as amended (25 USC 5130-5131).

intense hazing by the State of Montana (Montana or the state) along the western boundary to keep bison in the park, and groomed roads that allowed bison to rapidly travel north during winter (Wallen and White 2015). In addition, counts of elk in northern YNP decreased from about 19,000 in the mid-1990s to 3,915 elk by 2013 following the restoration of predators such as bears, cougars (mountain lions), and wolves. As elk numbers decreased, the number of bison in northern YNP increased from about 1,500 in 2005 to 4,000 in 2016-2017. In contrast, the number of bison in central YNP decreased from about 3,500 in 2005 to about 1,200 in 2018 (White et al. 2015c; Geremia 2022).

Today, Yellowstone bison are the largest wild population of plains bison. These bison have relatively high genetic diversity and move across a vast landscape where they are exposed to natural selection (also known as survival of the fittest) through competition for food and breeding opportunities, predation, and survival under challenging environmental conditions. As a result, they have adaptive capabilities that are continually honed compared to bison kept in fenced pastures with no predators and where older bulls are removed to simplify management. Many American Indian Tribes have a deep relationship with Yellowstone bison because they are wild descendants of the huge herds of bison that once roamed across North America and provided their ancestors with food and other resources for centuries. As a result, public and tribal interest in the preservation and management of Yellowstone bison is substantial.

Brucellosis is a nonnative disease caused by the bacteria *Brucella abortus* that was introduced to the Yellowstone area when cattle were added to the landscape in the early 1900s; the source of the initial infection is unknown (Meagher and Meyer 1994; Yonk et al. 2018). Brucellosis can induce abortions in ungulates and be transmitted among bison, cattle, and elk if they contact infectious birthing tissues (amniotic fluids, fetus, placenta) or the newborn calf (National Academies of Sciences, Engineering, and Medicine 2020). Diagnosing brucellosis infection with a high level of certainty requires killing the animals and attempting to culture the bacteria from milk, lymphatic tissues, uterine discharges, and fetal tissues. Alternatively, serology is used to detect antibodies circulating in the blood that indicate past exposure to *Brucella* bacteria (Cheville et al. 1998). However, a positive serology test (seropositive) does not necessarily mean the animal is still infected or capable of transmitting the bacteria. For example, about 60% of adult female bison in YNP test seropositive for antibodies indicating previous exposure to *Brucella* bacteria, but only 10% to 15% of all adult female bison are infectious and could potentially shed live bacteria that spread the disease (Hobbs et al. 2015).

The Centers for Disease Control and Prevention (CDC) and the US Department of Agriculture, Animal and Plant Health Inspection Service (APHIS) consider the bacteria *Brucella abortus* a select agent and toxin because it has the potential to pose a severe threat to human and animal health, plant health, or animal and plant products (7 Code of Federal Regulations [CFR], Part 331, 9 CFR Part 121, and 42 CFR Part 73). Brucellosis is a zoonotic disease that can infect people, causing undulant fever with symptoms including intermittent fever, chills, night sweats, body and joint pain, poor appetite, and weakness. Brucellosis bacteria can infect people through breaks in the skin, mucous membranes, membranes in the eye, and respiratory and intestinal tracts. People consuming improperly handled or cooked meat or raw organs are at risk of a brucellosis infection. Proper handling and cooking completely kills the bacteria.

Brucellosis concerns livestock producers because, if cattle become infected, producers lose income from killing infected cattle, additional testing requirements, and possible restrictions on interstate transport and international trade (Bidwell 2010). These concerns have substantially influenced the management of Yellowstone bison and constrained their distribution across the GYA and elsewhere (White et al. 2015a,b). More bison began migrating into Montana during the 1990s as their numbers increased, and the higher prevalence of brucellosis exposure in bison (50% to 60%) than elk (less than 10%) suggested bison would be a higher risk of transmitting the disease to cattle (Cheville et al. 1998, State of Montana 2000).

In 1995, Montana sued the federal government due to concerns that bison infected with brucellosis bacteria that migrated outside YNP could jeopardize the state's brucellosis-free status for cattle and, in turn, interstate and international trade (State of Montana 2000, Franke 2005, Bidwell 2010). A

brucellosis-free classification allows producers to export cattle to other states or nations without testing. Historically, the entire state lost this classification if regulators detected brucellosis in two or more livestock herds within a 2-year period or ranchers did not depopulate a livestock herd exposed to brucellosis within 60 days. This reclassification had significant adverse economic consequences on producers state-wide (USDA, APHIS 2010). As a result, Montana wanted to maintain a negligible risk of brucellosis transmission from bison to cattle to assure other states and countries that management would prevent the transmission of brucellosis from bison to livestock and reduce brucellosis prevalence. The state deemed "low risk" unacceptable because brucellosis transmission might still occur under certain circumstances. Because the state had few funds or personnel allocated for bison management, and bison could not transmit brucellosis to cattle if they remained in YNP, state officials rejected alternatives for bison to occupy suitable public lands elsewhere (State of Montana 2000).

In 1995, the federal government and Montana entered into a court-approved settlement agreement for issuing a final plan/EIS and ROD regarding the management of Yellowstone bison (USDOI and USDA 2000b). Originating from concerns that bison migrating outside YNP would transmit brucellosis to cattle and, thereby, jeopardize interstate and international trade, staff for the Secretaries of Agriculture and the Department of the Interior (USDOI) and the Governor of Montana developed the IBMP. The ROD for the IBMP plan/EIS was signed in December 2000. The NPS, APHIS, US Forest Service (USFS), Montana Department of Livestock (MDOL), Montana Fish, Wildlife and Parks (MFWP), Confederated Salish and Kootenai Tribes of the Flathead Nation, Nez Perce Tribe, and the InterTribal Buffalo Council (ITBC) coordinate to implement the IBMP (see appendix A for roles and responsibilities).

Negotiators of the IBMP chose a population target of 3,000 bison in late winter and early spring to reduce migration outside YNP, which equates to about 3,600 to 3,700 bison after calving during summer (Cheville et al. 1998, USDOI and USDA 2000b, Angliss 2003). Bison could only migrate into small areas adjacent to YNP during a short period in winter to "prevent the reestablishment of a free-ranging bison herd in places where bison have been absent for more than a century" (State of Montana 2000). The management of bison under the IBMP, as adjusted, also includes actions such as capture, test-and-slaughter, vaccination, and hazing animals back into YNP to constrain their abundance and distribution while attempting to suppress brucellosis prevalence. The Montana Legislature imposed restrictions on the movements and relocation of Yellowstone bison (Montana Code Annotated [MCA], Titles 81 and 87). Many American Indian Tribes have rights reserved through treaties with the federal government to hunt on unoccupied lands of the United States so long as game is found thereon. The word "unoccupied" denotes an area free of residence or settlement by non-Indians (*Herrera v. Wyoming*, 139 S. Ct. 1686 [2019]). In 2009, the Confederated Salish and Kootenai Tribes of the Flathead Nation and the Nez Perce Tribe became members of the IBMP because of their treaty rights for hunting bison on unoccupied lands in southwestern Montana. The ITBC, which is recognized as a federally chartered Indian organization by the Bureau of Indian Affairs under Section 17 of the Indian Reorganization Act that has about 83 member tribes with a primary mission to restore buffalo to tribal lands, also became a member of the IBMP in 2009.

Between 2001 to 2023, the agencies and American Indian Tribes successfully met the overarching principal purpose of the IBMP, as adjusted, by preserving a viable, wide-ranging population of plains bison while preventing the transmission of brucellosis from bison to livestock. However, several of the circumstances that influenced the derivation and implementation of the original IBMP changed, and scientific knowledge regarding bison and brucellosis improved substantially (appendix B). Key changes are summarized here.

In 2006, the IBMP members clarified "a population of 3,000 bison is defined as a population indicator to guide implementation of risk management activities and is not a target for deliberate population adjustment" (IBMP Partner Agencies 2006). They also adjusted the operations plan to increase tolerance for bull bison in Montana because there is negligible risk of them transmitting brucellosis to cattle (Clarke et al. 2005).

Since 2006, several American Indian Tribes have asserted their treaty rights to harvest bison migrating from YNP onto unoccupied national forest lands in Montana. In 2023, approximately 1,175 bison were harvested outside the park, with all but 75 of those bison harvested by treaty tribes. Since 2009, livestock disease regulators have implemented the vaccination of livestock calves with high compliance in the brucellosis surveillance area in Montana. In 2010, APHIS changed regulations to deal with brucellosis outbreaks in cattle on a herd-by-herd basis without imposing unnecessary corrective actions and associated economic costs on the rest of the producers in the state (USDA, APHIS 2010). If outbreaks are investigated and contained by removing all cattle testing positive for brucellosis, the entire state or area is not reclassified or subject to corrective actions. In 2010, Montana designated a surveillance area (DSA) for brucellosis defined by occurrence of the disease in elk (MDOL 2011). To prevent brucellosis-infected livestock from being moved into other states, all calves within the DSA are vaccinated for brucellosis, all cattle are uniquely marked so relocations or sales can be traced, and all reproductive cattle are tested for brucellosis exposure prior to movement elsewhere. In 2015, Montana increased tolerance for more bison across a larger management area in the state (Bullock 2015).

In 2017–2018, the NPS, APHIS, and MDOL began the Bison Conservation Transfer Program (BCTP; quarantine) to identify brucellosis-free Yellowstone bison and transfer them to suitable tribal or public lands. Between 2019 and 2023, the NPS and APHIS sent 414 brucellosis-free Yellowstone bison to the Assiniboine and Sioux Tribes at Fort Peck for one year of assurance testing and eventual release. The ITBC transferred more than 300 bison of Yellowstone-origin from the Fort Peck Indian Reservation to 26 American Indian Tribes across 12 states.

In 2016, genetic data indicated elk had infected cattle herds with brucellosis in the GYA, not bison. Elk exposed to brucellosis inhabited an area encompassing about 17 million acres (6.9 million hectares), whereas bison inhabited 1.5 million acres (607,000 hectares) near the core. Control measures in bison would not affect the dynamics of unrelated *Brucella abortus* strains in elk elsewhere (Kamath et al. 2016). In 2020, the National Academies of Sciences, Engineering, and Medicine concluded infected elk had transmitted brucellosis to livestock in the GYA at least 27 times since 1998 with no transmissions attributed to bison. The Committee recommended prioritizing efforts on preventing brucellosis transmission by elk, while maintaining separation between bison and cattle (see appendix E). The Committee also recommended not using aggressive control measures on bison until tools became available for an eradication program in elk.

In 2022, the Custer Gallatin National Forest adopted a new land management plan (LMP). The selected alternative includes desired conditions supporting habitat improvement projects to create or connect suitable bison habitat with enough bison present and distributed year-round to provide a self-sustaining population on the national forest in conjunction with bison herds in YNP (USDA, USFS 2022a).

The IBMP agencies addressed these changed circumstances and new information through adaptive management adjustments and environmental compliance evaluations described at http://ibmp.info/adaptivemgmt.php and in other sections of this document.

Purpose and Need for Action

The purpose of this plan/EIS is to preserve an ecologically sustainable population of wild, migratory bison while continuing to work with partners to address brucellosis transmission, human safety, and property damage, and fulfill tribal trust responsibilities. Other tribal and governmental agencies have important roles in bison management outside the park, and the NPS intends to work cooperatively with these groups to accomplish this purpose.

When complete, a selected alternative from this plan/EIS will update NPS actions identified in the current IBMP, as adjusted. This plan/EIS considers bison management actions likely to occur on lands outside the park in Montana, while acknowledging the NPS does not have jurisdiction or control over actions beyond the park boundary. This plan/EIS would create opportunities to improve bison management in and outside

the park. Expected outcomes of the process include continued interagency partnerships, a ROD that reflects new information and changed circumstances and incorporates two decades of lessons learned, an enhanced ecological role for bison, increased hunting opportunities outside the park, more brucellosis-free bison restored to tribal lands, and fewer shipments of bison for processing.

Bison are prolific with high survival of calves compared to other ungulates in YNP and lower rates of predation due to their large body size and group defensive tactics. As a result, bison numbers can increase quickly when conditions are favorable (White et al. 2015c). Most bison migrate along elevation gradients in response to forage production and snow accumulation or melting. In spring, they move upslope as snow melts and highly nutritious vegetation begins growing to spend summer in higher-elevation areas of YNP. When snow cover becomes deep, however, foraging efficiency in higher-elevation areas decreases, and bison generally move to lower elevations where less snow accumulates, and food is more accessible (Geremia et al. 2015a). Since YNP is primarily mountainous with limited areas of low-elevation winter range for ungulates, some of these migrating bison move across the park boundary into Montana. The timing and extent of these movements depend on snow conditions, available forage, and the density of bison in the park (Geremia et al. 2011, 2014).

When the IBMP was negotiated during the 1990s, bison were believed to be the primary risk of brucellosis transmission to cattle (Bidwell 2010). Bison are allowed to migrate out of YNP during winter and spring into relatively small management (tolerance) areas in Montana adjacent to the northern and western boundaries of YNP (Bullock 2015). Given existing political and social constraints, however, it is unlikely these management areas will be increased if bison numbers continue to increase (White et al. 2015c). There remains a possibility that management areas outside the park may decrease, which may require the NPS to take additional management measures. Thus, under the IBMP, as adjusted, NPS personnel have captured bison near the northern boundary of YNP during winter to reduce bison numbers and prevent movements outside the designated management areas in Montana. Captured animals have been shipped to processing facilities or placed in quarantine as part of the BCTP to provide live, brucellosis-free bison to American Indian Tribes for restoration on their lands.

Action is needed because new information obtained since the approval of the IBMP in 2000 indicates some of the premises regarding brucellosis transmission in the initial plan were incorrect or have changed over time. Federal and state disease regulators initially thought elk played a minor role in brucellosis transmission to cattle, and bison migrating outside YNP would transmit brucellosis to cattle and jeopardize interstate and international trade. However, elk have transmitted brucellosis to cattle at least 27 times since 1998 with no transmissions attributed to bison. Circumstances also changed with fewer cattle near the park, and federal and state disease regulators taking steps to lessen the economic impacts of brucellosis outbreaks in cattle. In addition, since 2006, several American Indian Tribes have harvested bison on national forest lands adjacent to the park pursuant to long-standing treaties with the federal government.

In recent years, concentrated tribal harvests on national forest lands near the park boundary have, at times, resulted in conflicts with nearby residents due to shooting near roads and houses, gut piles left on the landscape, shooting of elk and other ungulates, and occasional incidents of shooting toward other hunters, houses, and cars. The Custer Gallatin National Forest has taken some actions to address public safety and natural resource concerns associated with hunts on National Forest System lands, but hunts conducted under permits through Montana or American Indian Tribes exercising their treaty rights do not require authorization from the USFS (Erickson 2019). The USFS has implemented measures to aid in the safety of hunting such as participating in daily operational meetings with tribal game wardens and law enforcement officers from the State of Montana and the NPS when hunting near the northern boundary of YNP is underway. In these meetings, participants address where hunting is occurring on the landscape, where hunters are located, and the number of permits available. The agencies address conflicts and safety concerns as they arise. The YNP Bison Management Plan/EIS will not resolve these issues because the NPS does not have regulatory authority or jurisdiction over hunts that occur outside the park. Likewise,

this bison management plan will not eliminate or substantially reduce the occurrence of brucellosis in the GYA. Brucellosis is spreading in elk throughout the region, and it has spread from elk to cattle at least 27 times since 1998. The eradication of brucellosis would require eliminating the disease in elk, which would involve attempting to capture, test, and vaccinate or slaughter tens of thousands of elk across the entire GYA, which most people consider unacceptable and impossible at this time (National Academies of Sciences, Engineering, and Medicine 2020). The NPS concluded in a previous final plan/EIS that the park-wide vaccination of bison would not achieve desired results and could have unintended negative effects to the population and visitor experience (USDOI, NPS 2014b). The NPS based this conclusion on the lack of an easily distributed and highly effective vaccine and limitations of current diagnostic and vaccine delivery technologies. Remote vaccination by darting or bio-bullet has unknown yet potentially negative behavioral impacts on bison, and in turn, on visitor experiences such as watching wild animals.

Project Location and Analysis Area

YNP encompasses about 2.2 million acres (890,300 hectares) of Wyoming, Montana, and Idaho and is the core of the GYA, which is the largest and most nearly intact ecosystem in the contiguous United States. The area specifically subject to analysis for this plan/EIS includes approximately 500,000 acres (2,020 square kilometers) in the central and northern portions of YNP and small adjacent areas in Montana. Bison in central YNP occupy the central plateau, extending from the Pelican and Hayden valleys with a maximum elevation of 8,200 feet (2,500 meters) in the east to the lower-elevation (6,570 feet [2,000 meters]) and geothermally influenced Madison headwaters area in the west (figure 1). Winters are often severe, with temperatures reaching negative 44 degrees Fahrenheit (°F) (negative 42 degrees Celsius) and snowpack exceeding 6 feet (1.8 meters) in some areas. Bison in central YNP congregate in the Hayden Valley for breeding. Afterward, most bison move between the Madison, Firehole, Hayden, and Pelican Valleys, but some travel to the Hebgen Basin in Montana or the northern region of the park before returning to the Hayden Valley for the subsequent breeding season. Bison in northern YNP and nearby areas of Montana primarily occupy the Yellowstone River drainage and surrounding mountains between the Lamar Valley and Mirror Plateau in the east (maximum elevation = 9,000 feet [2,740 meters]) and the lower-elevation Gardiner Basin in the west (5,300 feet [1,615 meters]). The northern region of YNP is drier and warmer than the rest of the park, with average snow depths ranging from about 3.5 feet (1 meter) at higher elevations to less than 1 foot (0.3 meter) at lower elevations. Bison in northern YNP congregate in the Lamar Valley and on adjacent plateaus during the breeding season.

The landscape of the analysis area is characterized by high-elevation shrub steppe and grasslands with well-defined riparian corridors surrounded by moderately steep slopes of the local mountain ranges and plateaus. The Gallatin and Absaroka Mountain ranges dominate the northwestern and eastern boundaries of the park. The Washburn Range, Central Plateau, Solfatara Plateau, and Mirror Plateau encompass the intervening high points within the analysis area. The Pelican Creek watershed is located at the southeast portion of the analysis area and drains directly into Yellowstone Lake. The Gibbon and Firehole Rivers (both tributaries of the Madison River) are key features of the south and west portion of the analysis area. Several other small watersheds occur in the area, including Duck and Cougar Creeks in the Madison Valley and Sedge Creek east of Mary Bay on Yellowstone Lake. Soda Butte and Slough Creeks drain into the Lamar River, which forms the Lamar Valley (6,693 feet [2,040 meters] in elevation) in the northeastern area of the park. The moderately hilly topography on top of Mount Everts and the Blacktail Deer Plateau is bounded on the north by the Black Canyon of the Yellowstone River and on the south by Folsom and Prospect Peaks. The Yellowstone River flows through a wide valley northwest of Gardiner, Montana, and is generally less than 5,495 feet (1,675 meters) in elevation. Resources outside the park may be described in subsequent sections if any of the proposed alternatives could potentially affect them.

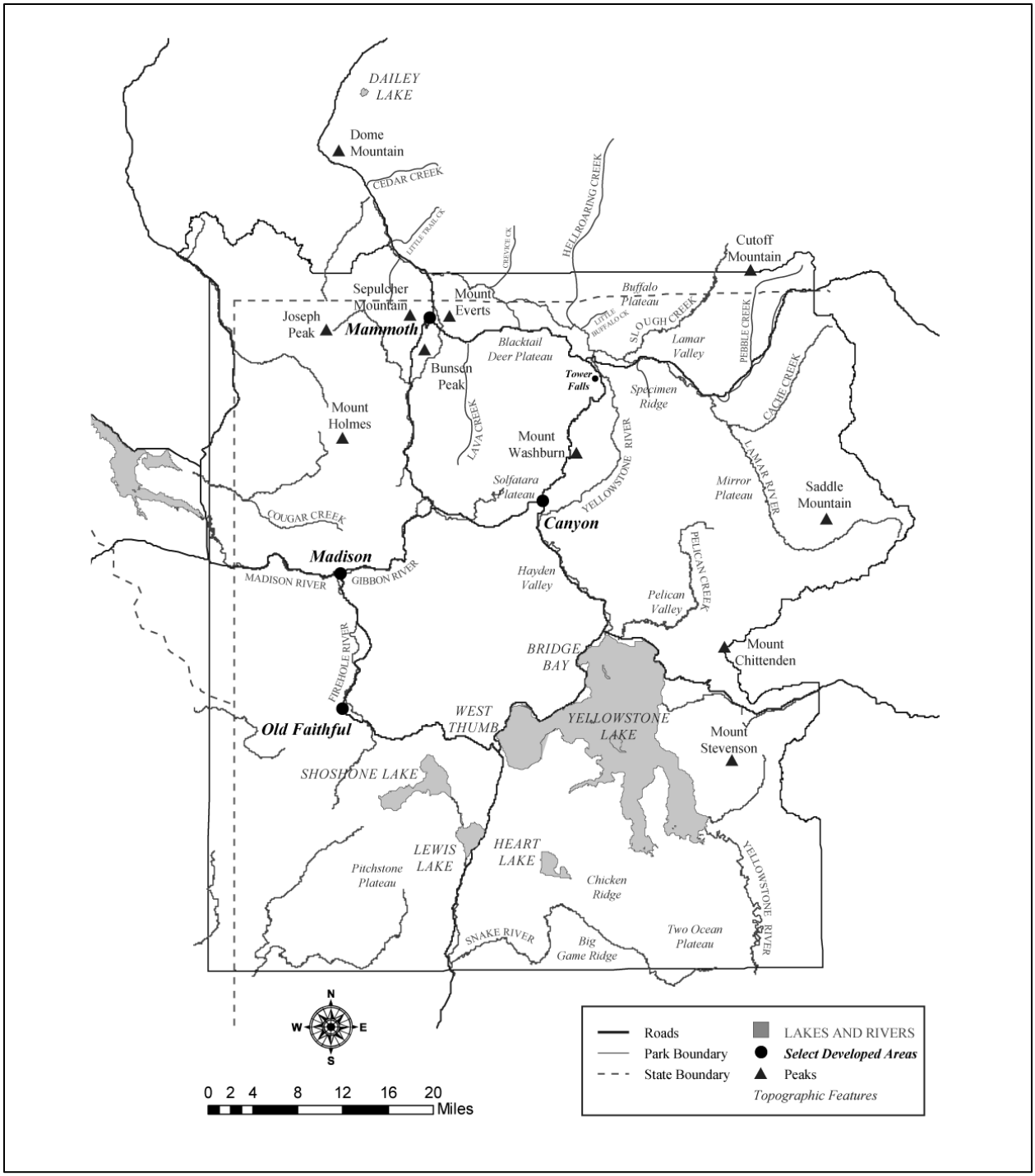

Figure 1. Yellowstone National Park and nearby areas of Montana with geographic features and place names

Impact Topics Retained for Further Analysis

The NPS identified a range of issues and impact topics to evaluate in this plan/EIS. Several issues were also eliminated from further consideration. Issues and impact topics dismissed from detailed analysis, including the rationale, are provided in appendix C. Issues carried forward for detailed analysis fall under the following impact topics: Yellowstone bison; wildlife; threatened animals and plants; American Indian Tribes and ethnographic resources; health and human safety; socioeconomics; visitor use and experience; and vegetation. The ongoing effects of climate change are included in each impact topic's "Affected Environment" section to describe current conditions, forecasts, and the impacts of climate change on those resources.

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Chapter 2: Alternatives

Introduction

The National Environmental Policy Act (NEPA) requires federal agencies to develop a range of alternatives and analyze the impacts those alternatives could have on the human environment. As prescribed by NEPA's implementing regulations, this plan/EIS includes the alternative of no action (40 CFR § 1502.14). USDOI's NEPA Regulations define two options for the no-action alternative: (1) "no change" from a current management direction; and (2) "no project" for situations where a proposed activity would not take place, such as construction of a new facility (§ 46.30). The Council of Environmental Quality's (CEQ) 40 Most Asked Questions specifically notes that continuing current management applies to updating a land management plan initiated under existing legislation and regulations where an action will continue, even as new plans are developed. In these cases, the no-action alternative represents no change from current management or level of management activity, and the analysis provides a baseline of continuing with the present course of actions (CEQ 1981). Alternative 1 is identified as the no-action alternative and represents the continuation of current management.

Alternatives 2 and 3 represent the action alternatives providing detailed guidance for future management of bison in YNP. Action alternatives carried forward for detailed analysis must: (1) meet the purpose and need; (2) be technically and economically feasible; and (3) show evidence of common sense (CEQ 1981). This chapter also describes actions common to all proposed alternatives and alternatives considered but eliminated from further consideration (40 CFR §1502.14(a)). Relevant portions of the documents cited in this section are incorporated by reference into this plan/EIS pursuant to 43 CFR 46.320. Alternative-specific mitigation measures are incorporated into each alternative description. Mitigations that apply to all alternatives and would be implemented as part of the project to avoid or minimize adverse effects to resources are described in the "Actions Common to All Alternatives" section.

The NPS did not identify a preferred alternative in the draft plan/EIS because one did not exist at the time the NPS released the document (40 CFR 1502.14). Section 4.3C of the NPS NEPA Handbook (2015), states that, "it is standard NPS practice to identify the preferred alternative in EAs and is required by the CEQ regulations in most instances for draft EIS' and in all instances for final EISs unless another law prohibits the expression of a preference (46.425(b)). The only instances where a preferred alternative does not need to be identified in a draft EIS is when the NPS truly does not have a preferred alternative at the time the draft EIS is released or when another law prohibits the expression of a preference (46.425(a))." Alternative 2 is identified as the preferred alternative in the final plan/EIS.

Throughout this document, the term "harvest" refers to bison shot during hunts outside the park by members of American Indian Tribes pursuant to long-standing treaties with the federal government and public hunters with permits from MFWP. The word "cull" refers to bison captured and shipped for processing or dispatched on-site. The word "removals" refers to the combined numbers of harvests, culls, and bison placed in the BCTP.

Actions Common to All Alternatives

Under all alternatives, the NPS would continue to meet the principal purpose of the IBMP, as adjusted. Since 2012, the NPS and other IBMP partners have met these goals while averaging a population of about 4,800 bison after calving. In the GYA, there has been no documented transmission of brucellosis from bison to cattle, fewer conflicts with people and property, high visitor enjoyment and economic contributions to gateway communities, increased tribal and public hunting opportunities outside the park, and more brucellosis-free bison sent to tribal lands (White et al. 2015a,b; Geremia 2022). If the risk of bison mingling with livestock increases in the future, the NPS would take more aggressive management actions, such as increasing captures, hazing, hunting outside the park, and removals, in collaboration with other IBMP partners. Montana uses these techniques to manage brucellosis transmission risk from elk

mingling with livestock in the Paradise Valley (Rayl et al. 2019) and, for over two decades, the IBMP partners have demonstrated these same techniques work for bison.

Bison Conservation Transfer Program (BCTP)—The NPS would continue to implement the BCTP in coordination with APHIS and MDOL to identify and transfer brucellosis-free Yellowstone bison to suitable tribal and public lands. The NPS and partners would continue to use quarantine procedures to reduce the numbers of bison sent for processing and work to minimize the risk of brucellosis spreading from bison to livestock (USDA, APHIS et al. 2017). Following a 2018 decision, the NPS would continue the quarantine program for Yellowstone bison using facilities in and adjacent to the Stephens Creek Administrative Area in YNP (north of Mammoth near the north boundary and entrance to YNP), north of the park in Corwin Springs, Montana (leased by APHIS), and at the Fort Peck Indian Reservation (USDOI, NPS 2018). Details of this program are incorporated by reference and can be found on pages 3-5 of the 2018 Finding of No Significant Impact (FONSI) for the project located here: https://parkplanning.nps.gov/documentsList.cfm?projectID=53793.

The NPS would continue to work with members of the Assiniboine and Sioux Tribes at Fort Peck (Fort Peck Tribes), APHIS, Montana, ITBC, other American Indian Tribes, and nongovernmental organizations (NGOs), such as the Greater Yellowstone Coalition, Yellowstone Forever, and Defenders of Wildlife, to lower the number of test-negative animals (no antibodies for brucellosis exposure) sent for processing due to a lack of quarantine capacity. In 2022, the NPS increased the capacity of the quarantine pastures near the Stephens Creek Administrative Area in YNP to about 200 bison (approved in USDOI, NPS 2018) The NPS would continue the BCTP by:

- Coordinating efforts among federal, state, and tribal agencies to maximize holding capacity and testing efficiency.
- Providing young bison in family groups to establish or augment other bison herds.
- Providing some male-only groups to improve the genetic health of bison populations.
- Collecting data to improve testing procedures and, if possible, shorten testing timelines.
- Promoting low-stress handling and sorting of bison within the facility (low-stress handling is an "animal-centered, behaviorally-correct, psychologically-oriented, ethical and humane method of working animals which is based on communication, not coercion" [Hibbard 2021]). The low-stress handling techniques being implemented in YNP are described in Geremia (2021).
- Enhancing tribal involvement in program implementation.

The NPS anticipates APHIS would continue to lease two properties in Corwin Springs, Montana, for the stewardship and testing of up to 90 bison.

Prior to winter, the NPS would coordinate with the American Indian Tribes and ITBC regarding the composition of bison they would like taken into quarantine (e.g., all males or family groups). The NPS would use passive capture techniques to the extent feasible by providing hay within the capture pens, allowing bison to enter, and closing the pen gates behind them. Personnel also may use low-stress hazing to encourage movements into the capture pens. The NPS would try not to influence bison movements outside the areas immediately surrounding the Stephens Creek Administrative Area capture facility, but this strategy may be adjusted to include more distant hazing depending on capture success. Animals that initially test negative for brucellosis exposure using blood serum, trap-side tests (tests specified by APHIS and Montana health officials), would be placed into the quarantine facility in groups based on age and sex. Their blood sera would be sent to diagnostic laboratories for comprehensive testing to confirm test results. Captured bison not eligible for the BCTP may be released so they are available for tribal harvests outside the park or shipped for processing if there is a need to reduce numbers substantially.

The NPS would continue to complete quarantine within the park in coordination with APHIS and the State of Montana. The entities outline quarantine procedures using a General Agreement. The current agreement states: "all parties will follow the cattle and bison regulations of the National Brucellosis Eradication Program, including (Veterinary Service) VS Memos, VS Notices, VS Guidance Documents, pertinent parts of the Code of Federal Regulations, and the (Uniform Methods & Rules) UM&R." Presently, bison must be held in quarantine until health officials from the State of Montana release them. Animals are first entered into approved quarantine facilities operated by YNP or APHIS. Males can be released from quarantine by testing negative after 300 days and reaching at least 18 to 24 months of age. For non-pregnant females, the bison must test negative prior to breeding within the facility, test negative within 5 days of parturition, and test negative 150 to 210 days after the last calf is born. This process generally requires 32 months. All bison released from quarantine must be held in an approved assurance testing facility and tested one year after release from quarantine.

All bison released from quarantine or assurance testing in YNP would continue to be given to American Indian Tribes. This would be in support of Secretarial Order 3410, *Restoration of American Bison and the Prairie Grassland*, which directs the NPS to increase the number of live bison transferred from YNP to American Indian Tribes. Currently, American Indian Tribes have capacity for receiving all bison entered in the quarantine program. Managers of other private, state, and federal lands could coordinate with American Indian Tribes to receive some bison completing assurance testing.

The NPS could collaborate with interested partners to establish additional quarantine facilities which could include terminal pastures outside the park and transfer bison to them each year as the capacity of these facilities and bison migrations allow. Federal rules (USDA, APHIS 2003) allow the transport of live bison from a population suspected to be infected with brucellosis to a terminal pasture where they would be killed within an agreed-upon time. Bison testing positive for brucellosis exposure could be placed in pastures within the DSA for brucellosis in Montana and killed within a few months. The fenced pastures would need to be separate and apart from any commercial livestock operation. The official identification and date of death for each bison harvested in the pasture would be provided to APHIS and the Montana State Veterinarian. Calves born and weaned in the pastures could be transferred to the BCTP.

The IBMP members would need to evaluate the design, cost, and potential locations for quarantine facilities or terminal pastures outside the park within the DSA for brucellosis. This evaluation would include the development of a management plan for transplanting Yellowstone bison onto suitable private or public lands (section 5 of §87-1-216 MCA), environmental compliance assessments, a cost-sharing agreement for building and maintaining the facilities, and an agreement for operating the facilities and conducting quarantine testing and terminal pasture operations. Additional facilities would enable the NPS to ship more bison initially testing negative for brucellosis exposure from the park to quarantine, thereby reducing the number of bison sent for processing and increasing the number of live bison sent to American Indian Tribes.

Honor and Support American Indian Rights Reserved Through Treaties—The NPS would continue to:

- Sustain a wild population of bison capable of migrating and dispersing outside YNP onto adjacent National Forest System lands so American Indian Tribes can access this traditional food, cultural, material, and spiritual source.
- Support the rights of American Indian Tribes to conduct harvests of bison migrating from YNP onto unoccupied lands in surrounding states pursuant to treaties with the federal government.
- Participate in hunt-capture coordination efforts to reduce the effects of capture operations on hunting opportunities (see the following section on "Hunt-Capture Coordination").
- Provide American Indian Tribes and tribal organizations with captured bison for processing and the distribution of meat, hides, and other resources to their members.

- Work with American Indian Tribes and Custer Gallatin National Forest to create or connect suitable bison habitat with enough bison present and distributed year-round to provide a self-sustaining population on the national forest in conjunction with bison herds in YNP (USDA, USFS 2022a).
- Support the 2014 *The Buffalo: A Treaty of Cooperation, Renewal and Restoration* (Buffalo Treaty) and 2020 Bison Conservation Initiative in YNP by engaging with Buffalo Nations associated with Yellowstone bison to explore ways to increase the efficiency and safety of harvests outside the park and increase the restoration of brucellosis-free bison to tribal lands through the BCTP. The NPS would continue to contribute to the Bison Conservation Initiative in YNP by preserving the largest wild, wide-ranging population of plains bison and relocating some brucellosis-free bison to establish additional populations on tribal lands.

Establish Collaborative Partnerships with American Indian Tribes for Bison Management—In September 2022, the NPS Director issued a policy memorandum describing how the NPS would ensure Tribal Nations play an integral role in decision-making related to the management of federal lands and waters through co-stewardship (USDOI, NPS 2022). Co-stewardship refers to collaborative partnerships for managing and preserving natural and cultural resources under the responsibility of federal land managers. It includes the sharing of expertise and information and combining capabilities to improve resource management, advance shared interests, and ensure tribal involvement when plans or activities may affect their interests, practices, or traditional use areas (USDOI, NPS 2022).

Additionally, in November 2022, the White House Office of Science and Technology Policy and the Council on Environmental Quality issued guidance for Federal Departments and Agencies on Indigenous Knowledge (OSTP and CEQ 2022). As described in the guidance, "Indigenous Knowledge" is generally used, but a variety of terms including Traditional Ecological Knowledge, Traditional Knowledge, Indigenous Traditional Knowledge and Native science may be preferred by different American Indian Tribes and Indigenous Peoples (OSTP and CEQ 2022). The guidance states that agencies should consult and collaborate with Tribal Nations and Indigenous Peoples to include Indigenous Knowledge in decision-making. Appropriately recognizing, considering, and applying Indigenous Knowledge requires growing and maintaining strong and mutually beneficial relationships between agencies and American Indian Tribes and Indigenous Peoples. Such relationships provide opportunities to identify shared values and goals, build trust and common understanding, and facilitate the exchange of information. The framework of the IBMP, as adjusted, and the BCTP partnership provide meaningful and valuable discussions and consider tribal knowledge and recommendations in the management of Yellowstone bison (Stark et al. 2022). One example of this is the hunt-capture coordination described in the next section.

In January 2023, the Secretary of the Interior issued order 3410, *Restoration of American Bison and the Prairie Grasslands*, to enhance USDOI's work to restore wild and healthy populations of bison through collaboration with other federal agencies, states, American Indian Tribes, and landowners. The order directs the NPS to increase the quarantine capacity for Yellowstone bison to further increase shared stewardship and the number of live bison transferred to American Indian Tribes, which YNP would continue to do.

In addition, the NPS would incorporate the expertise of American Indian Tribes into the following planning and resource management activities:

- The development of adaptive management adjustments and annual operating plans;
- The composition and distribution of bison placed in the BCTP;
- The transfer of bison culled at Stephens Creek Administrative Area to processing facilities for processing;

- The processing of bison killed on-site at the Stephens Creek Administrative Area or in terminal pastures outside the park;
- The distribution of meat and other resources from culled bison to tribal members;
- The involvement and training of tribal personnel on bison management; and
- The implementation of lower-stress handling techniques with captured bison to reduce trauma.

The NPS would seek to ensure mutual benefits from increasing bison distribution and improving the coordination, efficiency, and safety of harvest practices outside the park. Likewise, the NPS would collaborate to transfer more brucellosis-free bison to augment or establish populations of plains bison on tribal lands elsewhere in North America to restore cultural, ecological, and spiritual relationships. These actions would facilitate bison recovery; improve hunting opportunities outside the park; enhance local, regional, and tribal economies; and enrich the experiences of tribal members, residents, and visitors.

Hunt-Capture Coordination—While tribal harvest and public hunting outside the park are not within the NPS's jurisdiction or control, harvests outside the park would continue to reduce bison numbers and aid the NPS in meeting population objectives. State agencies, in cooperation with the national forest supervisor and American Indian Tribes with hunting rights, would determine and coordinate the location and/or extent of hunting in Montana, outside the park. The NPS expects to implement public hunting and tribal harvests in coming years, similar to current conditions.

Bison harvest and hunting in Montana would continue to occur outside the northern (Gardiner Basin) and western (Hebgen Basin) boundaries of YNP, with hunter harvests varying from year to year depending on how many bison move to the park boundary in response to snow depths and forage availability in the higher mountains. The NPS anticipates the State of Montana would continue to conduct its annual 90-day public bison hunt from November 15 to February 15 on lands adjacent to the park. The NPS anticipates that tribal harvests outside the park generally would continue to occur from December through March, with each American Indian Tribe determining its own regulations and seasons.

The NPS would continue engaging with American Indian Tribes associated with Yellowstone bison, the Custer Gallatin National Forest, MFWP, residents, and NGOs to explore ways to increase the efficiency and safety of hunting outside the park. Hunting in Montana could become more effective over time if hunters move away from the park boundary and bison can distribute across the landscape year-round so hunting seasons and locations can be adjusted to more traditional autumn and early winter periods in certain areas. Increasing the hunter harvest of bison outside the park in future years may require allowing bison to occupy some areas for longer periods of time, better access for hunters, and hunters adjusting their strategies in response to bison behavior and habitat use patterns.

The NPS would use a variety of annual, weekly, and daily meetings during winter to coordinate the timing and extent of capture operations in the Stephens Creek Administrative Area with American Indian Tribes that harvest bison on lands adjacent to the park to reduce the effects of capture operations on harvest opportunities. Each summer, representatives from American Indian Tribes that harvest Yellowstone bison outside the park meet with representatives from Montana and the Custer Gallatin National Forest to discuss issues and concerns from previous harvests, safety concerns, access, and enforcement, and to share harvest data. The NPS would attend these meetings to provide information on the status of the bison population and discuss management objectives for the overall population and each breeding group (central, northern). During winter, the NPS would participate in weekly calls to inform other IBMP members and American Indian Tribes engaging in tribal harvests about the timing and extent of bison migrations toward the boundary of YNP and coordinate with them regarding capture activities for the BCTP and processing to reduce effects on harvest opportunities outside the park. However, the NPS would continue to have no authority or jurisdiction over when, where, and how harvests of wildlife occur outside the park. The NPS would continue to support IBMP partners in their efforts to reduce impacts outside the park and address hunting-related issues within each agency's jurisdictional authorities.

The NPS would use passive capture techniques to the extent feasible by allowing bison to enter the capture pens at their own volition or providing minimal pressure to influence movements into the capture pens from areas immediately adjacent to the capture pen perimeter. The NPS would coordinate with American Indian Tribes engaging in tribal harvests each morning and through weekly calls to discuss capture operations. The NPS would not guarantee certain numbers of bison would be available for harvest each day or control the fact that many bison in groups engaged by hunters return to the refuge of the park.

A series of relatively mild winters could result in little bison migration to the boundary and insufficient removals to stem population growth. As a result, bison abundance could increase above the anticipated or desired range. Under such circumstances, tribal harvesters and the NPS would coordinate to harvest, cull, and place in the BCTP more bison during a subsequent severe winter with high migration to the boundary and into Montana to slow population growth and/or reduce abundance.

Adaptive Management—The NPS defines adaptive management as "a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes; and if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated" (43 CFR 46.30). More simply, adaptive management "refers to the process of learning by doing and then adapting or adjusting" (USDOI, NPS 2016b). It recognizes imperfect knowledge and the uncertainties in natural systems and allows managers to adapt to changing conditions and new information (learning) to progress toward objectives (Williams et al. 2007).

The agencies and American Indian Tribes involved with the IBMP have used this process to inform decision-making and adjust bison management. The NPS would continue to evaluate current conditions, identify undesired trends, implement management actions, monitor progress toward desired conditions, and adjust actions to improve progress. The NPS would work with partners to explore other management options outside the park, including streamlining testing protocols for quarantine as part of the BCTP and the construction of additional quarantine facilities and capture facilities near the outer boundaries of management zones. The NPS would assess whether any adaptive management changes would affect the environment in a manner or to a degree not previously considered and conduct additional NEPA analysis, if necessary, at that time.

The NPS would manage for the following demographic and genetic objectives (Geremia 2022):

- *Sustain a Viable, Wild Population:* A population viability analysis indicates Yellowstone bison should retain about 95% of existing allelic (genetic) diversity for neutral nuclear microsatellites ('genes') for the next 200 years with a population size greater than 3,250 bison and removal of mainly or only juveniles (Pérez-Figueroa et al. 2012). Greater genetic loss could occur if intermixing and gene flow ceases between the two primary breeding herds, but current analysis presently supports significant gene flow (Pérez-Figueroa et al. 2012; Stroupe et al. submitted). The NPS would continue to collect genetic information and revise population viability analyses, adjusting minimum numbers as dictated by best available science. In addition, per statute and policy, the NPS does not manage for minimum numbers of wildlife but, rather, to sustain populations in their natural condition, which was defined as "the condition of resources that would occur in the absence of human dominance over the landscape" (USDOI, NPS 2006a; 16 United States Code [USC] 21 et seq., 17 Stat. 32; 54 USC 100101a,b). Thus, to the extent feasible, the NPS would allow bison and other wildlife to move freely and unpursued within the interior of the park, with their behaviors, movements, reproductive success, and survival primarily affected by their decisions and natural selection (White et al. 2013a; White 2016).

  Under any alternative, the NPS does not want bison abundance to decrease below 3,500 total in the population because this could substantially decrease genetic diversity (Halbert et al. 2012; Pérez-Figueroa et al. 2012; see "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis"). This level could be adjusted based on future genetic

analyses. The upper population estimates provided for each alternative are intended to guide the implementation of risk management activities; not as targets necessitating immediate population adjustment (IBMP Partner Agencies 2006). Bison abundance may exceed the upper estimate in each range at times due to a series of mild winters that limit migration and removals or because successful management based on the demographic, genetic, ecological, and social objectives in this section indicate bison can be sustained at a higher population level.

- *Maintain a Balanced Sex Ratio:* The NPS would seek to maintain a balanced sex ratio of about 50% males and 50% females, which is based on the expected sex ratio given vital rates, to support mate competition and allow natural selection to affect population genetics (Pérez-Figueroa et al. 2012; Geremia 2022).
- *Maintain an Age Structure of About 70% Adults and 30% Younger Animals:* The NPS would seek to maintain an age structure of about 70% adults and 30% juveniles, which is based on the expected population composition given age-specific birth and survival rates (Geremia et al. 2015b; Hobbs et al. 2015; Geremia 2022).
- *Maintain Gene Flow Between Primary Breeding Herds and Preserve Existing Genetic Diversity:* Bison breed in northern or central geographic regions of the park with some interchange of animals between breeding areas among years (Wallen and White 2015). A nuclear microsatellite-based population level assessment revealed two genetically distinct bison subpopulations during 1997–2003 (Halbert et al. 2012). After this study, there was evidence of females switching between breeding areas in northern and central Yellowstone, suggesting the population structure may be breaking down (White and Wallen 2012). In 2016, an analysis of mitochondrial haplotypes showed the two founding maternal lineages were distributed throughout the park (Forgacs et al. 2016). Finally, between 2019 and 2021, a nuclear microsatellite-based reassessment and initial Single Nucleotide Polymorphism (Stroupe and Derr submitted) level assessment revealed that Yellowstone bison no longer exhibited population substructure (Stroupe et al. submitted). Instead, Yellowstone bison are best described as one interbreeding population with two primary breeding herds. To the extent possible, the NPS would allow ecological processes, such as natural selection, migration, and dispersal, to prevail and influence population and genetic substructure (White and Wallen 2012; Wallen and White 2015). The NPS would attempt to maintain existing allelic richness and diversity based on neutral nuclear markers.

The NPS would manage for the following ecological objectives:

Sustain the Role of Bison as Ecosystem Engineers: To the extent feasible, the NPS would allow bison to move unfettered in the interior of YNP so they can fulfill their ecological role. When bison roam without human constraints, they begin to engineer the landscape as described by Geremia et al. (2019, 2022). More specifically, the NPS would:

- *Maintain Functional Grasslands*: The NPS would strive to maintain functional grassland and sage-steppe communities. Plant communities would vary widely in their appearance and composition depending on differences in soil and weather conditions, land use and management histories, and historic and current grazing intensities. Many communities would include invasive plants due to their previous spread. Ungulates would graze some areas intensely and others lightly, thereby providing a mosaic of conditions across the landscape to support a variety of plants and animals. However, each community should still maintain plant productivity, soil organic matter, and functioning energy, nutrient, and water cycles (Geremia and Hamilton 2019, 2022).

- *Sustain Bison as a Meaningful Component of the Food Web Influencing Energy and Nutrient Transfer through the Ecosystem*: To the extent feasible, the NPS would manage bison with minimal intervention in the interior of YNP, so bison continue to provide a key food source for species ranging from wolves to magpies to beetles and bacteria in the soil that redistribute nutrients across the landscape (Wallen et al. 2015a). Bison carcasses contribute to nutrient surges that greatly enhance the productivity of nearby plants. Carcasses of bison dying from injuries or malnutrition could continue to provide about 25% of the meat wolves eat during winter. This scavenging has reduced predation on elk during winter from about 18 elk per wolf per year (based on kill rates during winter) to about 12 elk per wolf per year (Metz et al. 2020a,b).

The NPS would manage for the following social objectives:

- *Promote an Environment in YNP Where Wildlife Remain Uncontrolled and Visitors Could be Impressed and Inspired by Their Uninhibited Behaviors*: The NPS would continue management strategies where wildlife in most of the park could remain uncontrolled, and visitors could be impressed and inspired by their uninhibited behaviors. As a retired park historian emphasized, the greatest value of YNP may be the "authenticity of its wildness—the opportunity for us to be awed and learn from nature making its own decisions" (Schullery 2010; White et al. 2013a,b; White 2016).
- *Manage Brucellosis Transmission Risk to Cattle:* The NPS would work with IBMP partners under the IBMP framework, as adjusted, to manage brucellosis transmission risk from bison to livestock by preventing mingling through hazing, hunting outside the park, fencing, removing attractants, and improving forage on public lands, like Montana manages risk from elk populations also chronically infected with brucellosis (National Academies of Sciences, Engineering, and Medicine 2020; Rayl et al. 2019).
- *Protect Human Safety and Property:* The NPS would work with IBMP partners under the IBMP framework, as adjusted, to reduce and alleviate conflicts with livestock, people, and property (IBMP Agencies 2016; Geremia 2022).

Operations Plans—The NPS would continue to follow the framework of the IBMP, as adjusted, where annual operating plans are used to set out "specific expectations and areas of responsibility for personnel from each of the cooperating agencies" (USDOI and USDA 2000b:42). The NPS would continue to meet with IBMP partners each spring to evaluate operations from the prior winter, identify problems, and propose solutions. The following summer and autumn, the NPS and partners would review existing procedures to determine whether they need revision. The NPS would continue to meet with the other federal, state, and tribal agencies to coordinate bison management activities by the various parties. The NPS would continue to assess the status of the bison population and propose adjustments to adaptive management based on the selected alternative in the ROD resulting from this process. This information would continue to be available for public review.

Population Abundance—The NPS would continue to use an integrated population model to estimate the abundance and composition of the bison population each summer. The NPS would continue to complete two to three aerial surveys from June to September using a fixed-wing airplane. Surveys encompass the areas within YNP where bison are known to occur and require about 10 hours of flight time. The NPS would also continue to complete ground surveys where observers locate bison groups and count numbers of animals in age and sex categories. The NPS also tracks adult female survival and reproduction using approximately 30 to 50 bison fit with radio telemetry devices. This information would be input into an integrated population model along with information on numbers of bison harvested, entered in the BCTP, or culled to estimate the numbers of bison in the population and age and sex breakdown. The NPS would continue to synthesize this information in a report on the status of Yellowstone bison for the Superintendent. Each autumn, the NPS would convey this information to the IBMP members and other

hunting tribes for their consideration (Geremia 2022). Park biologists may recommend removals of bison to the Superintendent based on scientific assessments of the demographics in each breeding herd and their movements, as well as the potential for conflicts with cattle, people, and property (see annual status reports at http://ibmp.info/). As winter progresses, the NPS would conduct aerial counts in early and late winter to update the model to predict numbers of bison in the population. These assessments would support decision-making for management activities. The integrated population model generally predicts the bison population within a range of about 500 animals.

Forage Production and Grazing Research—Because there is considerable complexity around forage production estimates due to large variations in weather and grass production from year to year, scientists would continue to monitor and adapt these estimates to ensure sufficient forage is available in the park to sustain all grazers including bison, elk, pronghorn, mule deer, and bighorn sheep (Geremia and Hamilton 2019, 2022). The NPS would use both short, season-long, and multi-year exclosures across the migratory landscape used by bison to track grazing, plant productivity, soil organic matter, and nutrient cycling. The NPS would work with the Custer Gallatin National Forest to monitor grazing impacts in the Gardiner Basin, as requested.

Monitor Genetic Diversity—The NPS would continue to work with the USDOI Bison Working Group to monitor genetic diversity based on existing microsatellite markers. The NPS would continue to evaluate new markers, such as Single Nucleotide Polymorphisms, and implement future monitoring based on the best available science. Future tissue sampling of bison would be conducted under oversight by an Institutional Animal Care and Use Committee of NPS veterinarians pursuant to an Animal Research Protocol Approval Long-term, Ongoing Research Project that is reviewed annually.

Habitat Conservation and Enhancement—The final EIS for the IBMP anticipated there would be changes to bison habitat and considered how to prepare for these changes. An opportunity exists to influence the distribution and movement of bison by protecting and enhancing habitat through conservation easements, fee purchases, closure of public grazing allotments, restoration of degraded habitats, and other activities. In 2022, the Custer Gallatin National Forest issued a decision on its LMP (USDA, USFS 2022a). This long-term plan allows for expanded tolerance of bison on the national forest, including a desired condition to have a self-sustaining population of bison on the forest year-round. It also includes an objective to complete three habitat improvement projects every three years to create or connect suitable habitat for bison on the forest, while continuing to work with partners to reduce conflicts with livestock and private property. In addition, the plan allows the national forest to address potential barriers to bison on the landscape in areas under consideration for expanded tolerance by Montana. The NPS would continue to collaborate with the Custer Gallatin National Forest on implementation of the LMP.

Several agencies and American Indian Tribes have suggested using prescribed burns to provide additional habitat with nutritious forage for bison. During the last 45 years, YNP has experienced about two dozen fires per year that burned an average of about 5,900 acres annually, excluding the massive fires during 1988 (Yellowstone Center for Resources 2018). Thus, habitat restoration to early seral stages would continue. The NPS would continue to allow natural disturbance processes such as fire, flooding, landslides, native insect outbreaks, and windthrow to occur in wilderness areas of YNP. In addition, the NPS would continue to conduct projects for weed removal and planting of native grasses, shrubs, and riparian trees to restore desired conditions (Yellowstone Center for Resources 2021). The NPS would continue to work with Montana, the Custer Gallatin National Forest, and NGOs to discuss conservation easements, livestock grazing plans, and fencing in certain places outside YNP to keep bison separate from livestock, people, and property.

The NPS would continue to provide for diverse, healthy ecosystems that are resilient to climate stressors. A 2014 assessment of the magnitude and direction of ongoing climate changes in the park showed that recent climatic conditions are already shifting beyond the historical range of variability (USDOI, NPS 2014c). Ongoing and future climate change will likely affect all aspects of park management, including

natural and cultural resource protection as well as park operations and visitor experience. To deal with the predicted impacts, planning and management would continue to be grounded in concrete information about past dynamics, present conditions, and projected future change. The park's website Examining the Evidence: Climate Change, https://www.nps.gov/yell/learn/nature/climate-examine-evidence.htm, highlights management and monitoring actions, including mitigation measures, to reduce the long-term effects of climate change.

Encourage More Tolerance for Bison in States Surrounding YNP—Bison would continue to migrate outside the park where state agencies and the national forest have jurisdiction and work with private landowners to determine levels of tolerance, hazing, and captures, and with American Indian Tribes with tribal harvesting rights to coordinate the location and extent of hunting outside the park. The NPS would work with the Custer Gallatin National Forest on projects to create or connect suitable bison habitat and allow bison to be present and distributed year-round on the national forest per the 2022 LMP (USDA, USFS 2022a).

Bison Health and Welfare—The NPS would continue to obtain veterinary assistance, keep detailed records and documentation, and use low-stress handling methods to reduce bison discomfort, distress, or pain caused by management activities. The NPS would continue to implement a disease surveillance program of animals in the BCTP.

Brucellosis Management—As mentioned above, the CDC and APHIS consider the bacteria *Brucella abortus* a select agent and toxin because it has the potential to pose a severe threat to human and animal health, plant health, or animal and plant products (7 CFR, Part 331, 9 CFR Part 121, and 42 CFR Part 73). These rules restrict the use of the field strain of this bacteria in scientifically controlled laboratory research and large animal studies in outdoor containment spaces. In January 2021, the CDC issued a draft policy statement on Biosafety for Large Animal Study-Related Activities with *Brucella abortus* and *Brucella suis* Using Outdoor Containment Spaces (*Federal Register* 86:3987–3988, *Federal Register* 86:4079–4080). If this policy is adopted, research on brucellosis suppression techniques could occur in facilities outside YNP. The NPS may provide APHIS or other parties with some Yellowstone bison for such research. Any brucellosis suppression techniques developed during such research would not be implemented as part of operations on Yellowstone bison until they are proven effective without significant adverse effects, additional NEPA compliance is conducted, and tools become available to eliminate brucellosis in elk as recommended by the National Academies of Sciences, Engineering, and Medicine in a 2017 and 2020 evaluation of brucellosis in the GYA (National Academies of Sciences, Engineering, and Medicine 2020).

The NPS would help to maintain separation between bison and cattle through capturing bison, controlling population numbers, and assisting state managers in hazing bison on a case-by-case basis. The NPS would not vaccinate bison or consider aggressive brucellosis control measures on bison until tools became available for an eradication program in elk.

Conservation Measures Pursuant to the Endangered Species Act (ESA)—Table 1 lists the federally listed and candidate species and designated critical habitat in the action area. This list was obtained from the US Fish and Wildlife Service (FWS).

Table 1. Federally listed and candidate species and critical habitat in the action area

Species	Status	Potential to Occur	Critical Habitat	Status and Occurrence in the Action Area
Canada lynx *Lynx canadensis*	Threatened	Yes	Yes	Lynx are rare and typically occur in mature forests dominated by subalpine fir, Engelmann spruce, and lodgepole pine. Reproduction in YNP is limited.
Grizzly bear *Ursus arctos*	Threatened	Yes	No	About 150 to 200 grizzly bears are widely distributed throughout YNP, which provides core, secure habitat inside a 9,210-square-mile Primary Conservation Area where no net increase in development, livestock grazing, or roads can occur.
Western glacier stonefly *Zapada glacier*	Threatened	Yes	No	Tens of thousands of nymphs live in about two dozen alpine streams formed from meltwater emanating from glaciers in Montana and Wyoming.
Whitebark pine *Pinus albicaulis*	Threatened	Yes	No	Whitebark pines occur on about 314,000 acres within YNP, typically at high subalpine elevations greater than 7,900 feet and often mixed with other conifers.
Wolverine *Gulo gulo*	Threatened	Yes	No	Wolverines are rare and sparsely distributed and primarily occur in areas with persistent snow and ungulates that provide carrion for food during winter.
Monarch butterfly *Danaus plexippus*	Candidate	Yes	No	Monarch butterflies are rare and sparsely distributed in YNP and primarily occur in upland, dry areas.

Conservation measures that will be implemented as part of the project to avoid or minimize adverse effects to threatened and candidate species include:

Canada Lynx and their Designated Critical Habitat, Grizzly Bears, and Wolverines:

- Managers will ensure all participants, including contractors, collaborators, and volunteers, are trained on how to avoid disturbing or encountering bears and other wildlife, including regulations regarding vehicle speed limits, food storage, disposal of garbage and other attractants, and approaching or harassing wildlife.
- When possible, managers will limit equipment storage areas to existing support facilities.
- During and after management activities, managers will take prevention and restoration measures to avoid the introduction of exotic invasive species and discourage the establishment of herbaceous foods such as clover.
- If helicopters are used for management activities, staff will report all observations of grizzly bears, lynx, and wolverines to the pilot and project manager as soon as possible after observation.

- Except when taking off and landing, or as necessary for management activities, helicopters will travel at least 500 feet above ground to reduce potential disturbance to wildlife below.
- As feasible, helicopter landings will be restricted to pre-determined locations, and the number of landings will be minimized to reduce the duration and extent of disturbance.
- If a grizzly bear, lynx, or wolverine is observed in or near (approximately 200 yards) a helicopter flight path or landing zone, the pilot will alter the flight path and landing zone to avoid the animal, including during future trips.

Western Glacier Stonefly:

- Managers will avoid working in the upper-most extent of high-elevation streams that originate from glacial meltwater and could be inhabited by the western glacier stonefly.

Whitebark Pine:

- Managers will attempt to avoid or minimize impacts to whitebark pines, especially mature cone-bearing trees and 'plus' trees that have some level of genetic resistance to whitebark pine rust and can survive infection.

Monarch Butterfly:

- To the extent feasible, no nectar feeding plants or host plant species for monarch butterflies or caterpillars will be removed during management activities.
- If habitat disturbance is necessary, project managers will try to adjust the timing of activities in areas containing plants used by monarchs to avoid interfering with breeding or feeding.

Alternative 1 (No Action)

In addition to the actions described under "Actions Common to All Alternatives" above, under the no-action alternative, bison would continue to be managed under the IBMP, as adjusted, as described in the adaptive management and annual operations plans (http://ibmp.info/) and the EA for the *Use of Quarantine to Identify Brucellosis-free Yellowstone Bison for Relocation Elsewhere* (2018 EA and FONSI), completed in 2018 (USDOI, NPS 2016a, 2018).

This alternative prioritizes maintaining a negligible risk of brucellosis transmission from bison to cattle to assure other states and countries that NPS management of bison would prevent the transmission of brucellosis from bison to livestock (State of Montana 2000). Bison could migrate from the park into established northern and western management areas in Montana, and numbers and distribution would be limited by captures for the BCTP or transferred to American Indian Tribes for shipment for processing (transfer for processing), and public hunting and tribal harvests primarily on National Forest System lands near the park boundary. Within YNP, management of bison, such as capture, hazing, and quarantine, would generally occur near the boundary. Disease surveillance would be conducted on bison placed into the BCTP and some bison shipped for processing or harvested outside the park. The NPS would capture migrating bison in the Stephens Creek Administrative Area near the northern boundary of the park and use shipments of bison for processing to decrease numbers and provide bison to American Indian Tribes. If space is available, some bison testing negative for brucellosis exposure would be placed in the BCTP to increase the number of live brucellosis-free animals relocated to suitable tribal and public lands. If space is not available, these bison would be transferred to tribal representatives at the capture facility for delivery to processing plants and subsequent distribution of meat.

Expected Population Numbers—Bison numbers are expected to range between about 3,500 and 5,000 after calving, consistent with consensus agreements among IBMP members on annual operations plans. Between 2001 and 2011, which was prior to IBMP members making adaptive adjustments to emphasize tribal harvests, bison summer counts averaged about 3,800 and ranged between about

2,930 and 4,860. Numbers of bison in the central and northern breeding herds would continue to vary depending on movements, reproduction, and survival (including NPS capture and removal and harvests outside the park).

Removal Guidelines—The NPS would work with IBMP partners, as defined in the "Hunt-Capture Coordination" section above, to manage for a decreasing population whenever there are more than 4,300 bison after calving. The NPS does not intend that 4,300 is a target for the population but a threshold over which it would change its management actions. The NPS recognizes that annual variations in migration may not allow for a reduction in the population in some years. The NPS proposes this threshold because it represents when the late-winter population would increase to about 5,000 animals post-calving (the upper limit of the range) if no removals were to occur during winter. The NPS would work with IBMP partners to limit removals to less than 25% of the post-calving population during a single winter when feasible. The NPS would also take precautions to ensure removals would not reduce the late-winter population below 3,000 bison.

Balancing Management Tools—The NPS would capture animals in the bison facility in the Stephens Creek Administrative Area to balance transferring live bison to tribal lands, providing food to American Indian Tribes, supporting tribal harvesting opportunities outside the park, lowering the number of bison exiting the park, and reducing population growth. The number of bison removed from the population each winter would continue to depend on the number of animals migrating to the northern park boundary, capacity for the live transfer of animals, hunter/harvest success outside the park, and level of conflicts outside the park (Geremia 2022). The NPS would employ passive capture methods as much as possible, permitting bison to wander into the capture pens on their own or use encouragement to guide them in. If migration numbers are low or the population exceeds 4,300 bison at the start of winter, the NPS may intensify capture efforts at the cost of reducing the number of animals that migrate out of the park for harvest and hunting purposes. This is to maintain the population that summers in the park between 3,500 to 5,000 bison. Other measures might involve using hay to lure bison into the pens or gently driving bison near the facility into the capture pens.

Capture of Bison in the Stephens Creek Administrative Area—The NPS would continue to capture bison in YNP, and state personnel could continue to capture bison in nearby areas of Montana during winter to reduce bison numbers, prevent movements outside management areas in Montana, and test and remove bison previously exposed to brucellosis. Captures could occur at a facility in the Stephens Creek Administrative Area in the northern portion of YNP, which is closed to public access year-round. The NPS could capture bison from December through April. Bison generally migrate to this area over a period of four to six weeks. Larger captures would generally occur during more severe winters or persistent droughts when larger, earlier, and prolonged migrations occur (Geremia et al. 2011, 2014, 2015a). The NPS would primarily capture migrating groups of females and juveniles that move to the boundary more frequently than adult males. The general philosophy for capture and processing would be to apply as little pressure and stress as necessary to move bison into and through the facility. Bison would be captured in fenced pens by leaving gates open with hay as an attractant or by deliberately herding them into the pens.

During capture, processing, and shipping operations in the Stephens Creek Administrative Area, the NPS would enact a temporary area closure that extends about 0.6 miles (1 kilometer) from the area and is about 3.5 miles (5.6 kilometers) long. Park staff would notice this temporary closure by posting signs at conspicuous locations along the perimeter and providing information at key visitor contact offices. The duration of the closure would be determined by bison migration to the park boundary and operational needs. This temporary closure would be implemented for public, staff, and bison safety and to ensure management operations are unimpeded. Once capture and/or herding actions begin, operations would be sporadic, dynamic, and unscheduled, leaving no time to ensure members of the public are absent from the operational area. Capture and herding events could involve hundreds of bison. The unanticipated presence of a person on the ground could disrupt operations and panic the bison, placing the public, staff, horses, and bison at risk of injury.

Transfer to Tribes for Processing—The NPS would transfer bison to American Indian Tribes that would then ship them for processing for their meat and hides. NPS personnel would contact tribal and agency partners to schedule transport for processing. Based on these discussions, bison would be sorted into appropriately sized groups in various holding areas so they could be loaded onto trailers for transfer for processing. Local representatives from APHIS would certify the numbers, sexes, and age categories of bison loaded and secured in each trailer using VS Form 1-27. The haulers would then chain and lock the trailer doors, and personnel from APHIS would put an official seal on the lock and chain and provide the hauler with a list of each bison on-board the trailer. The NPS would continue its agreements with American Indian Tribes to provide them with bison for transfer to meat processing facilities and subsequent distribution of meat, hides, and other resources to their members. The trailers would leave the Stephens Creek Administrative Area with law enforcement escorts and proceed directly to quarantine, processing, or research facilities.

The NPS would aim to transfer bison for shipments for processing by the end of March to prevent sending females late in gestation for processing. Non-pregnant bison could be held later into the spring based on processing facility availability. Transfer for processing is stressful to wild animals regardless of the time of year. NPS personnel are trained in low-stress-bison-handling to use best practices to humanely move wild bison into livestock handling facilities and onto trailers. The NPS encourages American Indian Tribes to use processing facilities proximal to the park to reduce transport times. The NPS also works with American Indian Tribes to transport small numbers of bison to processing facilities such that all bison are killed on the day of shipment.

Under the IBMP, as adjusted, transfer of bison for shipments for processing have ranged between about 0 and 1,304 each winter, and a similar range of shipments is expected under the no-action alternative. Other bison in the area are allowed to move toward park boundaries and support hunting opportunities outside the park. If more animals migrate, the NPS could capture bison to fill the capacity of the BCTP and give other animals to American Indian Tribes for processing. Bison would be allowed to move past the facility throughout winter to support hunting opportunities outside the park. If the winter is severe and a mass migration to the northern park boundary could hinder the capacity of managers to keep bison and cattle separate, additional bison could be captured to reduce numbers (Geremia 2022). These bison could be held in the Stephens Creek Administrative Area facility for later release when conditions are suitable for bison to migrate to higher-elevation summer ranges in YNP. Bison released back into the park would not be vaccinated for brucellosis (see dismissal "Implement a Previously Modified Alternative from the Record of Decision)."

BCTP—If space is available, some captured bison that test negative for brucellosis exposure would be placed in the BCTP for their eventual live transfer to American Indian Tribes. Up to about 100 to 300 bison could be entered into the BCTP during most winters, which would require the capture of about 300 to 750 bison (Geremia 2022).

Hazing—The NPS would haze bison in YNP when necessary for safety reasons, to protect property, or to move bison into the capture facility in the Stephens Creek Administrative Area, primarily from February to April. Details of hazing are discussed in the 2000 ROD and incorporated by reference as detailed earlier. To summarize, hazing in YNP would be conducted by people walking or on horseback. Before initiating hazing, personnel would assess the condition, size, and temperament of the herd, as well as the terrain where the herd is located, potential paths along which to move the bison, and potential hazards along the path of hazing. Weather conditions would be considered because snow, ice, and mud negatively affect the footing of bison, horses, and people. Bison may not be amenable to moving far, if at all, if they are already aggressive (e.g., bucking or butting), in poor condition, or have newborn calves. Furthermore, bison may resist moving after being hazed several times. Smaller groups of bison would generally be easier to move safely and efficiently than larger groups, which tend to fragment into several smaller groups as they move (Wallen and Keator 2012).

The general philosophy for hazing would be to apply as little pressure as necessary to move bison in the desired direction. Hazing would be initiated by approaching a group of bison at an angle (zig-zag pattern) from behind the direction of intended travel. Bison may initially trot in response to hazing but should calm down and move along in a somewhat slow, orderly manner if minimal pressure is applied. Hazing distances would be minimized to avoid undue stress to the bison, especially mothers with recently born calves. If bison in the group become aggressive or resistant to hazing, staff would temporarily halt the operation and allow the bison to feed and rest. The snow cover and conditions in the area to which the bison would be hazed is important. If bison are hazed to an area with deep or hard-packed snow, or with many bison already present, it is unlikely they would remain because forage would be inaccessible (Wallen and Keator 2012).

Once outside the park, if bison approach set boundaries in management areas in Montana, the State Veterinarian would continue to evaluate the circumstances, including numbers of bison, their behavior, weather, snowpack, and time of year, to determine what management actions would be necessary to prevent bison from moving from the management area (IBMP Agencies 2013, 2016). Hazing by state and other officials outside the park in Montana is outside the control of the NPS and would continue to be at the discretion of the state in cooperation with the national forest supervisor and private landowners to prevent the mixing of bison and cattle, to move bison away from private lands where they are not wanted, or to move bison away from homes and highways where they create safety or property issues. Hazing in Montana could be conducted by people walking, on horseback, on all-terrain vehicles, in trucks, or in helicopters. The NPS could assist state personnel with hazing bison in Montana by walking or on horseback, if requested and appropriate. Personnel from MFWP would continue to work with landowners who have safety and property damage concerns, as well as those who favor increased tolerance for bison, to allow bison to use suitable habitat while reducing conflicts. Helicopters have not been used for hazing bison in Montana since 2013 but could be used in the future with other methods if they are deemed necessary to move bison back to the park. This use should only be for 1 to 2 days and 4 to 6 hours per day (USDOI, NPS 2012a). Personnel have used cracker shells and rubber bullets when other types of hazing actions were not successful. Hunters or non-NPS agency staff could shoot bison in Montana that do not respond to hazing (IBMP Members 2020).

Alternative 2 (Preferred Alternative)

In addition to the "Actions Common to All Alternatives" listed above, the NPS would prioritize using the BCTP to restore bison to tribal lands, compared to Alternative 1. The NPS would capture bison when there is available space in the BCTP and release brucellosis-negative animals that do not qualify for the program. The NPS would selectively process brucellosis-positive animals when selecting for the BCTP, giving food and hides to American Indian Tribes. The NPS would work with tribal partners to increase tribal harvest outside the park to provide American Indian Tribes with access to traditional food, cultural, and material sources. The NPS would shift away from shipments for processing as a primary tool for population management. If the population surpasses an assurance threshold, the NPS would manage for a decreasing population. The NPS would first rely on harvests to reduce numbers but would resume shipments for processing when necessary. These management actions and their thresholds are shown in figure 2.

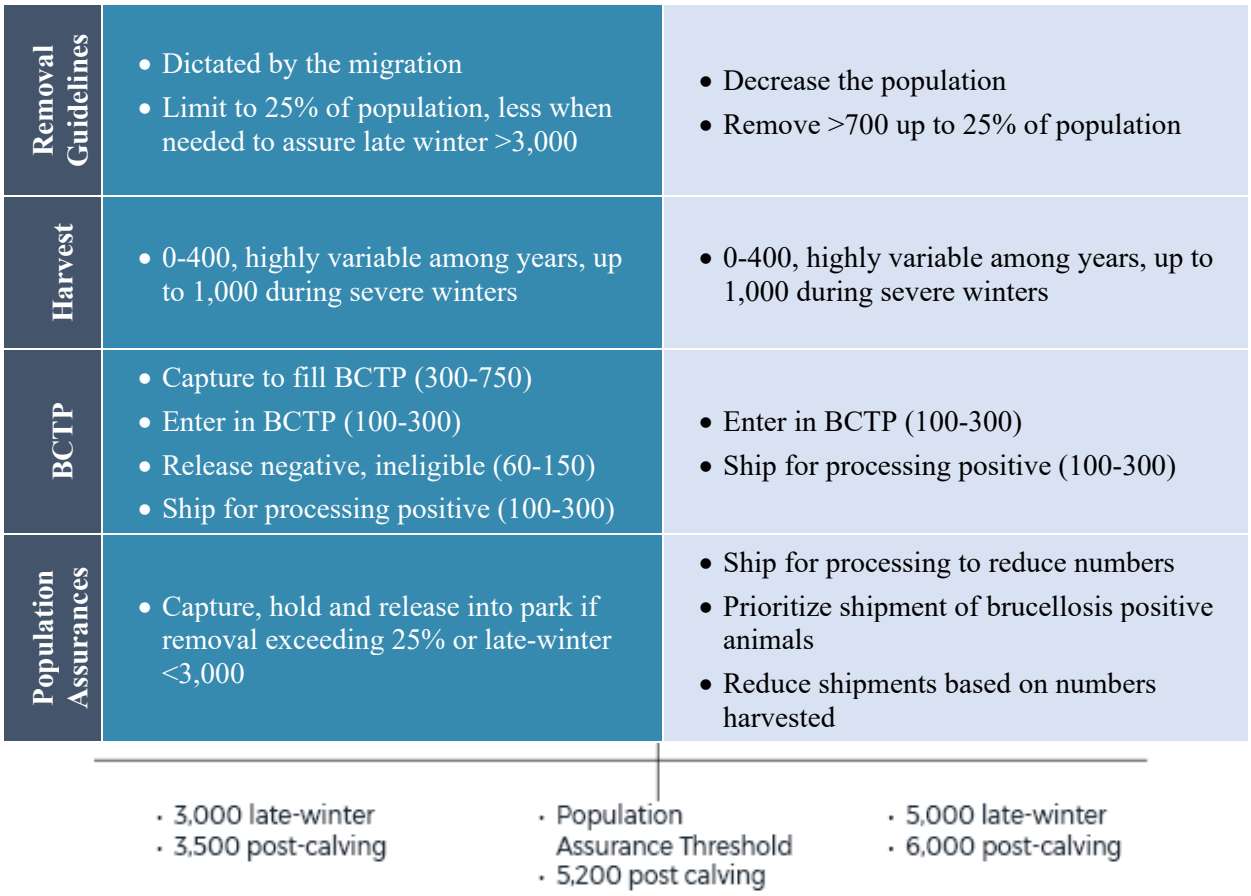


Figure 2. Management actions before and after population assurance threshold

Expected Population Numbers—Bison numbers would range between about 3,500 and 6,000 after calving and average 5,000 bison. Late-winter numbers would range between about 3,000 and 5,000 and average 4,150 bison, pre-calving. During 2015 to 2023, which was after the IBMP members made adaptive adjustments to emphasize tribal harvests and the State expanded the tolerance area for bison to its current extent, bison summer counts averaged about 4,900 and ranged between about 4,400 and 5,900. Bison abundance in the central and northern breeding herds would vary depending on movements, reproduction, and survival.

Removal Guidelines— The NPS would coordinate with IBMP partners and American Indian Tribes to manage bison within the expected population range, recognizing that American Indian Tribes have authority over tribal harvests outside YNP, the State has authority over public hunts outside YNP and other lethal removal outside YNP, and APHIS and surrounding states have authority over brucellosis quarantine outside YNP.

The NPS would provide an annual removal recommendation to IBMP partners and American Indian Tribes each fall and further coordinate through winter to assist their decisions on implementing hunts, captures, or other lethal removals outside YNP. The number of bison removed each year would depend on the magnitude of the migration, with more animals removed when more animals migrate. The NPS would take precautions to help ensure the bison population remains within a range of about 3,500 to 6,000 animals.

If the late-winter bison population approaches 3,000 bison, the NPS may cease placing bison in the BCTP or lethally removing them. The NPS would communicate and coordinate with other partners to limit lethal removals outside YNP. Also, the NPS may capture and hold animals for release back into the park or take other actions, such as hazing, to limit lethal removals outside the park if other entities choose not to adhere to NPS recommendations.

The NPS would establish 5,200 bison in early winter as a population assurance threshold. The assurance threshold is not a target for the population but rather a threshold when the NPS will change its management actions. The NPS established the assurance threshold at 5,200 bison because it represents when the post-calving population could increase to or surpass the upper limit of the population range. When there are more than 5,200 bison in early winter, the NPS would manage for a decreasing population, where the post-calving population is smaller than the early winter population.

The NPS would implement and recommend removal limits to IBMP partners and American Indian Tribes to avoid the unintended, negative consequences of removing large numbers of bison in a single year. The maximum limit would be 25% of the population but may include further limitations to prioritize conservation. The NPS would follow actions outlined for a late-winter population of 3,000 bison if the removal limit is exceeded.

Balancing Management Tools—The NPS would use a decision tree (example provided in appendix F) to meet the removal guideline that is based on the abovementioned constraints for capture of bison in the Stephens Creek Administrative Area, hunt-capture coordination, BCTP, and the Tribal Food Transfer Program.

BCTP—Whenever there is available space in the BCTP, the NPS would prioritize capturing bison and filling the BCTP over all other removal methods. The NPS would capture bison for the BCTP as described under "Actions Common to All Alternatives" and Alternative 1. The NPS would aim to operate the BCTP at full capacity, including entering 100 to 300 bison into the program annually. Details on the quarantine procedures near the Stephens Creek Administrative Area are provided in the 2018 EA and FONSI and are incorporated by reference (USDOI, NPS 2016a, 2018). The NPS would release brucellosis-negative bison captured that are not suitable for the BCTP. These released bison could increase harvest opportunities if they subsequently migrate beyond the park boundary. The NPS may collaborate with interested partners to establish additional quarantine and assurance testing facilities outside the park.

Capture of Bison in the Stephens Creek Administrative Area—The NPS would coordinate capturing bison in the Stephens Creek Administrative Area with IBMP partners and American Indian Tribes to place animals in the BCTP, ship for processing, or hold animals for release back into YNP. The NPS would use passive capture techniques to the extent feasible to allow other bison to move out of the park to support hunting.

If the early winter bison population is fewer than 5,200 bison, the NPS would capture bison when there is available space in the BCTP and cease capture when the BCTP is full. The NPS anticipates that about 300 to 750 bison would need to be captured during most years to support the BCTP. The NPS may additionally capture bison if tribal harvests or public hunting unnaturally constrain bison within and/or prevent them from exiting YNP.

If the early winter bison population exceeds 5,200 bison, the NPS would be proactive in capturing more bison than are needed for the BCTP and enough bison to ensure for a decreasing population. The NPS would be proactive because the timing of bison migrations out of northern YNP and limitations posed by processing facility availability would make it unfeasible, at times, for the NPS to wait until late winter to make decisions about capturing bison for transfer for processing. With more than 5,200 bison, the NPS anticipates that about 600 to 1,000 bison (total includes capture for the BCTP) would need to be captured

to decrease the population, but this number would be adjusted downward based on the number of bison harvested outside the park.

Regardless of population size, the NPS may capture bison whenever numbers of bison migrating from the park exceed the capacity provided by Montana's tolerance areas. The state did not provide a number limit on bison outside northern YNP in its 2015 decision notice on year-round tolerance but has informally indicated that several hundred may be tolerated. Therefore, the NPS would coordinate with the state and IBMP partners when bison migrate outside the park to determine appropriate courses of action based on migration levels.

Transfer to Tribes for Processing—The NPS would transfer bison to American Indian Tribes that would then ship them for processing for their meat and hides through a Tribal Food Transfer Program. The NPS would transfer for processing brucellosis-positive bison that do not qualify for the BCTP. If the NPS captures bison due to unnatural congregations in the Stephens Creek Administrative Area or when the population is above the population assurance threshold of 5,200 bison, it would prioritize the transfer of brucellosis-positive bison. When possible, the NPS would hold bison until late winter before transferring them for processing and reduce transfers based on the number of bison harvested outside the park. The NPS would use procedures for transferring bison for processing as described under Alternative 1.

Release of Bison in the Stephens Creek Administrative Area—In years with fewer than 5,200 bison, the NPS would immediately release brucellosis-negative, BCTP-ineligible bison to support tribal harvest outside YNP. The NPS anticipates this number would vary from 60 to 150 animals per year, which is about 20% of the bison captured when selecting for the BCTP. The NPS would not initially release brucellosis-negative bison when the population is above 5,200 animals but could release this subset of bison once it is determined that the removal is sufficient to decrease the population. Whenever the upper removal limit is met, the NPS would release captured bison back into YNP at the appropriate time.

Dispatch of Bison in the Stephens Creek Administrative Area—To reduce stress on bison from shipping them for processing or to address a lack of processing facility availability or capacity, NPS staff may dispatch some captured bison on-site by shooting them within the fenced pastures of the bison facility at Stephens Creek Administrative Area (Humane Slaughter Association 2018). The carcasses would be dressed, skinned, halved or quartered, and hung in trailers or other processing units to cool before transport to other locations for butchering and meat preparation. Members of American Indian Tribes would participate in the processing of bison. Unused parts from killed bison would be placed into a dump trailer or modified roll-off dumpster within a fenced area for later transport to a landfill or compost site. This process would involve collaborative management between the NPS and American Indian Tribes to determine the timing of culling, number of tribal members on-site for processing, and options for carcass removal. The NPS would prefer the American Indian Tribes and ITBC continue to reach agreement on the distribution of bison and work collaboratively to arrange processing, distribution, and carcass removal.

Capture Facilities Outside YNP—The NPS could collaborate with other IBMP members and American Indian Tribes to evaluate the need, design specifications, and potential location for temporary capture facilities in the northern management area. The 2000 final EIS (pages 123–136) and ROD (pages 17–18) for the IBMP, as adjusted, and Decision Notice for the State of Montana indicated a capture facility could be established between the park boundary and Yankee Jim Canyon when management north of YNP emphasized hunting to help control bison numbers and distribution. The NPS would work with cooperators on additional facilities outside the park. The building of new capture or quarantine facilities outside the park, or acquisition of hunting (terminal) or quarantine pastures outside the park, may necessitate other agencies complete additional NEPA and/or Montana Environmental Policy Act assessments and compliance with federal and state agencies, respectively. Although the building of these facilities is not analyzed in this plan/EIS, where appropriate, the use of these facilities and resulting effects on bison are analyzed. The NPS would request IBMP members and treaty tribes participate in the

capture, handling, and shipping of bison from any future capture facilities in the northern management area. The successful use of such facilities would depend on IBMP members and other treaty tribes reaching agreements that regulate hunting permits, locations, and methods to allow bison to disperse in the management area.

Hazing Bison—The NPS would haze bison using techniques described under Alternative 1.

Adaptive Management—In addition to the adaptive management objectives outlined in "Actions Common to All Alternatives" this alternative specifies that the BCTP would be operated at full capacity each year, the number of bison removed by harvest would exceed those shipped for processing, and brucellosis prevalence would be maintained or lowered over time. For these additional objectives, the NPS would monitor numbers of bison placed in the BCTP, harvested by American Indian Tribes or public hunters, and shipped for processing. The NPS would also monitor brucellosis prevalence from bison captured in the Stephens Creek Administrative Area. Following the adaptive management cycle of monitoring and reassessment, the NPS may adjust the population assurance threshold, target population range, transfer for processing, or release of bison back into YNP. The NPS would notify IBMP partners of changes to these numbers and provide rationale for the adaptive management change.

Additionally, if later or impeded migrations of bison due to climate warming, hunting, or other factors severely limit the effectiveness of managing bison abundance near the boundary of the park, park managers would consider capturing bison farther inside the park on an ad hoc basis. Additional NEPA analyses would be required for these actions.

Alternative 3

In addition to the actions described under "Actions Common to All Alternatives," this alternative would prioritize treating bison more like other ungulates such as elk in the GYA, which also have been exposed to brucellosis but are not subject to intense disease management like bison. Captures of bison for shipments for processing would immediately cease, with natural selection and public hunting and tribal harvests outside the park in Montana being the primary factors limiting bison numbers. The NPS would capture some bison to fill the BCTP and release all bison that do not qualify for the program. If the population exceeded a population threshold, even with additional hunting opportunities, the NPS would reinstitute shipments for processing and the use of other tools as described for Alternatives 1 and 2. The risk of brucellosis transmission from bison to cattle in Montana may increase compared to Alternative 1 from more bison on the landscape and a broader distribution, which could increase the likelihood of contact with cattle.

Expected Population Numbers—Bison numbers likely would be substantially higher than under Alternative 1 and could range between about 3,500 and 7,000 after calving. The NPS would continue to monitor demographic indices as bison density increases.

Removal Guidelines—The NPS would provide a removal limit to the IBMP partners as defined in the "Hunt-Capture Coordination" section above to avoid the unintended consequences of removing large numbers of bison in a single year. Initially, the limit would be 25% of the post-calving population but could increase or decrease based on new information and science. The NPS would take precautions to ensure removals would not reduce the late-winter population below 3,000 bison. The NPS would establish 7,000 bison as a population threshold above which it would implement different management actions to reduce the population.

BCTP—The NPS would implement the BCTP at maximum capacity as described for Alternative 2. Unlike Alternative 2, all bison not entered into the BCTP would be released back into YNP, including brucellosis-positive bison.

Capture of Bison in the Stephens Creek Administrative Area—The NPS would capture bison in the Stephens Creek Administrative Area when there is available space in the BCTP and cease capture when

the BCTP is full. The NPS would capture bison if the post-calving bison population exceeded 7,000 animals. If that were to occur, capture of more than 1,000 (total includes capture for the BCTP) bison may need to occur to decrease the population but would be adjusted down based on the number of bison harvested outside the park. The NPS may capture bison and hold them for release if a scenario occurs where the removal recommendation was met, and American Indian Tribes continued to implement harvests outside YNP. Methods of capture would be like Alternative 2 for scenarios when numbers are above the population assurance threshold.

Transfer to Tribes for Processing—The NPS would not transfer bison for processing unless the population exceeded 7,000 bison. When the population is above 7,000 bison, the NPS would transfer sufficient bison to American Indian Tribes for processing to decrease the population when accounting for harvests. When possible, the NPS would hold animals until late winter before transferring them for processing and reduce shipments based on number of bison harvested outside the park. The NPS would transfer bison to American Indian Tribes for processing and subsequent distribution to tribal members through a Tribal Food Transfer Program. The NPS would not prioritize transfer for processing based on brucellosis status. The NPS would use procedures for transferring bison for processing as described under Alternative 1.

Release of Bison in the Stephens Creek Administrative Area—In years with fewer than 7,000 bison, bison ineligible for the BCTP would be released from the capture facility to provide opportunities for hunter harvest if they move outside the park. The NPS anticipates releasing 180 to 450 bison each year, which is about 60% of the animals captured when selecting for the BCTP. Whenever the NPS captures bison because the upper removal limit is met, the NPS would release them back into YNP at the appropriate time.

Hazing Bison—The NPS may haze bison within YNP when necessary to protect people and property. Montana could implement hazing outside the park at its discretion. Like Alternative 1, bison could be hazed to the capture facility in the Stephens Creek Administrative Area for the BCTP using low-stress techniques such as people walking or on horseback slowly moving behind them to influence their direction. The NPS does not anticipate using vehicles or helicopters to haze bison within the park, but Montana could use a helicopter if it deems it necessary to move bison back to the park. The NPS anticipates hazing in Montana would be like Alternative 1.

Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis

Manage for a Target of 3,000 or Fewer Bison—In 1998, the National Academy of Sciences (the Academy) plotted population counts of Yellowstone bison from 1968 to 1997 against removals the following winter and found more bison moved to the boundary of YNP and were removed when there were more than 3,000 bison. The Academy then plotted (linear regression) snow water equivalent (density) against bison removals for eight winters during this period and concluded increasing snowpack exacerbated this trend. They concluded “above this population size [3,000], bison will move outside the park in all but the mildest winters” (Cheville et al. 1998:61). However, they also cautioned that this relationship was based on few data points with wide confidence limits and less certainty.

When the IBMP was negotiated during the 1990s, there was intense pressure at state and national levels to prevent cattle from being infected with brucellosis, thereby allowing their continued export without testing to facilitate interstate movements and trade agreements (Bidwell 2010). As a result, maintaining a negligible risk of brucellosis transmission from bison to cattle was prioritized in the court mediated IBMP. Montana deemed maintaining a low risk of transmission was insufficient because brucellosis transmission might still occur under certain circumstances and, purportedly, threaten the viability of the livestock industry (State of Montana 2000). In keeping with these objectives, a population target of 3,000 bison in “late winter/early spring” was chosen to reduce migrations outside YNP, rather than a target based on assessments of ecological or genetic viability (USDOI and USDA 2000b:32, 51; White et al. 2015a). Presently, the NPS estimates bison numbers during summer after calving because counting is

more accurate than during winter given weather conditions and bison distribution (Hess 2002; Geremia 2023). A late-winter/spring population of 3,000 bison would roughly equate to about 3,500 bison after calving depending on the composition of the population (Angliss 2003).

Maintaining a population of substantially fewer than 3,000 bison would not meet the purpose and need of this plan/EIS, as it may risk the bison population's genetic health. Genetic diversity, which is the variety of different genes at each specific chromosome location, is crucial for a species' ability to adapt (Allendorf 1986). Allelic diversity, or the number of different genes at each locus, is important to protect adaptive potential of a species (Allendorf 1986). Loci with large numbers of different genes require larger population sizes to maintain allelic diversity. Based on microsatellites, Yellowstone bison have loci that vary from 3 to 10 different genes (Halbert et al. 2012). To preserve this diversity, especially at chromosome locations with a high number of genes, a larger bison population is needed. Studies using simulation models indicate that to conserve over 95% of genetic diversity at locations with more than five genes, the bison population must exceed roughly 3,250 individuals, with a focus on removing mostly or solely younger animals (Pérez-Figueroa et al. 2012). Lower numbers of bison would lessen the long-term viability of the population and raise concerns related to the ESA. On June 6, 2022, the FWS announced it would conduct a 12-month status review to determine whether the population of Yellowstone bison should be listed as threatened under the ESA (*Federal Register* 87: 34228–34231).

The NPS explored the idea of maintaining a late-winter/early spring bison population of around 3,000. A potential strategy to achieve this could involve autumnal captures of bison within the park's interior, a method used by other bison management programs under the FWS and NPS. This tactic is not expected to harm the genetic integrity of the bison (Pérez-Figueroa et al. 2012). However, the NPS concluded that this method did not fulfill the purpose and need of this plan, as it would affect the bison's natural behavior as a free-roaming species (refer to the reasons for dismissal of "Capture Bison in the Interior of the Park") and could significantly decrease opportunities for tribal harvests around the park's boundaries, outside the park.

The NPS considered a strategy to sustain a late-winter/early spring bison population of approximately 3,000 by confining removal efforts to the periphery of the park. This approach was initially set forth in the 2000 ROD and has been subject to ongoing adaptive changes and revisions by the NPS and IBMP collaborators. Following the 2000 ROD, tolerance for bison migrating into Montana was constrained to a short period during winter and small areas adjacent to YNP, which did not achieve the goal of a free-ranging population or further the restoration of wild bison (White et al. 2015b). Instead, the IBMP was intentionally designed to "prevent the reestablishment of a free-ranging bison herd in places where bison have been absent for more than a century," which essentially defined the park and small, nearby areas in Montana as "the acceptable limits for bison distribution" (State of Montana 2000:27-28, 32). More recent analyses of data indicate the timing and magnitude of migrations are highly influenced by uncontrollable variables such as summer plant production and the onset and severity of snowpack, as well as herd size (central and northern). When the density of accumulated snowpack is well above average and plant production is well below average, more than 1,000 bison may migrate toward the boundary of YNP with a population size of about 3,000 bison. However, substantially fewer bison migrate under more moderate weather and productivity conditions, even when there are more than 5,000 bison, due to the logistic (non-linear) form of the migration response. Thus, potential migrations range from a few individuals to more than approximately 1,000 bison in any given winter (Geremia et al. 2011, 2014, 2015a). Given these observed migration fluctuations since the IBMP's inception in 2000, the NPS determined that managing for a population of about 3,000 by removing animals that leave the park was technically infeasible.

The NPS recognizes that simulation studies used to preserve the genetic health of the bison population are based on various assumptions and genetic monitoring methods currently available, which have their limitations. Given these uncertainties and using the best available science, the NPS used a cautious approach when determining the lower range limit under each alternative. Additionally, maintaining less than 3,000 bison could compromise the species' ecological contribution, potentially diminish the natural

quality of proposed wilderness areas within the park, lessen visitor encounters with wild bison, and negatively impact the treaty-secured hunting rights of American Indian Tribes outside YNP. Taking into account these factors, along with the potential risks to the bison's genetic integrity, the NPS concluded that keeping the bison population at or below 3,000 individuals does not meet the purpose and need of this plan/EIS and may be technically infeasible.

Implement a Previously Modified Alternative from the Original 2000 Record of Decision Called the Joint Management Plan or Modified Preferred Alternative—The 2000 Joint Management Plan was designed to adaptively progress through a series of management steps that initially tolerated only bison testing negative for brucellosis exposure on winter ranges outside YNP but would eventually tolerate limited numbers of untested bison on small winter ranges adjacent to the park when cattle were not present. During step 1, the agencies agreed to: (1) enforce spatial and temporal separation between bison and cattle; (2) use hazing by humans on horseback, all-terrain vehicles, or in helicopters to prevent bison from leaving the park; (3) if hazing was unsuccessful, capture all bison attempting to leave the park and test them for brucellosis exposure; (4) send test-positive bison for processing; (5) vaccinate all test-negative bison except adult females during the third trimester of pregnancy (mid-January through May); (6) temporarily hold all test-negative bison at the north boundary for release back into the park in spring; (7) release up to 100 test-negative bison at the west boundary and allow them to use habitat adjacent to the park until May 15; (8) conduct research on *Brucella* persistence in the environment to determine an adequate temporal separation period between bison and cattle; (9) conduct research on the safety and efficacy of strain RB51 vaccine; and (10) conduct research and development of a remote vaccine delivery system. Montana also agreed to encourage voluntary vaccination of cattle that might graze on bison -occupied winter ranges outside the park. If 100% voluntary vaccination was not achieved in one year, Montana agreed to make the vaccination of all female cattle greater than 4 months of age mandatory (USDOI and USDA 2000b; White et al. 2011).

Step 2 was to begin when cattle no longer grazed during winter on the Royal Teton Ranch adjacent to the north boundary of YNP, which was anticipated in winter 2003. Management actions initiated in step 1 would continue, except that up to 100 test-negative bison would be released at the north boundary and allowed to use habitat adjacent to the park until April 15, and any calf and yearling bison that could not be captured at the west boundary would be vaccinated using a remote delivery system. Step 3 was expected to begin by winter 2006 once the agencies had determined an adequate temporal separation period between bison and cattle; gained experience in managing bison in allowable zones outside the park; and initiated a vaccination program for all calf, yearling, and adult female bison in the population, including remote delivery vaccination inside YNP. The agencies would tolerate up to 100 untested bison to freely range in both the north and west boundary areas. The agencies would use capture facilities in these areas to maintain the population near 3,000 bison, enforce tolerance levels (less than 100 bison), and ensure no bison were outside the park after the respective spring cut-off dates. The agencies could also pursue a quarantine facility to better manage bison by developing a process to certify test-negative bison as brucellosis-free (USDOI and USDA 2000b; White et al. 2011).

This Joint Management Plan was never completely implemented because changed conditions and new information indicated these intrusive methods could have adverse effects on the bison population and were not likely to be effective, feasible, or socially acceptable (White et al. 2011; Halbert et al. 2012; White et al. 2015a,b). These conclusions were supported by several environmental analyses by the IBMP partners, including the evaluation of a remote delivery vaccination program for bison in 2013 and 2014 by the NPS and MFWP; the state's decision regarding year-round habitat for bison in 2015; the establishment of the BCTP by APHIS, Fort Peck Tribes, MDOL, and the NPS in 2017 and 2018; the National Academies of Sciences, Engineering, and Medicine evaluation of brucellosis and the potential for its spread in its 2020 report entitled *Revisiting Brucellosis in the Greater Yellowstone Area;* and the Custer Gallatin National Forest's decision on the LMP in 2022.

Implementing this alternative is not necessary given more than two decades of experience in managing bison with no direct transmissions of brucellosis to cattle and the changed circumstances and new information described in appendix B. The National Academies of Sciences, Engineering, and Medicine (the Committee) concluded in 2017 and 2020 that infected elk had transmitted brucellosis to livestock in the GYA at least 27 times since 1998 with no transmissions attributed to bison. The Committee recommended prioritizing efforts on preventing brucellosis transmission by elk, while maintaining separation between bison and cattle. The Committee also recommended not using aggressive control measures on bison until tools became available for an eradication program in elk. State biologists indicated these intrusive methods of disease control are not likely to be effective, feasible, or politically or socially acceptable to implement on wide-ranging elk populations. Instead, they concluded the primary strategy for managing brucellosis transmission risk from more numerous elk to livestock is to prevent mingling by hazing, hunting, fencing or removing haystacks and other attractants, or improving forage on public lands (Rayl et al. 2019). For over two decades, the IBMP partners have demonstrated these same techniques work for bison. As a result, this alternative would not meet the purpose and need for action because some elements are technically infeasible (such as remote vaccination delivery to the entire bison population), and it would have too great of an environmental impact since it would adversely affect treaty rights for American Indian Tribes to hunt bison on lands outside YNP.

Erect Physical Barriers to Keep Bison within YNP—Some members of the public have suggested fencing the northern and western boundaries of YNP to prevent bison movement into Montana. Preventing bison from leaving YNP would not meet the purpose and need of this plan/EIS because it would impede tribal harvest outside the park. Fortified fencing meant to limit bison movement would impede or prevent the movement of bighorn sheep, deer, elk, moose, pronghorn, and other animals. Fencing can create a ranch or zoo-like atmosphere and is generally inconsistent with both state and NPS wildlife management principles, although some management and park units in other areas are fenced (USDOI, NPS 2006a). Continuous fencing along the YNP boundary would limit the movement of ungulates outside the park and concentrate them therein. In addition, adequate fences would be expensive to purchase, install, and maintain, and their installation could cause major adverse impacts to movement and use of habitats by wild animals in some areas. Bison movements from the park occur at several widely scattered locations, and bison have found ways through or around some existing fences (Meagher 1989; Geremia et al. 2015a). As a result, managers would need to maintain fences damaged by animals, falling trees, or other events. In addition, fences could be less effective during winter if snow drifts over sections. Furthermore, bison could leave through unfenced public access gates of the park and across rivers during any time of year. In summary, this alternative would not meet the purpose and need for action, would have too great of an environmental impact on YNP wildlife, and would conflict with general wildlife and national park management principles such that a major change in the management plan or policy would be needed. It also would adversely affect treaty rights by preventing American Indian Tribes from accessing a traditional food source on lands outside the park.

Keep Bison within YNP to Avoid Impacts from Hunting on Residents and Businesses—During the past decade, concentrations of primarily tribal harvesters on national forest lands near the park boundary have, at times, resulted in conflicts with nearby residents and businesses due to shooting near roads and houses, gut piles left on the landscape, shooting of elk and other ungulates, and occasional incidents of shooting toward other hunters, houses, and cars. The Custer Gallatin National Forest and partners, within their respective authorities, have taken actions to improve public safety and natural resource concerns associated with hunts on forest lands by moving shooting and carcasses farther away from residences in the area. However, shooting and bison offal remain a concern for business and property owners and some people have suggested no hunting in these areas to avoid impacts on nearby residences or businesses. The NPS does not have regulatory authority or jurisdiction over hunts that occur outside Yellowstone National Park and, as a result, cannot control when, where, and how these hunter harvests occur, or the number of bison harvested by tribal or state hunters. The NPS continues to support its IBMP partners in mitigating impacts from tribal harvest and public hunting outside the park.

Some members of the public have suggested the NPS should feed bison in YNP to prevent their migration to lower-elevation winter and spring habitat outside the park. To do so would be inconsistent with both state and NPS wildlife management principles and would not meet the purpose and need of the plan/EIS to sustain a wild, migratory bison population. Park staff could attempt to haze bison back into the park to prevent them from leaving. The amount of hazing required to keep bison from exiting the park in some winters would be extensive, prolonged, and require the use of vehicles, helicopters, and other aversive conditioning methods (e.g., cracker shells, rubber bullets) that are intrusive and result in noise and other impacts to wildlife and people. However, bison movements from the park occur at several widely scattered locations and bison likely will eventually find ways through or around people attempting to haze them and keep them in the park, especially at night or during severe inclement weather (Meagher 1989; Geremia et al. 2015a).

Even if possible, completely restricting bison migration onto unoccupied lands adjacent to the park would adversely affect the exercise of reserved treaty rights by several American Indian Tribes. A similar argument would hold if the federal government eliminated tribal harvest on these lands, while the State of Montana still permitted public hunts. In summary, this alternative would not meet the purpose and need for action, would conflict with general wildlife and national park management principles (e.g., migration of a free-ranging and wild bison population) such that a major change in the management plan or policy would be needed, and would adversely affect treaty rights by preventing American Indian Tribes from accessing a traditional food source on lands outside the park.

Remove Cattle from the Yellowstone, Madison, and Gallatin River Valleys—The purchase of grazing rights or private lands for the benefit of wild animals has been effective at protecting habitat for decades. Conservation incentives can provide greater tolerance for bison on private lands while maintaining separation with cattle. Conservation groups and government agencies have successfully used and are still pursuing this strategy with willing landowners. Efforts are ongoing to identify additional habitat and conservation areas for bison, develop fencing strategies with landowners that raise cattle or have property damage concerns, and identify opportunities for the enhancement of habitat while discouraging bison movements onto private lands with cattle. Substantially reducing the number of cattle operations in areas adjacent to YNP would reduce the risk of brucellosis spreading from bison and elk to cattle and possibly contribute to more tolerance for wild bison. However, buying out most or all cattle producers in the Yellowstone, Madison, and Gallatin Valleys of Montana would be an enormously costly venture. The challenges of managing wild bison, including safety and property damage, are more diverse than simply preventing the mixing of bison with cattle. Moreover, buying out cattle operations would not decrease the occurrence of brucellosis in bison or elk.

The elimination of cattle ranching in valleys near YNP would not resolve the debate about the appropriate extent of the management area boundary for bison in Montana. If state agencies in cooperation with the national forest supervisor established a new tolerance boundary that included the Yellowstone, Madison, and Gallatin Valleys, bison would eventually expand in numbers and distribution to occupy these areas, and management would have to incorporate these new locations. Managers could relocate some bison elsewhere, but federal and state regulations prohibit movement of bison from an area where brucellosis occurs unless the animals have gone through quarantine to certify each animal is free of the disease (MCA 81-2-120, 87-1-216; 7 USC 8301 et seq.; USDA, APHIS 2003). Moreover, given existing political and social constraints, managers are unlikely to find additional habitat in Montana quickly enough to keep pace with increasing bison numbers (White et al. 2015c). Some members of the public have suggested requiring livestock permittees to stop raising cattle, raise bison instead of cattle, or raise only steers. Livestock agencies use vaccinations and incentives to reduce the number of cattle susceptible to brucellosis but requiring producers to modify their operations or cease grazing is not within the jurisdiction of the NPS. In summary, this alternative would be beyond the scope of the NEPA review, would be outside NPS's jurisdiction, would not meet the purpose and need for action, and would be economically infeasible.

Bison Relocation Within the Park—Several agencies and American Indian Tribes have suggested relocating bison to currently unoccupied areas within YNP to reduce densities. Bison congregate in two primary breeding herds during the rut. For the remainder of the year, they do not tend to stay in the same group or location for long. Telemetry data show animals move widely across the land, often returning to the same areas about every two to three weeks (Geremia et al. 2015a, 2019). It may look like bison remain in the same place, but that is not the case. Bison currently use about 500,000 acres of YNP and are free to move anywhere in undeveloped areas (99.3% of the park) based on their own decisions (White 2016). Thus, the NPS does not see a need to relocate bison to other areas of the park, which is contrary to the NPS mission and principles of preserving wildlife in their natural condition with minimal human intervention.

Restore Bison to the Great Plains—Some members of the public have suggested bison be recolonized across the plains of central and western North America. While the large-scale restoration of plains bison in North America is beyond the scope of this NEPA review, the alternatives under consideration in this plan/EIS include providing live, brucellosis-free bison from the Yellowstone lineages for restoration efforts on tribal and public lands. This would be in support of Secretarial Order 3410 that directs the NPS to increase the number of live bison transferred from YNP to American Indian Tribes. Currently, American Indian Tribes have capacity for receiving all bison entered in the BCTP. Managers of other private, state, and federal lands could coordinate with American Indian Tribes to receive some bison completing assurance testing.

Mass Test-and-Slaughter or Depopulate YNP and Reintroduce Brucellosis-free Bison—Some members of the public have suggested eliminating brucellosis by capturing every Yellowstone bison, testing them for brucellosis, and removing animals testing positive. Similarly, the 2000 IBMP envisioned the capture and testing of all bison moving outside YNP, with positive animals sent to slaughter facilities and negative animals sent to the BCTP or released after vaccination (USDOI and USDA 2000a,b). About 60% of adult female Yellowstone bison test positive for antibodies in their blood, indicating previous exposure to the bacteria that causes brucellosis, but only 10% to 15% are infectious and could potentially shed bacteria and spread the disease to other bison, cattle, or elk (Hobbs et al. 2015). The remaining noninfectious bison may have cleared the bacteria after infection and could have some resistance to the disease (Treanor et al. 2011). Alternatively, the entire bison population could be killed, and a brucellosis-free herd reintroduced. However, brucellosis occurs in elk throughout the region, and federal and state agencies have no plans to eliminate or substantially reduce infection in these elk. As a result, it would be ineffective and wasteful to remove two-thirds or more of the bison in YNP, only to have the remainder, or reintroduced bison, infected by elk over time. Moreover, a substantial reduction in bison numbers could negatively affect predators and scavengers, grasslands, and visitor experience. Large removals could alter age and sex composition, reduce the number of females and calves, and reduce genetic diversity (White et al. 2011; Halbert et al. 2012), thereby raising concerns related to the ESA. Thus, this alternative would not meet the purpose and need for action and might require a major change to law, regulation, or policy, such as YNP's enabling legislation.

Manage Elk to Substantially Decrease or Eradicate Brucellosis and Prevent Mingling with Cattle—Brucellosis is spreading in elk throughout the GYA and has spread from elk to cattle at least 27 times since 1998 (National Academies of Sciences, Engineering, and Medicine 2020). In many areas, such as the Paradise Valley north of the Gardiner Basin, elk mix with cattle at times during the year, without managers testing them for brucellosis or shipping them to slaughter facilities (Tilt 2020). The eradication of brucellosis would require eliminating the disease in elk, which would require attempting to capture, test, and vaccinate or slaughter elk across the entire region, which would be extremely difficult or impossible (National Academies of Sciences, Engineering, and Medicine 2020). The NPS would continue to prioritize minimal management of elk inside YNP and let numbers and brucellosis occurrence vary from year to year based on competition, predation, habitat conditions, weather, and hunting and management actions outside the park. Elk age, sex, and genetic diversity will vary in response to these

factors. Elk can move freely within YNP and across the park boundary. The NPS has no plans to decrease the occurrence of brucellosis in elk. Likewise, the MFWP Commission endorsed recommendations from a citizen working group regarding elk management where there are concerns about brucellosis spreading from elk to cattle. The group concluded the "eradication of brucellosis in elk is ultimately desirable, but it is not currently feasible, and current methods to achieve this goal, such as test-and-slaughter, are unacceptable" (MFWP 2013). Recommended actions to prevent or disperse concentrations of elk include hunting, altering habitat to promote separation between elk and cattle, and hazing and fencing to maintain separation (MFWP 2013, 2015; Rayl et al. 2019). This alternative would not meet the purpose and need for action, is technically infeasible, and is beyond the scope of the NEPA review.

Vaccination of Bison—The 2000 ROD for the IBMP directed the NPS to vaccinate test-negative bison captured when exiting the park and evaluate whether to implement remote delivery vaccination of bison inside YNP to decrease the occurrence of brucellosis (USDOI and USDA 2000a).

Many vaccines are modified or weakened versions of disease organisms, such as bacteria, which induce a weakened infection that is cleared by the immune system and leaves behind memory cells that enable an animal to fend against subsequent exposures to natural strains of the disease more effectively. These vaccines rarely provide complete protection against infectious diseases, especially organisms that invade the interior of cells such as *Brucella abortus* bacteria. However, vaccinations could contribute to brucellosis suppression by reducing the number of susceptible individuals, shedding of infectious bacteria, and rate of transmission (Treanor et al. 2010; Ebinger et al. 2011; Hobbs et al. 2015).

Currently, a vaccine (RB51) consisting of live, weakened strains of *Brucella abortus* bacteria is available to provide bison and cattle with some protection against infection and abortion (50%-60%), especially when they receive a booster vaccination (Olsen et al. 2012, 2015). However, the vaccine does not prevent most bison or cattle from becoming infected (less than 15%) after exposure to infectious amounts of *Brucella* bacteria (Olsen et al. 2009). Therefore, the primary reason for vaccinating bison would be to reduce the shedding of *Brucella* bacteria and the potential for further transmission after individuals become infected. These results highlight the need for better vaccines and emphasize vaccine RB51 may not be a viable option for brucellosis control in wild bison.

Efforts to reduce the prevalence of brucellosis in Yellowstone bison using vaccination would be most effective through a park-wide effort that consistently and reliably delivers vaccines to most bison each year over decades (Treanor et al. 2010; Ebinger et al. 2011). The most effective way to vaccinate bison is with a syringe so bison receive the intended dose in the correct site (just under the skin). This would require rounding up animals within the park in autumn to avoid vaccinating pregnant females in the third trimester and to provide at least 12 to 16 weeks to develop a protective immune response prior to potential exposure to *Brucella* bacteria in late February or March (Plumb and Barton 2008). However, capturing bison in the interior of the park was an action considered but dismissed (See this chapter "Capture Bison in the Interior of the Park"). Alternatively, the NPS could capture bison in late winter when animals exit the park. But even in winters with moderate snowpack, less than 50% of the bison in the population migrate to the boundary where capture facilities are located (Geremia et al. 2011, 2014). Most migrants tend to move to the boundary during late winter when pregnant females are late in gestation and should not be vaccinated because that could induce an abortion.

Approaches that target pre-reproductive females for vaccination, while removing reproductively active, likely infectious females, could reduce brucellosis transmission by reducing the shedding of the bacteria (Treanor et al. 2010; Ebinger et al. 2011). However, the selective vaccination of 50 to 100 pre-reproductive females and culling of 50 to 100 likely infectious females each year would require capturing and testing more than 650 bison, which is more bison than migrate to either the northern or western boundary of YNP in some winters. Also, staff would need to capture more bison each year to reach these goals as the prevalence of brucellosis decreased (Ebinger et al. 2011). In addition, vaccinated bison would need to be held in the capture pen for 21 days during hunting seasons due to concerns about consumption

before the vaccine is cleared from the animal's system. Holding vaccinated bison for an extended period would further limit opportunities for harvest outside the park. Under all alternatives, the NPS plans to include pre-reproductive female bison that test negative for brucellosis in the BCTP. This approach would further reduce the number of animals eligible for vaccination. Consequently, it would necessitate the capture of many more bison than migrate during most winters.

As an alternative, the NPS could consider remote vaccination during autumn. Delivering vaccines remotely using bio-bullets, darts, or bait is possible, but the effective range of bio-bullet or dart delivery via air rifle is approximately 33 to 44 yards (30 to 40 meters), which is ineffective for reaching bison inside the perimeter of a relatively large group. Also, it is uncertain whether each animal receives the intended dose, and there is no way to know because animals are not marked. Furthermore, there are recurrent issues with bio-bullet vaccine formulation and encapsulation, projectiles fracturing or being too soft to penetrate the skin, and poor immunologic proliferation. As a result, it is difficult to estimate the portion of the population that is effectively vaccinated. In addition, remote vaccination is likely unpleasant experiences for bison. Therefore, they may begin to avoid humans and, as a result, it will probably become more difficult to vaccinate a large portion of the bison population (USDOI, NPS 2014b).

The duration of vaccine-induced immune protection appears to be relatively short rather than life-long. Thus, booster vaccinations likely would be necessary (Olsen and Johnson 2012; Olsen et al. 2015). Furthermore, the extent of protective immune responses stimulated by vaccination may be reduced when vaccines are delivered to undernourished bison during winter (Treanor 2012, 2013). Like other ungulates in this northern mountain environment, bison are chronically undernourished by late winter from the limited availability of relatively low-quality forage, most of which is senescent (cured, dormant) and covered by snow. This seasonally poor body condition and nutrition increases the vulnerability of bison to attack or reemergence of infections and coincides with increasing reproductive demands during late pregnancy that curb the resources bison can allocate to immune defense. As a result, the vaccination of wild bison during winter may be relatively ineffective against brucellosis (Treanor 2012, 2013). Moreover, an effective vaccination program for bison would require that all possible routes of re-infection be treated or effectively separated from the vaccinated population. In the past decade, brucellosis prevalence in some elk populations in the GYA has increased and spread, independent of Yellowstone bison, with all detected transmissions of brucellosis to cattle traced to elk (Rhyan et al. 2013; Kamath et al. 2016). The potential for elk to maintain the disease and re-infect susceptible bison cannot be ignored.

A panel of scientists from federal, state, academic, and NGOs reviewed information about the vaccine-induced immune responses of bison and elk, as well as the benefits and limitations of existing tools and emerging technologies for reducing the occurrence of brucellosis in bison and elk. The panel evaluated whether it was feasible to decrease the occurrence of brucellosis substantially in bison without significantly affecting their behavior or visitor experiences. The panel concluded management to maintain separation between cattle and bison was effective at preventing the spread of brucellosis between them. They also thought the vaccination of bison with available vaccines would not decrease brucellosis to a level that substantially reduced the need for the separation of bison and cattle. The panel suggested the remote delivery of vaccine to bison would be a cost-ineffective tool for preventing brucellosis spreading to cattle and could lead to shifts in the distribution of bison across the landscape that reduced the opportunity for visitors to observe bison (USDOI, NPS and MFWP 2013). Based on these assessments, the NPS decided not to implement park-wide remote vaccination.

In the 2014 *Final EIS for the Remote Vaccination Program to Reduce the Prevalence of Brucellosis in Yellowstone Bison*, the NPS concluded that the implementation of park-wide remote vaccination would not achieve desired results and could have unknown, yet potentially negative behavioral impacts on bison and, in turn, on visitor experiences such as watching wild animals. The NPS based this conclusion on the lack of an easily distributed and highly effective vaccine and limitations of current diagnostic and vaccine delivery technologies. Bison nutrition, body condition, pregnancy, and lactation can reduce the protective

immune responses from vaccination. In addition, elk that are also infected and widely distributed would re-infect bison (USDOI, NPS 2014b).

Following a review of brucellosis in the GYA, the National Academies of Sciences, Engineering and Medicine (2020) recommended not using aggressive control measures on bison until tools became available for an eradication program in elk. While the State of Montana has implemented hazing, management shooting, blocked hunting on private land, and implemented hay fencing efforts in recent years to disperse some elk in the Paradise Valley north of YNP, many elk still mingle with cattle during the brucellosis transmission period (Tilt 2020). No substantive efforts have been implemented to prevent transmission from elk to cattle like the measures (vaccination, culling, test-and-slaughter) Montana suggested the NPS take with bison in YNP (Rayl et al. 2019).

If an effective, reliable, and safe vaccine and delivery method were developed and demonstrated to be effective without significant adverse effects, park managers might consider it; however such techniques would not be implemented as part of operations until additional NEPA compliance, including public engagement, is conducted; tools become available to eliminate brucellosis in elk, as recommended by the National Academies of Sciences, Engineering, and Medicine (2020); and reduction in brucellosis prevalence results in substantially more tolerance for bison in the state of Montana. In summary, this alternative would not meet the purpose and need for action and would be technically infeasible.

Fertility Control of Bison—The transmission of *Brucella* bacteria during mating is not a significant route in cattle, and a recent study in bison did not detect *Brucella* bacteria in tissue cultures 6 months after intravaginal inoculation (Crawford et al. 1990; Uhrig et al. 2013). Bull bison can shed *Brucella abortus* bacteria in semen but likely are not capable of infecting females during spring due to low numbers of bacteria (Frey et al. 2013). Instead, brucellosis appears to be transmitted by female bison during birth. Younger female bison 3 to 5 years old are more likely than other bison to be infectious and capable of transmitting the bacteria through a contaminated aborted fetus, live calf, or reproductive materials (Treanor et al. 2011). Preventing these animals from conceiving and giving birth for several years could decrease the risk of brucellosis transmission and, over time, the prevalence of brucellosis in the population (Ebinger et al. 2011). Fertility control also would reduce birth rates, which could lead to less frequent population reductions.

Currently, there are no fertility control agents that meet the criteria necessary for use on Yellowstone bison. An effective, reliable, and safe fertility control vaccine for bison would need to be more than 80% effective and induce a consistent immune response with each dose. It would need to be effective for multiple years with a single dose, without unintended side effects. In addition, the effects of the vaccine would need to be reversible, not negatively affect behaviors and social interactions, and be cost-effective (Powers and Moresco 2015). Fertility control vaccines currently under investigation are most effective when injected by hand syringe. There is no oral vaccine for bison, and remote delivery via bio-bullet or dart is not feasible for most wild animals distributed across large areas. As a result, a big issue is how to treat enough bison to obtain the desired effect in terms of reducing brucellosis or numbers. Effective vaccine delivery via syringe to appropriate numbers of female bison would require increasing the number of captures for several years or more, which would be challenging because bison would likely become harder to approach for repeated booster vaccination over time. In addition, captures would likely need to occur in many different locations in the park interior. Furthermore, fertility control vaccines could cause side effects such as inflammation, longer breeding seasons and life spans (which would complicate population regulation), and changes in reproduction and social behavior. They also could cause sterility, changes in age and sex composition, and reduced genetic diversity (Powers and Moresco 2015).

In 2012, APHIS began a six-year study of the effectiveness of the vaccine GonaCon^{TM} at preventing gonadotropin-releasing hormone from initiating follicle growth and ovulation in Yellowstone bison, thereby resulting in infertility. The objectives were to determine whether GonaCon^{TM} vaccine could prevent the shedding of brucellosis bacteria in young recently infected bison throughout the infection

cycle. Researchers also wanted to determine whether bacteria that remain dormant in infected animals during fertility control would increase again during pregnancies after the effects of the vaccine decreased. This study ended during 2017, but data and findings have not been published or provided to the NPS for scientific peer review. Regardless, the testing of this or another fertility control method likely will take years to evaluate sufficiently.

Research on brucellosis suppression techniques, including fertility control, in bison may occur concurrent with, or after, similar efforts are initiated on elk populations in the GYA. Initial studies should take place outside YNP and be peer-reviewed for effectiveness by independent experts. Fertility control would reduce the number of young bison eligible for placement in the BCTP or available for treaty hunter harvests. If an effective, reliable, and safe fertility control vaccine and delivery method were developed and demonstrated to be effective without significant adverse effects, park managers might consider them; however such techniques would not be implemented as part of operations until additional NEPA compliance, including public engagement, is conducted, and tools become available to eliminate brucellosis in elk, as recommended by the National Academies of Sciences, Engineering, and Medicine (2020). In summary, this alternative would not meet the purpose and need for action, is technically infeasible, and would conflict with the basic policy objectives for the management of YNP (USDOI, NPS 2006a).

Establish a Brucellosis-Free Population using Assisted Reproductive Technologies—Scientists have used several techniques developed for commercial production and captive breeding to produce bison with genes from the Yellowstone lineage but no risk of *Brucella* infection, including artificial insemination and *in vitro* embryo production, cryopreservation, and embryo transfer (Barfield 2015; Benham et al. 2017). Brucellosis-free females could be inseminated with sperm collected from live or dead Yellowstone bison and separated from seminal fluid to remove any potential *Brucella* bacteria. Also, female Yellowstone bison could be stimulated with hormone injections to ovulate more than one egg at a time. After artificial insemination or breeding, technicians would collect and wash embryos to remove any *Brucella* bacteria before transferring them to the uterus of a brucellosis-free bison. Alternatively, technicians could collect ovaries and testes from bison sent for processing to fertilize the eggs and transfer the embryos to brucellosis-free bison (Barfield 2015; Benham et al. 2017).

Colorado State University and APHIS have used artificial insemination and embryo transfer to establish a small herd of brucellosis-free bison with Yellowstone genetics on the shortgrass prairie at Soapstone Prairie Natural Area and Red Mountain Open Space in Colorado. However, these techniques do not preserve the adaptive capabilities of Yellowstone bison that move across a vast landscape where they are exposed to natural selection through competition for food and breeding opportunities, predation, and survival under challenging environmental conditions. Even young bison in YNP likely have adaptive capabilities, such as antipredator behaviors, foraging strategies, and knowledge of suitable migration routes and seasonal use areas, which are absent or reduced in bison created through artificial insemination and embryo transfer and subsequently managed like livestock in fenced pastures and treated for diseases with no predators and the removal of older bulls to simplify management. Populations established in captivity through assisted reproduction likely will be habituated to humans, naive of predators, and possess only a fraction of the genetic diversity present in the wild population due to collecting samples from relatively few bison in the population. In addition, many American Indian Tribes have a special relationship with Yellowstone bison because they are descendants of the indigenous herds of bison that once roamed across North America and provided sustenance to them for centuries. As a result, there is substantial interest in obtaining wild bison directly from YNP for conservation and cultural purposes (USDOI, NPS 2016a). Thus, this alternative would not meet the purpose and need for action.

Hunt Bison Inside YNP—The NPS prohibits hunting in national park areas except where "specifically mandated by Federal statutory law" (36 CFR 2.2). This is re-affirmed in *Management Policies 2006* (USDOI, NPS 2006a). Congress prohibited all hunting in YNP in 1894 (16 USC 26). The NPS has a

legislative mandate to protect the natural and cultural resources within national parks to allow for their enjoyment by future generations.

The late-winter movement patterns of bison and firing lines of hunters near the park boundary limit the effectiveness of using hunting in Montana to manage the bison population and distribution during many winters. Thus, some American Indian Tribes have suggested tribal harvests inside YNP. Because of the 1894 legislation and NPS regulations and policy, all hunting has been prohibited in the park for more than 120 years. As a result, this alternative was not carried forward for further analysis because it would be inconsistent with existing laws, policies, regulations, and case law regarding hunting in units of the NPS. It also would be inconsistent with long-standing basic policy objectives for NPS units where hunting is prohibited.

Administrative Shooting—Yellowstone bison management objectives are to promote preservation and restore ecological processes while minimizing conflicts with people and property. In addition, the NPS wants to support tribal harvests on lands outside the park and provide live brucellosis-free bison for restoration to tribal lands through the BCTP. Thus, an administrative shooting program in YNP would be used to supplement removals when tribal harvests and the BCTP cannot control numbers. An administrative shooting program would involve NPS staff or volunteers dispatching wild bison throughout YNP and removing meat, hides, and heads from YNP. Such a program would require a substantial increase in staff, time, and funding to manage bison operations and ensure the safety of visitors and staff by restricting access to certain areas of the park for extended periods. Administrative shooting would need to occur during early to mid-winter due to logistical concerns of grizzly and black bear activity, public safety, bison health and condition, and to prevent meat spoiling. Administrative shooting would need to occur in areas farther within YNP and away from roads to be effective, as these actions could affect bison behavior and movements, other natural resources, and visitor experience. Over time, bison may actively avoid shooting teams, requiring staff to implement operations over a longer time and broader region of the park, which would increase impacts to other natural resources, reduce program efficacy, and increase costs. Thus, this alternative would not meet the purpose and need for action and would conflict with the basic policy objectives for the management of the area such that a major change in the policy would be needed.

Manage Bison to Recover Hydrologic Function and Uniform Grazing—Some members of the public suggested restoring the hydrology of the Lamar Valley in YNP that was indirectly altered by the eradication of wolves, subsequent exponential increase in elk numbers, and browsing on riparian vegetation that substantially suppressed the recruitment of young aspen, cottonwood, and willow trees. This recommendation is beyond the scope of the NEPA review and would not meet the purpose and need for action. The recommendation for a new alternative to manage bison to recover hydrologic functions in YNP and uniform grazing is also beyond the scope of the NEPA review and would not meet the purpose for action, which is to preserve an ecologically sustainable population of wild, migratory bison while continuing to work with partners to address brucellosis transmission, human safety, and property damage and fulfill tribal trust responsibilities. Uniform grazing would require repeated herding of bison and fencing in the interior of YNP, which would detract from the wild free-ranging qualities of the bison population and could have a major adverse impact on the distribution of bison. It also would adversely affect the movements of other wild animals, negatively affect visitor experiences, and impact the untrammeled, undeveloped, and natural qualities of wilderness character in the recommended wilderness areas of YNP. Such action would be contrary to NPS policy, which focuses on preserving wildlife in their natural condition with minimal human intervention and maintaining ecological processes.

Create a New National Park for Bison—Some members of the public suggested creating a new national park for bison from the Snowcrest, Gravelly, and Centennial Complex on the Beaverhead National Forest. While the creation of a new national park is beyond the scope of this NEPA review, the alternatives under consideration include providing live brucellosis-free bison from the Yellowstone lineages for restoration efforts outside YNP.

Compensate Ranchers for Bison Impacts—Some members of the public suggested compensating ranchers for brucellosis transmission, fencing, delayed allotment turn-on dates, rangeland fees, and retired cattle grazing allotments. Conservation incentives can provide greater tolerance for wildlife on private lands and NGOs and government agencies have successfully used and are still pursuing this strategy with willing landowners. Efforts are ongoing to develop fencing strategies with landowners that raise cattle or have property damage concerns and to identify opportunities for the enhancement of habitat while encouraging elk movements off private lands with cattle during the brucellosis transmission period (Rayl et al. 2019; Tilt 2020). Conservation organizations, such as the Greater Yellowstone Coalition, Defenders of Wildlife, Natural Resources Defense Council, and Sierra Club, have worked with MFWP to implement the Yellowstone Bison Coexistence Program. These groups offer financial and technical assistance to landowners interested in building exclusion fences on private property to keep bison from damaging gardens, landscaping, yards, or livestock pastures. They have completed more than 50 fencing projects in the Gardiner and Hebgen Basins of Montana and contributed more than $45,000 in reimbursements and materials (Greater Yellowstone Coalition 2022). In addition, the Custer Gallatin National Forest has worked with livestock producers on grazing allotments and turn-on dates in the Gardiner and Hebgen Basins (USDA, USFS 2022a). However, compensating cattle ranchers for brucellosis transmission, property damage, or impacts to grazing allotments from elk in Montana is beyond the scope of this NEPA analysis and would not meet the purpose and need for action.

Manage Wild Bison Like Wild Elk—Some people have suggested managing bison like elk in Montana by allowing bison access to public lands; eliminating zone management (tolerance) areas; and ceasing captures, shipments for processing, and vaccination. Bison would only be hazed if there was an immediate threat to safety, property, or mingling with cattle on private land. In 2003, the Montana Legislature directed the Fish and Wildlife Commission to manage elk populations at or below sustainable population numbers by 2009 based on habitat assessments (MCA 87-1-301, 87-1-323). The primary method used by the Commission and MFWP to reduce numbers of elk is regulated public hunter harvests in designated hunting districts. These hunter harvests are not always effective at limiting elk numbers as evidenced by the fact that more than 60% of hunting districts are over their objective and the entire state is 50,000 elk above objective (United Property Owners of Montana 2022). Despite these conditions, state biologists do not implement intrusive measures such as vaccination, culling, and test-and-slaughter to prevent mingling and brucellosis transmission from elk to cattle. Instead, they manage brucellosis transmission risk from elk to livestock by hazing, hunting, and fencing or removing haystacks and other attractants to prevent mingling (Rayl et al. 2019).

Before the IBMP, bison that migrated into Montana were shot, slaughtered, or hazed back into the park by Montana personnel where some bison died of starvation or other natural causes (USDOI and USDA 2000a). This approach involved more hands-on management by Montana, including funding and staff, to mitigate possible land use conflicts. In contrast, management of bison under the IBMP has included more intrusive actions in the park, such as capture, test-and-slaughter, and vaccination to constrain their abundance and distribution. The Montana Legislature assigned primary management duties for Yellowstone bison to the Department of Livestock (MCA 81-2-120) and imposed restrictions on the movements and relocation of bison (MCA Titles 81 and 87). Thus, the ecological processes of bison migration and dispersal are restricted at or near the park boundary due to concerns about brucellosis transmission to cattle. Elk with the disease are allowed to move freely into Montana and managed much less intrusively even though they have transmitted brucellosis to cattle numerous times (White et al. 2015a).

For further recovery, bison need similar access to habitat that other wildlife species, such as elk, are given in the Yellowstone area, including year-round access to national forests and other public lands (White et al. 2015b). However, managers at YNP cannot preserve a viable population of bison on their own because when bison leave the park they are no longer under the agency's jurisdiction. Instead, their management falls to Montana, and in most cases, the USFS, which manages their habitat on National Forest System

lands. The NPS has worked with these agencies using adaptive management to increase tolerance for bison in their jurisdictions, including year-round in some areas (Bullock 2015). In 2022, the Custer Gallatin National Forest adopted a new LMP. The selected alternative includes components supporting habitat improvement projects to create or connect suitable bison habitat with enough bison present and distributed year-round to provide a self-sustaining population on the national forest in conjunction with bison herds in YNP (USDA, USFS 2022a) Allowing bison to occupy more public lands would create new opportunities for hunting (managed by the State of Montana or American Indian Tribes), bolster tourism, and enhance conservation.

Alternatives 2 and 3 would reduce intrusive management actions, such as capture for shipments for processing and hazing to constrain the abundance and distribution of bison. Alternative 3 would treat wild bison and elk similarly in YNP except for captures of bison near the north boundary for possible placement in the BCTP. The NPS believes this program is important for fulfilling its trust responsibilities to American Indian Tribes and the public by restoring brucellosis-free bison to more portions of their historic range. Thus, implementing this recommended alternative would not meet the purpose and need for action, is duplicative in part with other alternatives, and implementation in Montana is outside the jurisdiction of the NPS.

Hunting Modifications—When bison cross the boundary of YNP into Montana, they are no longer under the jurisdiction of the NPS. Instead, their management, including public hunter harvests, is the jurisdiction of Montana, and their habitat is managed by the USFS on National Forest System lands. In addition, several American Indian Tribes have rights reserved by treaties with the federal government to harvest bison migrating outside YNP onto portions of the Custer Gallatin National Forest. Thus, decisions about prohibiting hunting adjacent to YNP, changing hunting regulations, having split seasons, increasing permits for residents, and fees for hunting are the jurisdiction of Montana and treaty tribes. The NPS would continue to work with partners to honor and support rights reserved through treaties and coordinate with the IBMP members to increase the efficacy and safety of these hunts that provide access to a traditional food resource. Congress prohibited hunting in YNP in 1894 (16 USC 26), and this prohibition includes the boundary lands area in northern YNP between Gardiner, Montana, and the northern boundary of the park at Reese Creek. Thus, this recommended alternative would be outside the jurisdiction of the NPS and inconsistent with existing laws, policies, regulations, and case law regarding hunting in units of the NPS. It also would be inconsistent with long-standing basic policy objectives for NPS units where hunting is not authorized.

Tribal Right of First Refusal for Bison—The ITBC requested tribal right of first refusal for all bison transferred from the park. Through the BCTP, the NPS has transferred all bison completing quarantine as "surplus animals" to the Fort Peck Tribes for assurance testing. To date, the Fort Peck Tribes operate the only approved assurance testing facility capable of receiving bison cleared from quarantine in YNP. The Fort Peck Tribes coordinate with the ITBC to transfer bison completing assurance testing to other American Indian Tribes. Since 2012, all bison captured for transfer for processing have been transferred to American Indian Tribes for distribution of meat, hides, and other resources. Under the proposed alternatives, bison completing quarantine or assurance testing in YNP would continue to be sent to American Indian Tribes. In addition, bison captured for processing would continue to be transferred to American Indian Tribes for distribution of meat and hides.

The NPS has collaborated with several American Indian Tribes associated with YNP and the ITBC through agreements and other avenues to benefit their interests. These collaborations have included involving American Indian Tribes as partners in the management of Yellowstone bison; coordinating with American Indian Tribes that harvest bison on National Forest System lands adjacent to the park to reduce the effects of capture operations on hunting opportunities; and expanding the BCTP to identify more brucellosis-free bison and transfer them to American Indian Tribes for restoration on their lands. The NPS would continue to collaborate with American Indian Tribes and the ITBC on these issues, as well as the composition and distribution of bison captured for the BCTP, the processing of bison killed at Stephens

Creek Administrative Area, the creation of new quarantine and terminal pastures for Yellowstone bison, the testing of bison in the BCTP to improve effectiveness and shorten timelines, the involvement of tribal personnel in bison management, and the implementation of lower-stress handling techniques with captured bison to reduce trauma. These collaborations may be implemented through cooperative agreements or other appropriate avenues.

The Superintendent, through the Secretary of the Interior and Director of the NPS, has the discretion to transfer or dispose of "surplus" animals (16 USC 36; 54 USC 100101, 100752). They have the authority to enter into transfer agreements and discussions with other federal, state, and tribal agencies. The Secretary of the Interior and responsible NPS managers will continue to collaborate with American Indian Tribes and tribal organizations on the transfer of "surplus" Yellowstone bison.

Construct Another Quarantine Facility (West Side of Park) to Avoid Conflicts with Hunts—The NPS has doubled the capacity of the BCTP in northern YNP (see the "Actions Common to All Alternatives" section). Currently, the agency does not have a need, funding, or staff to construct and implement quarantine operations on the west side of the park. Since 2017, NPS biologists have recommended no management removals or public hunts and tribal harvests of bison in the western management area in Montana. Bison migrating west of the park during winter are almost entirely from the central breeding herd, which has decreased in abundance since 2005. Management captures and removals have not occurred along the western boundary since 2010, but public hunts and tribal harvests continue in nearby areas of Montana. In addition, the NPS has indicated bison captured but not eligible for quarantine at the Stephens Creek Administrative Area could be released to increase hunting opportunities if they subsequently migrate to the park boundary. Regardless, the NPS has indicated it could collaborate with interested partners to establish additional quarantine facilities outside the park and transfer bison to them as the capacity of these facilities and availability of migrating bison allow. These partners would need to work with Montana and other IBMP members to evaluate the design, cost, and potential locations within the DSA for brucellosis, as well as the development of environmental compliance assessments and a management plan for transplanting Yellowstone bison onto suitable private or public lands in Montana (Section 5 of §87-1-216 MCA). They also would need to develop agreements for building, maintaining, and operating the facilities and conducting quarantine testing. In addition to the reasons listed above, this alternative element would duplicate elements included in Alternative 2 and was therefore not carried forward for detailed analysis.

Changes to Quarantine Protocols—APHIS maintains authority to control and/or eradicate brucellosis under the Animal Health Protection Act, in section 10411 (7 USC 8301) and 10409 (7 USC 8308). The act provides, among other things, the authority for APHIS to cooperate with states or political subdivisions thereof, domestic or international associations or organizations, American Indian Tribes, and individuals to improve livestock and to control or eradicate any communicable disease of livestock, including brucellosis. APHIS maintains it has authority for establishing policy and guidance for establishing likelihood of brucellosis-freedom in livestock as well as brucellosis-freedom in bison from YNP. The State of Montana maintains it has authority under MCA, Title 81, Chapter 2, and specific authority over Yellowstone bison under MCA 81-2-120, for the State Veterinarian to ultimately provide brucellosis clearance that allows bison to enter or pass through the State of Montana from YNP.

In the FONSI for *The Use of Quarantine to Identify Brucellosis-free Yellowstone Bison for Relocation Elsewhere* EA (USDOI, NPS 2018), the NPS's selected action was to establish a quarantine program for Yellowstone bison using a combination of elements from Alternative 2 (Quarantine Facilities Within the Designated Surveillance Area for brucellosis) and Alternative 3 (Quarantine Facilities Outside the Designated Surveillance Area). To satisfy these authorities, the NPS completes quarantine within the park in coordination with APHIS and the State of Montana. The entities outline quarantine procedures using a General Agreement. The current agreement states "all parties will follow the cattle and bison regulations of the National Brucellosis Eradication Program, including VS Memos, VS Notices, VS Guidance Documents, pertinent parts of the Code of Federal Regulations, and the UM&R." Thus, the entities agree

to use protocols outlined by APHIS to identify brucellosis-freedom, and the State Veterinarian agrees to provide formal brucellosis clearance if the NPS is in compliance. Unilateral changes made by the NPS to quarantine protocols would signify the NPS is no longer abiding by its agreements with APHIS and Montana, which could cause APHIS or Montana to restrict movement of bison from YNP. The NPS would continue to collaborate with APHIS and Montana to provide data on bison undergoing quarantine in YNP to inform APHIS's efforts to adjust quarantine protocols. For these reasons, the NPS did not consider changes to quarantine protocols in this plan/EIS.

Manage for a Target of More Than 7,000 Bison—As indicated in the Notice of Intent (NOI) to prepare the draft plan/EIS, the NPS considered alternatives with as many as 10,000 bison. Biologists estimated the carrying capacity for bison in YNP at about 10,000 bison during summer and 6,500 during winter (Coughenour 2005; Plumb et al. 2009; Geremia and Hamilton 2019). As indicated under "Actions Common to All Alternatives," the upper population estimates provided for each alternative are intended to guide the implementation of risk management activities; they are not targets necessitating immediate population adjustment. Bison abundance may exceed the upper estimate in each range at times due to a series of mild winters that limit migration and removals or because new research or successful management based on the demographic, genetic, ecological, and social objectives indicate bison can be sustained at a higher population level.

With around 4,400 to 5,900 bison in the population since 2013, numbers of animals moving north of Mammoth Hot Springs in the park averaged 1,389 animals per winter with up to 1,000 animals outside the park at one time. The State of Montana defines tolerance limits for bison outside the park and has informally indicated that several hundred animals could be tolerated outside the northern boundary in its 2015 decision to expand tolerance areas. An alternative including more than 7,000 bison after calving is infeasible because numbers of animals outside the park during some winters would far exceed tolerance limits defined by the State of Montana.

Ceasing Transfer to Tribes for Processing in All Circumstances—After reviewing public comments, the NPS considered ending all transfer of bison to American Indian Tribes for processing under any circumstance. With higher numbers of bison, movements to the boundary could occur earlier and be larger in some winters (Geremia et al. 2015a). Thus, more bison would be available for the BCTP and harvest opportunities in Montana. However, the removal of 1,000 or more bison may be necessary during many winters to reduce bison numbers once they approach or surpass 7,000 animals, as defined by Alternative 3. It is uncertain whether public hunting, tribal harvest, and the BCTP would be sufficient to remove enough bison from the population in these winters, especially if the capacity for quarantine and assurance testing is full, and hunting is ineffective at removing enough bison to regulate numbers. Hunter harvests are not always effective at limiting ungulate numbers as evidenced by the fact that more than 60% of elk hunting districts in Montana are over their objective, and the entire state is 50,000 elk above the objective (United Property Owners of Montana 2022). The late-winter movement patterns of bison and firing lines of hunters near the park boundary have limited the effectiveness of using hunting in Montana to manage bison numbers and distribution in many winters.

The State of Montana defines tolerance limits for bison outside the park and has informally indicated that several hundred animals could be tolerated outside the northern boundary in its 2015 decision to expand tolerance areas. Managing for more than 7,000 bison would likely lead to numbers of animals outside YNP that surpass existing tolerance limits defined by the State of Montana. Also, the Governor of Montana indicated in a July 21, 2023, letter sent to the NPS regarding the draft plan/EIS that "absent commitment to specific, predictable population and disease management activities, the State may be forced to re-examine its tolerance." It is infeasible to manage for numbers that far exceed 7,000 animals (the NPS includes a specific dismissal for managing for more than 7,000 bison in this chapter), which could happen if public hunts, tribal harvests, and the BCTP cannot control numbers. Alternative 3 considers ceasing all transfer for processing with fewer than 7,000 bison and only resuming transfer for processing as an assurance tool to keep the population within a number range compatible with existing

tolerance areas outside YNP. For these reasons, this alternative element was not carried forward for detailed analysis.

Manage for Numbers of Bison and Vegetative Communities Present When the Park was Established—Some members of the public suggested the NPS manage for historical conditions of bison and vegetation present when the park was established. This would entail managing for fewer than 1,000 bison on the landscape. The NPS includes a specific dismissal for managing fewer than 3,000 bison in this chapter. Importantly, managing for fewer than 1,000 bison likely would fail to preserve existing genetic diversity and would raise concerns related to the ESA.

Regarding the idea of managing for historical vegetative conditions in YNP, during the first half of the 20th century, the NPS's actions significantly altered vegetation in parts of YNP. These actions included removing wolves; permitting livestock grazing; introducing nonnative plants; irrigating the Lamar Valley; building fences and corrals for bison; and culling elk, pronghorn, and deer. Later, the NPS stopped culling ungulates within the park and focused on predator recovery. As a result, especially in northern YNP and the Lamar Valley, some woody-riparian habitats were replaced by grasslands. Planted cool-season invasives like Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), creeping clover (*Trifolium repens*), and smooth brome (*Bromus inermis*) spread to other floodplain and nutrient-rich habitats. Further details are described in chapter 3 of this plan/EIS. These actions changed the baseline conditions for vegetation communities for some areas of the park.

NPS *Management Policies* (2006) define "[a]ll exotic plant and animal species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if (1) control is prudent and feasible, and (2) the exotic species interferes with natural processes and the perpetuation of natural features, native species, or natural habitats" (*Management Policies* 4.4.4.2). Control of cool-season invasives across large extents of northern YNP is neither prudent nor feasible. Also, many of these invaded grasslands sustain the ecosystem services that would have been provided by the native communities that were replaced.

Management Policies (2006) also state that "whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species" (*Management Policies* 4.4.2). Management policies also direct the NPS to restore native plant and animal species that were "substantially diminished as a direct or indirect result of human-induced change to the species population or to the ecosystem" (*Management Policies* 4.4.2.2). Presently, YNP supports fully restored large herbivore and large predator populations. The recovery of large herbivores facilitated predator recovery. Recovery of large herbivores also contributed to the decline of riparian zones in some northern regions of YNP, compared to historical conditions, and the spread of some invasive plants. The NPS considers these to be natural fluctuations in the ecosystem.

Management Policies (2006) defines "natural condition" as "the condition of resources that would occur in the absence of human dominance over the landscape" (see *Management Policies*, Chapter 4, Introduction). Considering that current science says that climate change is linked in large measure to human activity, and that the rate of climate change will continue to accelerate, achieving natural conditions and a "vignette of primitive America," or in this specific case, managing for historic vegetative conditions, is a challenging directive. Although "natural conditions" may be both increasingly difficult to characterize and ineffective as a guide for desired future conditions, traditional practices targeted to maintain natural conditions in the park would continue. The NPS would continue to manage and remove invasive species and other stressors; maintain natural processes and disturbance regimes; restore naturally functioning ecosystems; support biodiversity and landscape connectivity; participate in the movement of genetics between bison herds if the population gets too low; and continue other actions that build and support system resilience. These actions are consistent with NPS's need to adapt to climate change (USDOI, NPS 2012b).

Some members of the public have suggested the NPS request the Bureau of Land Management assess vegetation conditions and provide recommendations for management. The methodologies and criteria that the Bureau of Land Management uses to determine forage capacity for public cattle grazing are not necessarily the same as those used for determining wildlife habitat capacity in YNP. The Bureau of Land Management regularly uses Animal Units per Month as a process for determining sustainable stocking rates for grazing pastures and rangelands in the west. The Bureau of Land Management would likely advocate for less grazing to improve riparian areas and distribute grazing more evenly. Such actions would directly conflict with NPS policies to allow natural processes to predominate. Also, most of the areas used by bison are recommended wilderness. The park's recommended wilderness is managed as wilderness per *NPS Management Policies*. NPS manages wilderness to preserve untrammeled, natural, and primitive characteristics. Controlling grazing to alter vegetation would directly conflict with such characteristics. For these reasons, NPS law, regulation, and policy do not support the NPS managing to historical conditions when the park was created, and this would not meet the purpose and need of this plan/EIS.

Chapter 3: Affected Environment and Environmental Consequences

Introduction

This chapter describes the current and expected future conditions of Yellowstone bison, wildlife, threatened animals and plants, American Indian Tribes and ethnographic resources, human health and safety, socioeconomics, visitor use and experience, and vegetation by implementing the alternatives described in chapter 2.

General Methodology for Assessing Impacts

This chapter is organized by impact topics, which represent specific resources. Under each impact topic, the "Affected Environment" is presented first and includes a discussion of the current state of each resource. The "Affected Environment" includes environmental trends and reasonably foreseeable actions, where appropriate. The "Environmental Consequences" section evaluates direct, indirect, and cumulative effects on the natural and human environment (i.e., physical, natural, cultural, and socioeconomic resources) from the implementation of each alternative.

Note that for all impact topics, the impacts of the no-action alternative (Alternative 1) are characterized in the "Affected Environment" section, because implementation of the no-action alternative would result in the same impacts and trends as are currently occurring. This approach takes into consideration direction from CEQ that EISs shall be analytic, concise, and no longer than necessary to comply with NEPA (40 CFR 1502.2) and is consistent with direction from CEQ that states that agencies "may contrast the impacts of the proposed action and alternatives with the current and expected future conditions of the affected environment in the absence of the action, which constitutes consideration of a no-action alternative" (85 FR 43323).

Yellowstone Bison

Affected Environment: Current Status and Expected Future Conditions

Population and Distribution—Archeological evidence indicates bison have lived in the GYA for more than 10,000 years, and historical narratives suggest they were abundant and widely distributed into the 1830s (Cannon et al. 2020; Whittlesey and Bone 2020). Bison were much more numerous at lower elevations in river valleys and on the surrounding plains, but many apparently migrated into the mountains during summer to access nutritious forage, and a smaller number lived year-round in the mountains, including the area encompassed by present-day YNP (Cannon et al. 2020; Whittlesey and Bone 2020). Numbers of bison using mountainous areas, like present-day Yellowstone, may have increased when bison were being hunted to near extinction. Around 1,000 animals were estimated within the park near the time of establishment in 1872 (Meagher 1973). About 600 bison were reported in 1880 as poaching reduced numbers (NPS 1880; Meagher 1973). By 1902, only 23 bison were counted in the park. Bison numbers increased after protection from hunting and poaching due to husbandry and the reintroduction of bison to various locations, including the northern and central portions of YNP. The NPS fed bison in the northern portion of YNP during winter at the Buffalo Ranch in the Lamar Valley and herded them to the Mirror Plateau and the upper Lamar River area during summer (Meagher 1973). The remaining native bison spent winter in the Pelican Valley in central YNP but also moved to the Mirror Plateau and upper Lamar River area during summer. Bison numbers increased rapidly to about 1,100 by 1930 (Meagher 1973).

The NPS counted between 2,900 and 5,900 Yellowstone bison after calving each summer between 2001 and 2023. During 2023, the bison population was estimated around 3,960 pre-calving and 4,830 post-calving. Over the last 10 years, the post-calving population averaged 4,890. Post-calving numbers of bison in the northern herd increased from 1,500 in 2008, stabilizing around 4,000 since 2016. Post-calving numbers of bison in the central herd rapidly declined from about 3,500 in 2006 to 1,500 in 2008

and continued to decline to 1,200 bison in 2023 (figure 3). Females (56.5%) outnumbered males (43.5%) in the population in 2023, with the male to female ratio decreasing over the last four years, but near the demographic objective previously described in chapter 2. The age structure of the population was also near the objective with about 30% juveniles and 70% in 2023. The calving rate in 2023 was near the long-term average of about 45 calves per 100 2+ year-old females. Survival and birth rates have remained high as numbers increased, with the population maintaining an annual growth rate of about 14% after accounting for hunter harvests and management removals (Geremia 2022).

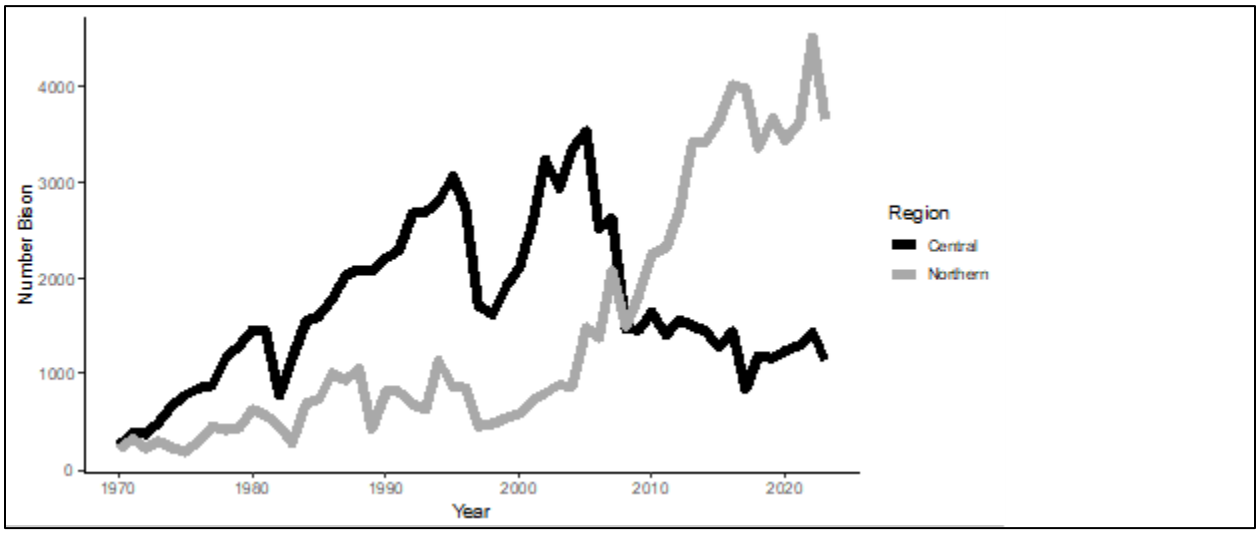


Figure 3. Numbers of bison counted in the Northern Region of YNP and Central Region of YNP during summer 1970-2023

Bison roam relatively freely over an expansive landscape in YNP. Bison can use all wilderness and other undeveloped areas in YNP, which includes about 99.3% of the park's 2.2 million acres (8,900 square kilometers). When Yellowstone bison leave the park, they are no longer under the jurisdiction of the NPS and are managed as wildlife by the State of Montana. Under the current State of Montana Decision Notice for Year-Round Tolerance Plan, bison would continue to migrate from YNP during winter and spring into established management areas north and west of the park in Montana. State personnel would continue to haze female and young bison from the northern management area back to YNP by May 1, but male bison could remain in this area year-round. Bison of both sexes could use the Eagle and Bear Creek areas and portions of the Absaroka-Beartooth wilderness north of YNP year-round (figure 4). In addition, bison of both sexes could use the Hebgen Basin west of YNP year-round, including Horse Butte and north along Highway 191 to the Cabin Creek Recreation and Wildlife Management Area, Monument Mountain Unit of the Lee Metcalf Wilderness, and the Taylor Fork drainage (figure 5). State personnel would continue to limit numbers of bison in the western management area to 250 from July through September, 450 from October through February, and 600 from March through June. From November 15 through April 15, up to 30 female bison (or a mixed group of 30 males and females) could use the Madison Arm. After April 15, up to 30 female/mixed group bison could be east of the Madison Arm Resort. After May 15, no females or mixed groups of bison could use the Madison Arm, and state personnel would haze them to nearby areas or remove them (IBMP Agencies 2016).

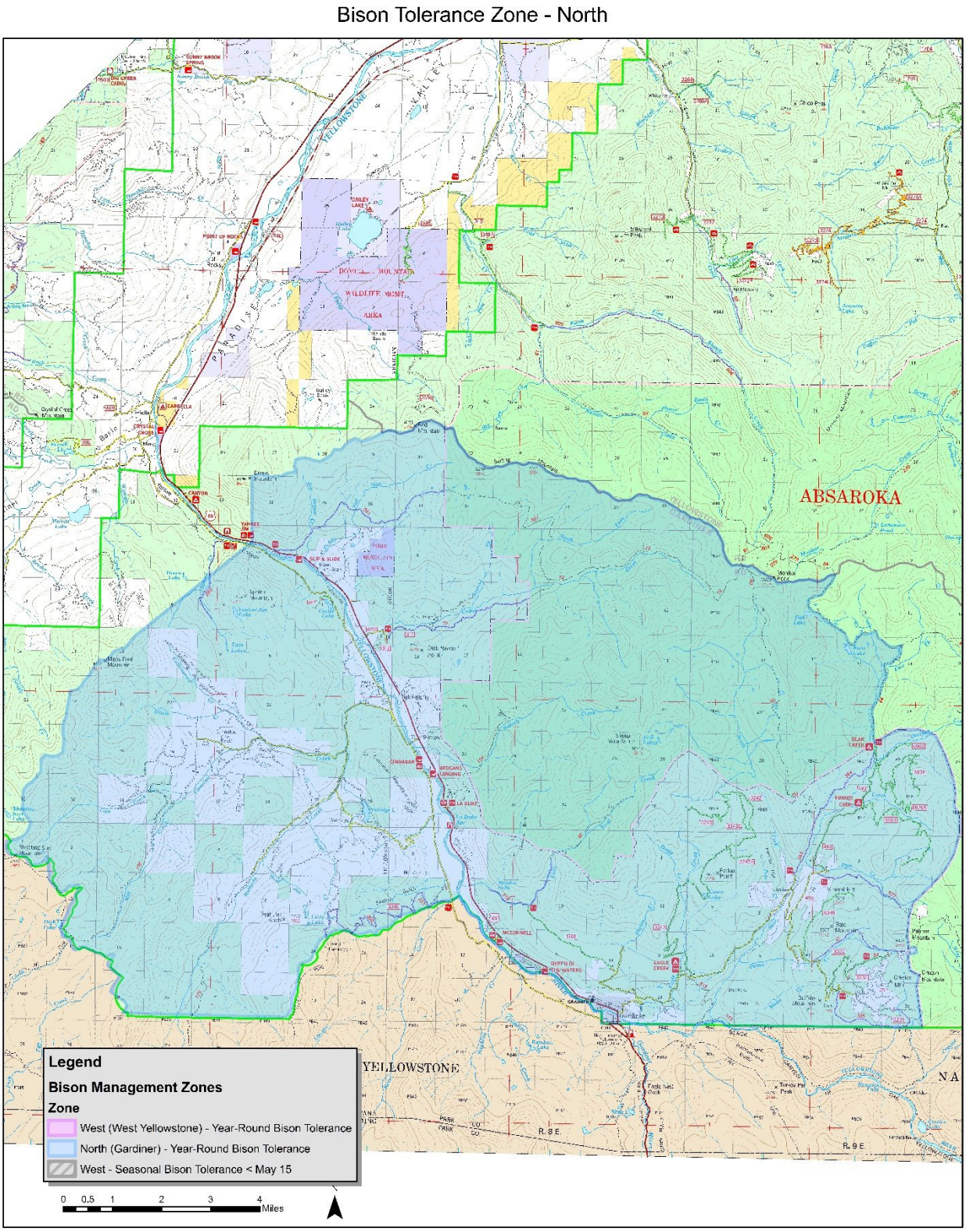


Figure 4. Northern management area in Montana for the Interagency Bison Management Plan (Map courtesy of the Custer Gallatin National Forest)

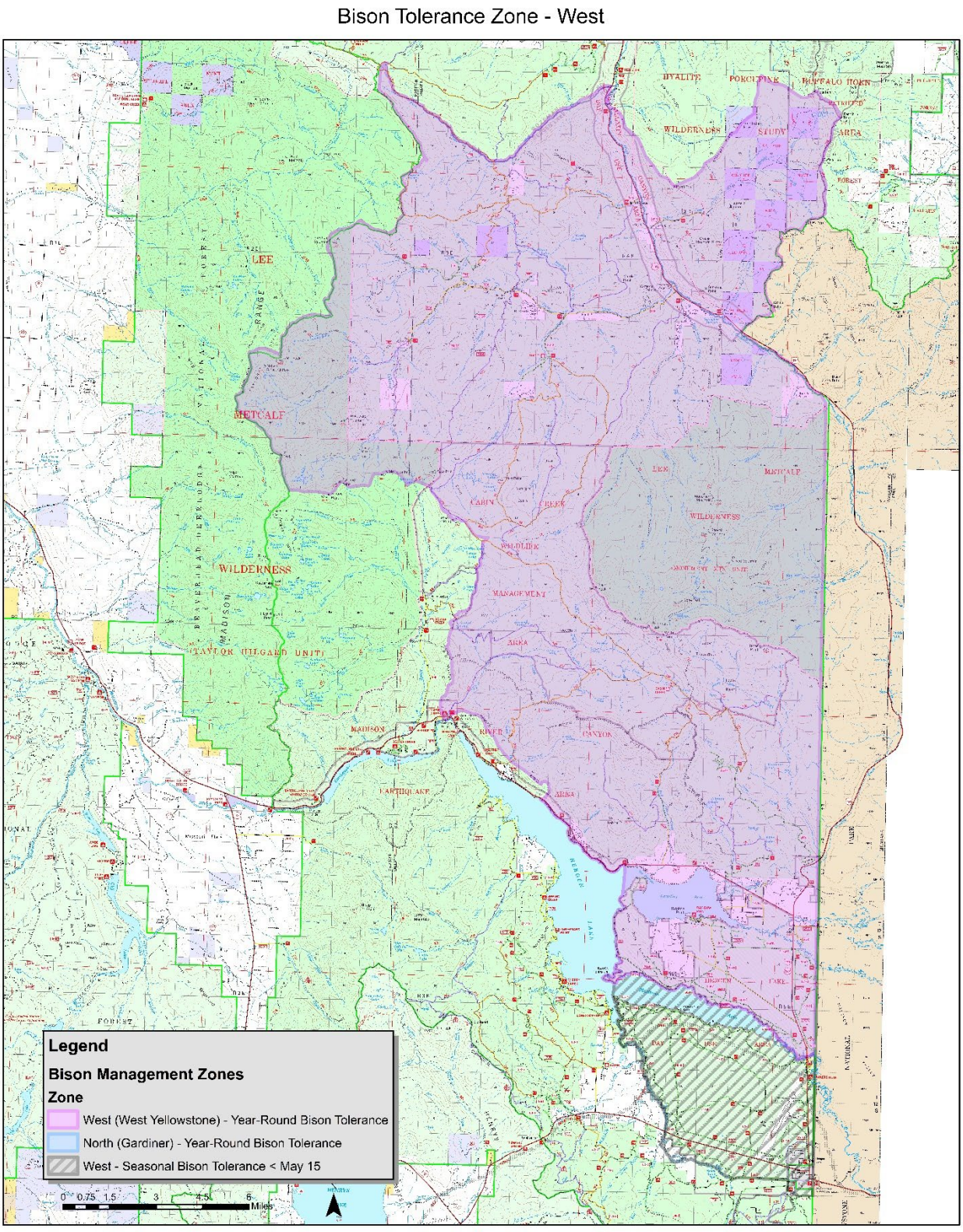


Figure 5. Western management area in Montana for the Interagency Bison Management Plan (Map courtesy of the Custer Gallatin National Forest)

Migratory and dispersal movements of bison are often impeded by intense hunting near the park boundary that induces surviving bison to return to the park. When hunter harvests were not sufficient to limit population growth, park managers implemented captures and culling of bison (primarily for shipments for processing) to decrease numbers. The IBMP members and American Indian Tribes engaging in tribal harvests have removed (through hunter harvests, culls, and placement in the BCTP) about 11,700 bison since 2001, which exceeds deaths from natural causes such as injuries, predation, and starvation. The NPS captured and removed bison in the Stephens Creek Administrative Area during the winters of 1997, 2003, 2004, 2006, 2008, 2011, 2014 to 2020, 2022, and 2023. Capture and transfer for processing or to research facilities removed about 6,500 bison during winters from 2001 through 2023. Since 2016, about 580 bison were placed in the BCTP.

The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101, USDOI NPS 2006a), and public hunts and tribal harvests removed about 4,300 bison during winters from 2001 through 2023 (table 2) outside the park. Public hunts and tribal harvests removed about 260 bison per winter during 2012–2022, and around 1,175 bison in winter 2022–2023. The NPS expects a similar range of harvests would continue under current management. Some bison move to lower-elevation ranges in Montana each winter, depending on food production and consumption, snowpack, and bison numbers (figure 6; Geremia et al. 2011, 2014). Thus, bison should continue to be available for harvests in Montana during many winters. In 2011 and 2023, the NPS held about 800 bison in captivity and fed them hay for several weeks to prevent a mass migration north of the park. These bison were released during spring, but confinement and feeding conflict with the management of bison as wildlife and could lead to food-conditioning, disease transmission during confinement, and disruption of traditional migratory patterns.

Following a summer count of more than 5,800 bison in 2022, the NPS forecast that at least 800 bison would need to be removed to stabilize or slightly decrease numbers. The winter of 2022–2023 was the most severe of the IBMP era (2001–2023). Snow pack was about 199% at Tower Junction in northern YNP and snow water equivalent was about 156% at West Yellowstone, Montana (Geremia 2023). As a result, more than 4,000 bison migrated out of the park, with 1,551 of those animals removed. Bison survival and calving are lower during and after severe winters, respectively, with a population growth rate of less than 4% after severe winters in 2005–2006, 2007–2008, and 2010–2011 compared to an average growth rate of 15% during the IBMP era (Geremia 2023). However, numbers of Yellowstone bison increased during the IBMP era despite these severe winters and the removal of about 11,700 bison from 2001 through 2023 (Geremia 2022, 2023, figure 7). The NPS expects this pattern to continue under current management.

Table 2. Numbers of bison removed from Yellowstone National Park or nearby areas of Montana from 1985 to 2023

	Average Number of Bison Counted Previous July-August			Processing or Other Management Removal		Hunter Harvest[a]		Placed in BCTP		Total Removal
Winter	Northern Herd	Central Herd	Total	North Boundary	West Boundary	North	West	North	West	
1985	695	1,552	2,247	0	0	88	0	0	0	88
1986	742	1,609	2,351	0	0	41	16	0	0	57
1987	998	1,778	2,776	0	0	0	7	0	0	7
1988	940	2,036	2,976	0	0	2	37	0	0	39
1989	1058	2,089	3,147	0	0	567	2	0	0	569
1990	432	2,075	2,507	0	0	1	3	0	0	4
1991	818	2,203	3,021	0	0	0	14	0	0	14

	Average Number of Bison Counted Previous July-August			Processing or Other Management Removal		Hunter Harvest[a]		Placed in BCTP		Total Removal
Winter	Northern Herd	Central Herd	Total	North Boundary	West Boundary	North	West	North	West	
1992	822	2,290	3,112	249	22	0	0	0	0	271
1993	681	2,676	3,357	0	79	0	0	0	0	79
1994	686	2,635	3,321	0	5	0	0	0	0	5
1995	1,140	2,974	4,114	307	119	0	0	0	0	426
1996	866	3,062	3,928	26	344	0	0	0	0	370
1997	860	2,724	3,584	725	358	0	0	0	0	1,083
1998	455	1,715	2,170	0	11	0	0	0	0	11
1999	489	1,622	2,111	0	94	0	0	0	0	94
2000	550	2,034	2,444	0	0	0	0	0	0	0
2001	690	2,578	2,584	0	6	0	0	0	0	6
2002	722	3,081	3,268	0	202	0	0	0	0	202
2003	921	2,864	3,802	231	13	0	0	0	0	244
2004	1,060	3,059	3,785	267	15	0	0	0	0	282
2005	1,368	3,493	4,119	1	96	0	0	0	17	114
2006	1,313	2,479	4,860	861	56	32	8	87	0	1,044
2007	1,820	3,583	3,792	0	4	47	12	0	0	63
2008	1545	1,386	4,402	1,288	160	59	107	112	0	1,726
2009	1,639	1,514	2,931	1	4	1	0	0	0	5
2010	2,029	1,697	3,154	3	0	4	0	0	0	7
2011	2,381	1,237	3,725	59	0	201	0	0	0	59
2012	2,563	1,532	3,619	0	0	15	13	0	0	28
2013	3,272	1,388	4,095	0	0	148	81	0	0	229
2014	3,294	1,408	4.660	318	0	258	69	0	0	645
2015	3,465	1,299	4,703	518	0	201	18	0	0	737
2016	3,444	1,558	5,001	101	0	378	24	49	0	552
2017	3,969	847	4,816	753	0	389	97	35	0	1,274
2018	3,397	1,037	4,433	697	0	285	90	99	0	1,171
2019	3,604	1,143	4,747	348	0	109	3	0	0	460
2020	3,422	1,247	4,669	445	0	223	61	105	0	834
2021	3,727	1,432	5,158	0	0	153	34	0	0	187
2022	4,464	1,358	5,822	27	0	6	7	10	0	50
2023	3,414	1,460	4,873	94	0	1,133	42	282	0	1,551

[a] Total bison shot by game wardens and hunters from 1973 through 1991, and state hunts and tribal harvests after 2005 outside the park, including injured bison dispatched during hunts. The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101, USDOI NPS 2006a).
unk = unknown

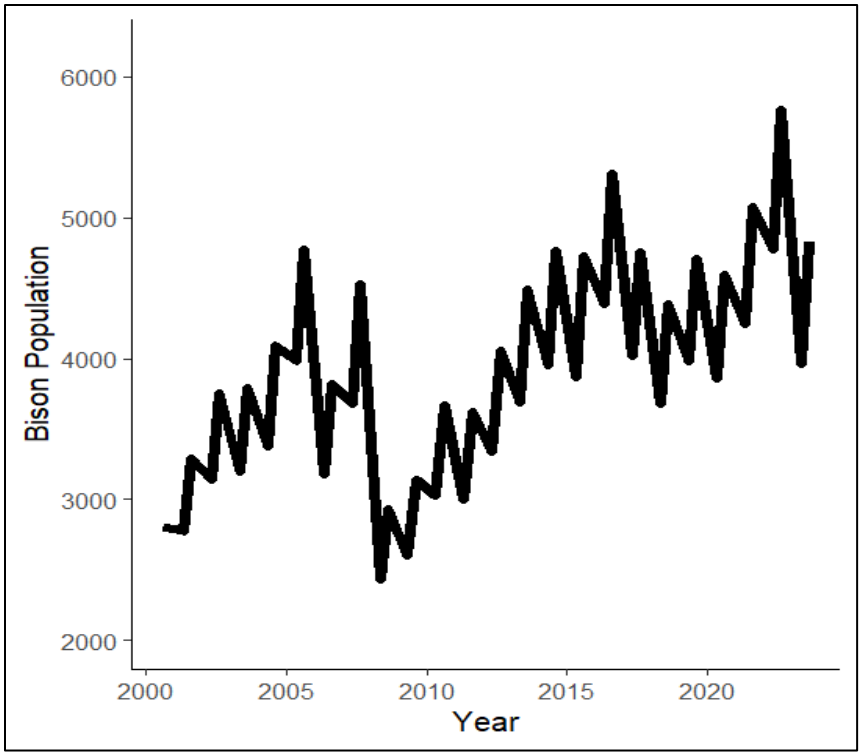
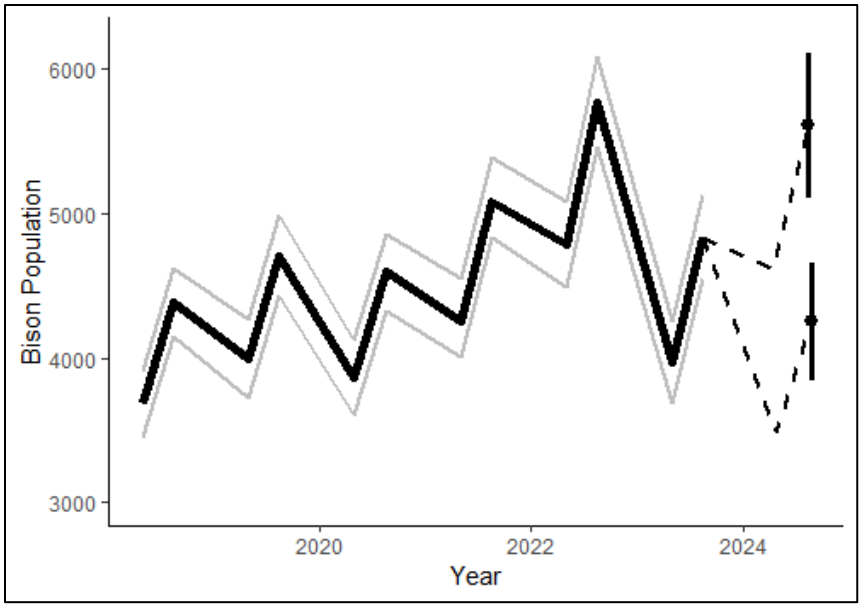


Figure 6. Numbers of bison in the Yellowstone population during 2001 to 2023



Source: Geremia (2023)
Black bold lines represent model predicted average population size and grey lines show the 95% range of estimates. Dotted lines show predictions for the population assuming 0% or 25% of the population is removed during 2023-2024 winter.

Figure 7. Modeling estimates forecasted the bison population to remain within numbers observed during the IBMP era during 2023-2024 provided IBMP partners removed between zero and 25% of the population

Public hunting and tribal harvests began in the winter of 2005–2006 with American Indian Tribes asserting their treaty rights to hunt outside the northern boundary of the park. During these early years, two American Indian Tribes exercised their right to hunt. Over time, more American Indian Tribes have exercised their right to hunt, and hunting intensity, particularly in Beattie Gulch, increased. Hunter harvest data are included in table 2.

The IBMP agencies made adaptive management adjustments to the IBMP in 2008 to decrease captures and shipments of bison for processing by increasing hunting opportunities outside the park. Management action 2.2.b indicates: "adjacent to YNP, emphasize management of bison as wildlife and increase the use of state and treaty hunts to manage bison numbers and demographic rates, limit the risk of brucellosis transmission to cattle, and protect human safety and property" (Partner Agencies, IBMP 2008). The Citizens Working Group on Yellowstone Bison (2011) recommended making public hunting and tribal harvests in Montana a primary method to decrease bison numbers rather than shipments for processing. The Working Group also recommended MFWP and American Indian Tribes set collective hunt targets and document hunter harvests. The IBMP agencies agreed to these recommendations, although some American Indian Tribes objected to hunting limits. The IBMP agencies revised the adaptive management plan in 2011 to include "[o]bjective 1.4: recognize tribal treaty rights for hunting bison." Management action 1.4a is to "[a]llow bison to occupy National Forest System lands and other areas determined suitable within the designated tolerance area (Zone 2) and maximize timing and geographical extents to increase tribal harvest opportunities." Management action 1.4b is to "[c]oordinate management activities that could potentially impact opportunities for tribal members to exercise their treaty rights." The expansion of the management (tolerance) zones in Montana during 2015 (Bullock 2015; IBMP Agencies 2016) was an important step toward eventually reestablishing year-round bison presence to support tribal harvests on lands in these areas, as was the 2022 LMP supporting bison presence and distribution year-round on the Custer Gallatin National Forest (USDA, USFS 2022a).

By 2013, the number of tribal members hunting in the Beattie Gulch area outside the northern park boundary had increased, leading to issues such as "firing lines" that prevented bison from distributing across the larger landscape, wounding of bison that returned to the park, concentrations of gut piles near roads and residences, and human safety issues. The Custer Gallatin National Forest worked with MFWP, hunting tribes, and private property owners to assess safety concerns associated with the hunt and implement management changes to address issues. In 2013, the Custer Gallatin National Forest issued a permanent shooting closure for a portion of Beattie Gulch between the Yellowstone River to the east, Old Yellowstone Trail South Road to the west, YNP to the south, and residential houses to the north. In addition, MFWP led efforts in 2013 to remove gut piles and other parts from bison harvested in Beattie Gulch to reduce the chance of grizzly bears congregating in the area.

In 2015, MFWP began requiring successful bison hunters to place unused parts of carcasses at least 200 yards (183 meters) from roads, trails, and homes, and to spread stomach contents on the ground to reduce attractions to scavengers. To decrease traffic congestion and carcasses along Old Yellowstone Trail South Road, the Custer Gallatin National Forest began allowing successful hunters access to the Beattie Gulch administrative road to retrieve bison. In 2016, the hunting tribes agreed to a 150-yard (137-meter) buffer extending west from Old Yellowstone Trail South Road in Beattie Gulch where there would be no shooting, carcasses, or gut piles. The Custer Gallatin National Forest issued an official shooting closure for this area in 2016. These actions, in addition to the Custer Gallatin National Forest Food Storage Order (effective March 1- December 1) moved shooting and carcasses farther away from residences in the area but shooting and bison offal remain a concern for property owners.

In 2017, the Nez Perce Tribe, Confederated Salish and Kootenai Tribes of the Flathead Nation, Confederated Tribes of the Umatilla Indian Reservation, and Yakama Nation signed a memorandum of agreement to maintain a regular, predictable, safe, and respectful bison hunt in Beattie Gulch. The tribes agreed to closely coordinate and implement common hunt protocols; safety regulations; and enforcement to ensure the safety of hunters, wardens, and the surrounding community. The agreement limits the

number of hunters from these tribes in the area to 25 or fewer at any time, with each hunting party having a designated lead hunter and law enforcement officer from each tribe remaining on-site to coordinate the hunts. The law enforcement officers hold a daily pre-hunt coordination meeting, meet with hunters to ensure safety, and issue citations, as necessary. The lead hunter for each party is responsible for ensuring hunters follow the hunt protocols and safety regulations, coordinating with other parties to determine an orderly engagement and hunter harvest of bison, and ensuring a safe approach and shooting direction.

In 2019, a local organization named the Bear Creek Council asked the IBMP agencies to consider recommendations for a safer hunt with fewer impacts to residents in and near Gardiner, Montana. The IBMP agencies hosted a field trip to the hunting areas outside the park, discussed concerns with local citizens, reviewed the current shooting closures and hunting regulations, and agreed to continue work to address these concerns while respecting tribal rights. In 2020, the Custer Gallatin National Forest implemented a one-year emergency closure and in 2021 implemented a permanent firearm discharge closure, including bison hunting, on about 23 acres (9 hectares) for human safety near Beattie Gulch and the McConnell area north of Gardiner, Montana. In 2023, staff from the Custer Gallatin National Forest, State of Montana, and the FWS, and members of the Shoshone-Bannock Tribes, removed gut piles and other parts from bison harvested in Beattie Gulch to reduce the chance of grizzly bears congregating in the area (French 2023).

Ecological Role of Bison—Large groups of bison move freely across wilderness and other undeveloped areas in YNP, producing a mosaic of grassland conditions by grazing and wallowing, depositing and redistributing nutrients across the landscape, and competing with other ungulates for food and other resources (Geremia and Hamilton 2019, 2022; Geremia et al. 2019). Higher numbers of bison increased their function as a meaningful component of the food web, influencing energy and nutrient transfer through the ecosystem (Geremia and Hamilton 2019, 2022). Bison provide prey for predators, create a variety of habitats for plants and animals, and provide carcasses for scavengers (Geremia et al. 2022). Bison do not have substantial negative effects on other resources such as geothermal features, songbirds, small mammals, insects, and other ungulates.

Bison do have substantial positive and negative effects on vegetation, as described in this chapter in the "Vegetation" section. Impacts vary with the intensity of grazing, with both positive and negative effects most pronounced in areas of highest bison use. In terms of positive effects, bison have been shown to increase plant community diversity, accelerate nutrient turnover, improve nutrition provided by plants, and facilitate plant growth under grazing. Bison have also been shown to facilitate the spread of invasive plants, compact soils, reduce water infiltration, facilitate the spread of grasses into riparian areas and inhibit willow, aspen, and cottonwood plants. Presently, the strongest effects are limited to the summering areas of bison in the Lamar and, to a lesser degree, Hayden Valleys.

Adaptive Capabilities and Genetics—Yellowstone bison exhibit wild behaviors like their ancestors, competing for food and mates, using group defensive strategies to protect their young from predators, and moving widely to explore new areas. They are extremely adaptable and quickly respond to management actions and environmental changes. Virulent diseases that kill substantial numbers of animals currently are not affecting the bison population. In addition, bison can withstand severe winter conditions with poorer forage availability better than smaller ungulates due to their large four-chambered stomach that effectively digests plants high in fiber (Wallen and White 2015).

Yellowstone bison are one of a few populations that meet the viability guidelines recommended by scientists (Freese et al. 2007; Sanderson et al. 2008; Hedrick 2009; Dratch and Gogan 2010; Gross et al. 2010). Geneticist Dr. Philip Hedrick at the University of Arizona indicated "[i]ndividual herds or clusters [of bison] should have an effective population size of 1000 (census number of 2000-3000) to avoid inbreeding depression and maintain genetic variation. If it is not possible to have this primary herd in 1 location, then it could be in 2 or 3 locations with significant genetic exchange between them. Note that this is larger than any of the plains bison herds except for Yellowstone NP [National Park] and any of the

wood bison herds except for Wood Buffalo NP and Mackenzie Bison Sanctuary in Canada" (Hedrick 2009:419). Although there is evidence of genetic differences between bison sampled in the central and northern breeding herds (Halbert et al. 2012), monitoring of radio-collared bison and genetic markers suggest Yellowstone bison are a single intermixing population during recent decades, with substantial movements, breeding, and gene flow between bison originating from central and northern Yellowstone (White and Wallen 2012; Wallen and White 2015; Forgacs et al. 2016; Stroupe et al. submitted). Thus, Yellowstone bison meet Dr. Hedrick's criteria for sustaining an effective population size and maintaining genetic variation.

The NPS is meeting the genetics objectives described in the "Adaptive Management" section in chapter 2. The NPS has allowed gene flow between the primary breeding herds, and the larger population size has helped maintain existing genetic diversity without genetic exchange from other bison populations. Bison breed in the northern or central geographic regions of the park with some interchange of animals between breeding areas among years (Wallen and White 2015). The founding maternal lineages of the population occur in both breeding areas. Maintaining more than 1,000 bison in each breeding area helps to protect any existing unique diversity or rare alleles. In addition, the NPS has maintained a balanced sex ratio to support mate competition and allow natural selection to influence population genetics.

Continuing current management should not reduce genetic diversity or change the genetic constitution of the population. In 2011–2012, geneticists identified 10 different mitochondrial deoxyribonucleic acid (DNA) haplotypes in Yellowstone bison, an overall haplotype diversity of 0.78, and identified descendants of the original indigenous and introduced bison that founded the current bison population. (Forgacs et al. 2016). Genetic analyses of nuclear DNA identified high genetic diversity relative to other existing bison populations (Halbert et al. 2012; Stroupe et al. submitted). That genetic diversity measured in terms of allelic diversity, or the number of different genes at each locus, has been preserved over time. Between two and five groups of related alleles based on neutral markers exist across the park, and allelic diversity, allele frequencies, and inbreeding levels remained similar between the 1990s and 2020s based on 44 microsatellites across the bison genome (Geremia 2022; Stroupe et al. submitted). Loci with large numbers of different genes require larger population sizes to maintain allelic diversity. Based on microsatellites, Yellowstone bison have loci that vary from 3 to 10 different genes (Halbert et al. 2012). To preserve this diversity, especially at chromosome locations with a high number of genes, a larger bison population is needed. Studies using simulation models indicate that to conserve over 95% of genetic diversity at locations with more than five genes, the bison population must exceed roughly 3,250 individuals, with a focus on removing mostly or solely younger animals (Pérez-Figueroa et al. 2012).

Injuries and Trauma to Bison—Hazing imposes energetic costs on bison that, like all ungulates in the temperate, montane environments, are in poorer body condition during late winter. Hazing also contributes to occasional injuries and temporary behavioral changes, such as aggression like bucking or butting by some bison. Hazing may break up groups and some mother-calf pairs, causing flight behavior such as running, and prevent bison from stopping to feed, drink, or rest when they desire. The frequency and extent of hazing has decreased substantially since 2016 following adaptive management adjustments to provide more tolerance for bison in Montana, including year-round in some areas, and concentrated hunters along the park boundary impeding many bison from moving farther into Montana (Bullock 2015; IBMP Agencies 2016, 2020). In addition, IBMP members have not used helicopters for hazing since 2013.

The Stephens Creek Administration Area Plan addresses issues such as sprawl, visual impacts, exotic vegetation, and infrastructure to support the park's corral operation (USDOI, NPS 2006b). The administrative use of this area was capped at a 43-acre footprint and plans were developed and implemented to manage exotic vegetation, address visual impacts, and construct a barn for the park stock operations, which improved the health and safety of staff and livestock and the efficiency of these operations. Some bison in holding corrals could gore other bison, run into facility walls, or break horns on hard structures. In addition, physically restraining bison for brucellosis testing temporarily elevates their

stress levels and makes injuries more likely. There could be stress and injuries to bison during loading or transport in trailers due to crowding, fighting, or panic. Additionally, feeding and gathering animals in confined areas could potentially lead to situations where numerous animals are at risk of exposure to brucellosis following an abortion event. The NPS checks captured bison daily and removes individuals showing signs of disease. The NPS consults with veterinarians and, if necessary, tests and treats affected bison. Thus, the potential impacts of disease outbreaks in capture and quarantine facilities are low.

Some people expressed concern about injuries or mortality from wildfires in the facilities at the Stephens Creek Administration Area because a fire burned through the fenced pasture on the Fort Belknap Reservation during 2012, killing 10 bison relocated from YNP after completing quarantine. Should fires become an issue, NPS personnel would minimize potential impacts to bison by fighting fires under existing wildfire management practices, relocating bison if necessary, repairing damage to fences, and providing food to the bison.

Since 2005, APHIS and the NPS have placed approximately 800 Yellowstone bison in quarantine. The average time in quarantine was about 700 days (888 days for females and 660 days for males). The maximum time an animal was in quarantine before release was 1,356 days. The latest detections of brucellosis antibodies during testing in quarantine were at day 232 (male bison) and 259 (female bison), with 67 bison (11%) testing positive for brucellosis exposure while in a holding facility (USDA, APHIS 2022; Springer Browne et al. 2023). These bison were killed. All bison completing quarantine or assurance testing in YNP are and would continue to be sent to suitable tribal lands.

The effects of removing bison from the Yellowstone population each year for quarantine or through other methods, such as hunting or shipments to research or meat processing facilities, were evaluated in the final EIS and ROD for the IBMP (available at http://ibmp.info/library.php in the document library section) and in the 2018 quarantine EA and FONSI. Impacts to bison from capture, hazing, and disposition of bison at and near the Stevens Creek Administrative Area are detailed starting on page 55 of the 2018 quarantine EA and FONSI as well as in appendix F of the final EIS and ROD, which provides a summary of bison management techniques that the NPS developed with veterinarians and members of the Humane Society of the United States. Both documents are incorporated by reference. Generally, impacts to bison from capture and hazing include energetic and physiological efforts that have variable costs depending on the duration of effort and stress. Capture and hazing result in occasional injuries and temporary behavioral changes such as aggression by some bison and in some instances death. Injuries and trauma during hazing, capture, handling, and transportation would affect a few localized individuals and would not impact population trends.

Other actions in the winter that may continue to impact bison are the presence of over-snow vehicles in the interior of YNP. Details of these impacts are included in the *Final Winter Use Plan and Supplemental EIS* (SEIS). Generally, the presence of over-snow vehicles and related noise can temporarily displace bison and have the potential to increase heart rate and stress levels for bison. The SEIS and associated ROD establish a framework that allows the public to experience winter resources at YNP. This document, and additional details related to adaptive management are found here: https://www.nps.gov/yell/learn/management/winter-use-archive.htm.

Brucellosis Transmission—The proportion of adult females that test positive for brucellosis has remained at about 60% under the IBMP, as adjusted (Hobbs et al. 2015). Brucellosis testing of 347 bison captured in the Stephens Creek Administrative Area during 2019 detected positive exposure (antibodies) in 76% of adult males, 33% of yearling males, 4% of male calves, 65% of adult females, 35% of yearling females, and 11% of female calves (IBMP Agencies 2020). Similar testing of 638 bison during 2023 detected 68% of adult males, 69% of adult females, 45% of yearlings, and 2% of calves. The NPS anticipates the prevalence of brucellosis would remain at approximately these levels under current management.

The NPS is meeting the goal to manage brucellosis transmission risk described in the "Adaptive Management" section in chapter 2. Brucellosis has not been transmitted from bison to cattle despite

transporting almost 6,450 bison for processing in Montana and Idaho since 2001. Brucellosis has not spread from bison to cattle due, in part, to successful efforts by federal and state agencies to maintain separation. The NPS and other IBMP agencies would continue to contribute to the low risk of brucellosis spreading from bison to cattle by using hazing and other focused management to maintain separation.

Additional Trends and Planned Actions— Public opinion is shifting toward more tolerance for bison in the region and, as a result, managers could sustain more bison and allow them to move more freely on suitable public lands. However, state and local governments and many private landowners do not support more tolerance for bison on public lands farther from the park. In addition, the continuing development of open space on private lands surrounding the park degrades and fragments habitat and movement corridors for wild animals, including bison.

Since 1970, the number of people in the GYA has doubled to about 473,000 and the number of homes has tripled, with about 31% of the area developed or used for agriculture (Hansen and Phillips 2018). Habitat destruction and fragmentation have mostly affected valley bottoms and floodplains with higher plant productivity and more moderate winter conditions. These areas, which are primarily located outside preserves and wilderness areas, are crucial for movements by many animals in this mountainous region. More than 75% of long-distance movement corridors for bison and other animals in the region have been lost or shortened (Berger 2004). Regional plans or zoning districts do not restrict potential uses for most undeveloped private lands. Thus, 30% to 40% of undeveloped private lands could convert to rural residential development (Gude et al. 2006, 2007). These impacts could increase disturbances to bison and losses of habitat.

It is possible that additional American Indian Tribes may assert treaty rights to harvest bison outside the northern park boundary in the future. Additional harvesting tribes are not expected to impact bison, or the number of bison taken through harvest based on the management actions presented in chapter 2 because the NPS would continue to monitor the number of bison migrating from the park and adjust management actions to meet the population objectives discussed there.

Ongoing and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges, the USFS LMP, updated testing procedures from APHIS, implementation of Secretarial Order 3410 to construct tribal bison facilities in support of the BCTP, and ongoing state hunts and tribal harvests (see appendix D). Three of six of these projects are a result of the catastrophic flooding in June 2022 that caused severe damage and loss of several sections of road and access. Bison may avoid or be excluded from small amounts of habitat at or near construction areas, slightly altering patterns in their distribution, movements, and behavior during the construction period for these projects. However, this would have negligible effects on the distribution of the ecological role bison play in nutrient cycling given the extensive habitat available in the park. The NPS does not anticipate impacts to bison genetics or adaptive capabilities from the temporary construction of these projects, given the extensive habitat available to bison and continued gene flow between breeding herds. The repair and replacement of park roads and bridges would temporarily reduce forage habitat availability in areas at and adjacent to construction sites, but these effects would be negligible given the ample forage habitat available within the park. There is potential for conflict between construction personnel/operations and bison. If bison travel near construction sites, there may be an occasional need for hazing to keep bison at a safe distance away for both their safety and the safety of personnel working in the area. Usually, the noise and presence of machinery and people keep bison at a distance and hazing is not necessary. There would be no increase in the risk of brucellosis transmission due to these projects. Additionally, none of the construction projects would result in an effect to population numbers beyond what is described under each alternative.

The USFS LMP may benefit bison through habitat improvement projects that create or connect suitable bison habitat. This could encourage a year-round, self-sustaining bison population on the national forest in conjunction with bison herds in YNP. The LMP also includes an objective to complete three habitat improvement projects every three years to create or connect suitable habitat for bison on the forest, while

continuing to work with partners to reduce conflicts with livestock and private property. In addition, the LMP allows the national forest to address potential barriers to bison on the landscape in areas under consideration for expanded tolerance by the State of Montana. The NPS would continue to collaborate with the Custer Gallatin National Forest on implementation of the LMP (USDA, USFS, 2022a).

Updated testing procedures for approved bison quarantine facilities to classify bison as brucellosis-free could result in beneficial impacts to bison because these updated procedures would decrease the number of required days for bison in quarantine. UM&R established rigorous testing over several years to classify animals as brucellosis-free. VS recently evaluated data collected from bison that have cleared quarantine since 2005 and suggested reducing the testing burden, including allowing males to qualify for brucellosis clearance in 300 days and reducing the post-quarantine assurance testing requirement to a single test at 12 months.

Secretarial Order 3410 directs the NPS to initiate discussions with American Indian Tribes and other conservation partners to develop a plan to increase quarantine capacity for bison from YNP so that they may undergo disease testing to further increase both shared stewardship and the number of live bison transferred to American Indian Tribes. It is possible that additional American Indian Tribes may construct facilities to support the BCTP because of this, which may result in beneficial impacts to bison because more live bison would be transferred from YNP and not removed through culling or hunting.

The State of Montana and American Indian Tribes would continue to hunt outside the northern boundary of the park where the NPS does not regulatory authority or jurisdiction. Indirect impacts resulting from changes in NPS management actions that would affect hunting outside the park are discussed above and in the impact analysis below. However, some hunting outside the park would continue in the future regardless of NPS actions. Public hunting and tribal harvests would continue to impact bison by directly removing individual bison, causing stress to bison, and creating a potential barrier to future migration of bison outside the park due to the concentration of hunters near Beattie Gulch.

Evidence indicates there has been a substantial increase in the amount of carbon dioxide in the atmosphere over the past two centuries (Friedlingstein et al. 2019). Elevated carbon dioxide can increase plant growth by reducing water loss and facilitating photosynthesis. This increase may have indirectly contributed to more grass production and abundant forage for ungulates in YNP, especially in wetter areas where nonnative, cool-season grasses were planted for hay during the early 1900s and subsequently spread (Frank 2022). However, variations in precipitation and temperature strongly influence soil moisture, which can limit grass production (Knapp and Smith 2001; Frank et al. 2013 and references therein; Geremia and Hamilton 2019, 2022).

Average annual temperatures in the GYA increased about 2.3°F from 1950 to 2018, with a longer snow-free season (Hostetler et al. 2021). In northern YNP, these changes resulted in less snow at lower elevations, earlier snowmelt and plant growth, longer and drier growing seasons, and more frequent drought (Tercek et al. 2015; Thoma et al. 2015; Hansen and Phillips 2018; Yellowstone Center for Resources 2018). The regional warming trend is predicted to continue, with an increase in mean annual temperatures of about another 2°F across all seasons, milder winters with fewer days below freezing, earlier spring vegetation green-up, and more frequent drought (Hostetler et al. 2021; Intergovernmental Panel on Climate Change 2022). However, there is uncertainty around these predictions and somewhat divergent outcomes are possible.

Continuing trends toward warmer and drier conditions with more frequent drought could worsen the spread of invasive plants, such as winter annuals, and threaten some native bunchgrass communities that provide food for bison in the warmest and driest areas and regions with historical (tilling/plowing) and contemporary (roads) soil disturbance. Fires should continue to be infrequent in grassland and shrubland areas, mostly moving rapidly at low intensity. However, an increased frequency in fires could make grassland communities more vulnerable to the spread of nonnative grasses. These changes could reduce plant production and the food-limited carrying capacity of the park to support bison and other wildlife,

leading to larger migrations during some winters, with some animals being unable to obtain adequate fat and protein reserves for pregnancy and survival (Wilmers et al. 2013; Geremia et al. 2014; Middleton et al. 2018). Warmer temperatures have already resulted in lower snowpack and soil moisture at elevations between 5,000 and 7,000 feet (1,520 to 2,135 meters; Thoma et al. 2015; Hostetler et al. 2021), and bison may respond to less snow on their winter ranges by remaining longer at higher elevations in the park and migrating to lower elevations near the boundary later in the winter. Later migrations would reduce the time frame in which bison can be captured or harvested near the park boundary before they are late in pregnancy, which would limit the effectiveness of managing bison abundance and distribution in some winters.

If summers start earlier and are wetter than expected, the prolonged periods of warm and wet soils may increase decomposition rates and liberate soil carbon, nitrogen, and phosphorus. The longer periods of nutrient and water availability would naturally shift plant communities to faster-growing lifeforms, including rhizomatous and shallower rooted forms and nonnative annual plants. Plant production may increase, and more frequent wet years could enhance grazing feedbacks that further promote plant production, especially in higher-elevation wet areas. Grazing-tolerant, cool-season, nonnative cultivars would continue to spread in wet areas, with this spread enhanced by grazing. There could be an increase in body condition of bison and other ungulates by autumn, which would increase reproductive success and survival, resulting in increased population sizes for these species. More bison may remain in the park during winter due to increased forage availability, and earlier spring migrations to higher elevations would be timed with earlier snowmelt (Yellowstone Center for Resources 2021).

If summers are hotter and drier than expected plant production across grasslands and shrub steppe could decrease as a result of reduced soil moisture which, in turn, would limit absorption of water and nutrients by plants and indirectly lower soil decomposition rates. Shorter, ephemeral pulses of nutrient availability in wet grassland areas could promote the growth of drought-tolerant plants, including annuals, winter annuals, and slow-growing graminoids. Thus, shrub and bunchgrass-dominated plant communities in dry upslope areas on the Blacktail Deer Plateau, Little America, and the slopes of the Lamar Valley could convert to infestations of annual plants with hotter and drier conditions. Increased fire frequency and intensity in ungrazed and lightly grazed areas could facilitate these plant community changes. Under this scenario, the numbers of bison could decrease from lower landscape-level plant production, which would contribute to decreased body condition, pregnancy, and survival. More intense droughts would further limit forage availability in late summer and winter. There could be mass migrations of bison and other ungulates from the park during limited forage years, with more ungulates remaining outside the park on agricultural land (Yellowstone Center for Resources 2021).

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to bison would be like those described above in the “Affected Environment” section, which contains a description of the current and expected future conditions of Yellowstone bison.

Impacts of Alternative 2

Population and Distribution—Impacts would be similar to those described for Alternative 1; however, this alternative could preserve a higher number of bison than Alternative 1, thereby sustaining a more viable, wide-ranging population and allowing for fluctuations in abundance and movements influenced by annual differences in weather and other factors. Numbers of bison could range up to about 6,000 after calving, and numbers of bison using northern YNP likely would be higher than current conditions and approach about 4,000 to 5,000 animals at times. Numbers of bison in central YNP would be similar to current conditions. Northern migrations would lengthen to include the Pelican and possibly Hayden Valleys, via the Mirror Plateau. Larger numbers of bison should result in more sustained annual migrations. Demographic objectives would be similar to those described for Alternative 1. The NPS

expects a small increase in conflicts between bison, cattle, and people compared to Alternative 1 from the larger number of bison on the landscape.

Bison movements within YNP and north and west of the park in Montana should be like those described for Alternative 1, while sustaining large breeding congregations in the central and northern regions of YNP. Larger numbers could induce some bison movements into new areas of the park and outside park management areas, including adjacent to the western park boundary. This also could result in more bison killed by harvest outside the park.

Some bison would move to lower-elevation ranges in Montana depending on food production and consumption, snowpack, and bison numbers. Slightly larger numbers of bison compared to Alternative 1 may induce some earlier and larger movements, especially during severe winters. Concentrations of hunters outside the park near the park boundary could continue to impede further bison movements within the management areas in Montana and result in many bison returning to the park. Increased tribal engagement could help address this issue across a broader landscape.

Impacts from tribal harvest and public hunting outside the park would be like those described for Alternative 1 but may slightly increase. Fewer captured bison and releasing brucellosis-negative captured bison would provide more opportunities for treaty and public hunting in Montana, outside the park. When possible, captured brucellosis-positive bison would be sent for processing to reduce the chances of increasing brucellosis prevalence by selectively placing brucellosis-negative bison in the BCTP. Captures for culling bison would decrease compared to Alternative 1 by shifting away from processing as the primary population management tool. On-site culling at the Stephens Creek Administrative Area would have the same effects as Alternative 1 and would incorporate the same best management practices described there. Should the NPS capture bison in the interior of the park for transport to the Stephens Creek Administrative Area following the adaptive management strategy outlined in chapter 2, bison may temporarily disperse away from the capture operation. Additional site-specific NEPA analysis would be completed prior to implementation.

Ecological Role of Bison—Like Alternative 1, large groups of bison would continue to move freely across wilderness and other undeveloped areas in YNP to provide prey for predators and provide carcasses for scavengers. Expansion of bison into new areas could enhance the cycling of energy, nutrients, and water; grassland health; and biodiversity across a larger extent of the park and outside the park. There could be intense grazing in some areas, including wallowing and trampling of vegetation and soil, which could facilitate the spread of nonnative plants.

Adaptive Capabilities and Genetics—Yellowstone bison should retain existing genetic diversity because numbers would average more than 3,500 (Pérez-Figueroa et al. 2012). Hundreds of mature males would compete for breeding opportunities, and a high portion of adults would produce offspring during their lifetimes. A reduction in shipments for processing should help maintain genetic diversity by increasing numbers, maintaining balanced sex ratios, and increasing generation time.

Injuries and Trauma to Bison—A reduction in captures for shipments for processing and the increased use of low-stress handling techniques should reduce injuries and trauma to bison compared to Alternative 1. The impacts of hazing on bison within YNP would be the same as Alternative 1. There may be a need for more hazing by Montana to prevent mixing with cattle or to protect people and property if more bison are moving into Montana. Like Alternative 1, Montana would continue to haze female and young bison in the north management area in the park by May 1, with impacts being like those described in the "Affected Environment" section. Some of the indirect effects of hunting bison outside the park would include direct removal of bison from the landscape, stress to bison in the area, and potential barriers to the migration of bison. These impacts may increase compared to Alternative 1.

Brucellosis Transmission—The NPS would not take actions to reduce the occurrence of brucellosis but would continue to monitor the disease and take actions to maintain separation between bison and cattle.

Like Alternative 1, the NPS would continue to support other IBMP agencies in maintaining the low risk of brucellosis spreading from bison to cattle by using hazing and other focused management to maintain separation. The NPS anticipates the prevalence of brucellosis would be similar to levels under Alternative 1 due to similar bison numbers and transmission risk.

Impacts of Alternative 3

Population and Distribution—Impacts would be similar to those described for Alternative 1; however, this alternative would preserve the most bison with the least management. The NPS would treat bison more like other wild ungulates, such as elk populations also infected with brucellosis, with numbers varying in response to competition, habitat conditions, predation, weather, and hunting and other management actions outside YNP. Movements within YNP and north and west into Montana could increase with less management while maintaining large breeding congregations in the central and northern regions of YNP. In addition, bison could access the Eagle and Bear Creek areas, portions of the Absaroka-Beartooth wilderness, Cabin Creek Recreation and Wildlife Management Area, and Monument Mountain Unit of the Lee Metcalf Wilderness year-round (IBMP Agencies 2016). Under the IBMP, as adjusted, bison have not moved to the Cabin Creek and Monument Mountain areas, possibly due to intervening ranches with cattle and vehicle traffic along Highway 191. Such movements may occur with less management, such as hazing.

Numbers of bison in the northern region of YNP likely would exceed forage capacity at times and may cause bison to move into new areas. This alternative could result in bison intensively grazing portions of the Lamar, Hayden and other valleys during summer, and the Gardiner and Hebgen Basins during winter and spring. Numbers in the Hayden Valley may increase toward 3,000 bison; bison would be forced to move to new areas, and migrations likely would link the Lamar and Hayden Valleys via the Mirror Plateau. Concerns about overgrazing may increase in some areas if much higher numbers of bison remain in the park. With higher numbers of bison, movements from the park could occur earlier and be larger in some winters (Geremia et al. 2015a). Thus, more bison would be harvested in Montana.

With fewer than 7,000 bison, the NPS would only capture to place bison in the BCTP and release other bison. Captures and confinement in the Stephens Creek Administrative Area would be reduced compared to other alternatives. However, if the population surpasses 7,000 animals, shipments for processing would resume. If shipments for processing resumed, adverse impacts due to large capture and culling operations would be like those described for Alternatives 1 and 2 in terms of the tools that would be used and their impacts.

Like other migratory wildlife, bison numbers would vary from year to year under this alternative based on competition, habitat conditions, predation, weather, and hunting and other management actions outside the park. Bison age and sex ratios, breeding herd structure, and genetic diversity also would vary in response to these factors.

Ecological Role of Bison—Less management of bison could result in competition, grazing, and predation having a larger influence on bison numbers, genetic diversity, and vegetation communities. With current numbers of elk, northern YNP produces enough vegetation to support at least 5,000 bison (Coughenour 2005; Plumb et al. 2009; Geremia and Hamilton 2019). There is a lot of uncertainty around this estimate, however, due to large variations in weather and grass production from year to year. Implementation of this alternative would increase the likelihood that die-offs of bison and other animals occasionally occur because of competition for a limited food supply interacting with severe weather. Carcasses would provide increased food for predators, scavengers, and decomposers.

Adaptive Capabilities and Genetics—Analyses suggest averaging more than 3,500 bison would preserve the existing diversity in Yellowstone bison for centuries with continued gene flow between the primary breeding herds (Pérez-Figueroa et al. 2012). Less management would favor wild behaviors and traits that increase reproduction and survival. Fewer removals of bison should allow the central and northern

breeding herds to increase in size and disperse onto the Custer Gallatin National Forest. Hundreds of mature males would compete for breeding opportunities, and a high portion of adults would produce offspring during their lifetimes. A reduction in shipments for processing should help maintain genetic diversity by increasing numbers, maintaining balanced sex ratios, and increasing generation time.

Injuries and Trauma to Bison—There should be fewer injuries and less trauma to bison because initially there would be far fewer captures, confinement, handling, restraint, testing, or transportation of bison except for the BCTP and to protect safety and property. The impacts of hazing on bison within YNP would be the same as current conditions. IBMP members would haze bison to prevent mixing with cattle or protect people and property. In addition, Montana would continue to haze female and young bison in the north management area back into the park around May 1, resulting in the same impacts as current operations. Some of the indirect effects of hunting outside the park on bison would include direct removal of bison from the landscape, stress to bison in the area, and potential barriers to migration of bison. These are likely to increase, compared to Alternatives 1 and 2.

Brucellosis Transmission—The NPS would not take actions to reduce the occurrence of brucellosis but would continue to monitor the disease and take actions to maintain separation between bison and cattle. A careful and managed increase in tolerance for bison in Montana should not substantially increase the risk of brucellosis spreading from bison to cattle if there is focused management to prevent mixing (Bullock 2015). However, severe winters when there are large numbers of bison could reduce food availability and trigger movements of bison to lower-elevation winter ranges outside the park (Geremia et al. 2015a). The movements of thousands of bison into Montana could require more and intense hazing, possibly using helicopters, to maintain separation between bison and cattle and protect people and property, which would stress the bison and could surpass the capabilities (staffing) and resources of managers to prevent mingling.

A wider distribution of bison in Montana near areas with cattle likely would increase the risk of brucellosis transmission, but the actual risk should still be relatively small compared to the greater risk from more abundant and widespread elk. Despite at least 27 brucellosis outbreaks in cattle traced to wild elk since 1998, the NPS is not aware of subsequent spread from the GYA to cattle herds in other geographic regions. This suggests current surveillance and prevention efforts in livestock are working and should work with bison on a larger landscape as well. Nor have there been economic sanctions or sustained efforts to restrict the numbers and distribution of elk in areas of Montana where brucellosis is prevalent and spreading (National Academies of Sciences, Engineering, and Medicine 2020).

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are described above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, implementation of the USFS LMP, updated testing procedures from APHIS, implementation of Secretarial Order 3410 to construct tribal bison facilities in support of the BCTP, and hunting that occurs outside the park boundary (appendix D). Bison may avoid or be excluded from habitat at or near construction areas during the construction period for these projects. Habitat improvement projects and a goal to establish a year-round self-sustaining bison population presented in the USFS LMP would benefit bison. A reduction in quarantine time for bison as result of changes to APHIS regulations and more facilities to support the BCTP may benefit bison. Hunting outside the park would continue to impact bison through direct removal, stress, and potential barriers to migration. Under Alternative 1 current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, under Alternative 1, impacts, including those from past, present, and reasonably foreseeable future actions, would result in conditions like those described in the "Affected Environment" section.

As discussed above, bison management actions proposed under Alternative 2 could result in a higher number of bison in YNP compared to Alternative 1, which could result in more bison migrating out of the

park and, in turn, more hunter harvest outside the park. An increase in bison numbers under Alternative 2 could increase grazing pressure in some areas of the park resulting in less forage available and the movement of bison to different areas, including out of the park, and during different times than what is currently occurring. Alternative 2 would decrease the number of bison that are transferred for processing, which would reduce stress to bison from capture and transport operations. When combined with the temporary loss of habitat from repairs and replacements to park roads and bridges, beneficial habitat improvement projects under the USFS LMP, a reduction in quarantine time, additional BCTP facilities, the adverse impacts from hunting outside the park, and impacts of other past and present actions, the overall condition of the bison population is expected to improve to a small degree, compared to what is described in the "Affected Environment" section, with most changes resulting from implementation of Alternative 2.

Under Alternative 3, a larger population of bison would be on the landscape, resulting in increased bison movements into new areas of the park and outside the park to other suitable grazing habitats. This would increase harvest by hunting outside the park. The NPS would treat bison more like other wild ungulates in the park and take a more restrained approach to management. Like Alternative 2, fewer captures, confinements, handling, restraint, testing, or transportation of bison would occur, which would reduce stress to individual bison. However, should the bison population approach 7,000 animals, removals of more than 1,000 bison would need to occur during many years to slow population growth, which would increase stress and could change herd compositions. When combined with the temporary loss of habitat from repairs and replacements to park roads and bridges, beneficial habitat improvement projects under the USFS LMP, a reduction in quarantine time, additional BCTP facilities, the adverse impacts from hunting outside the park, and impacts from other past and present actions, the overall condition of the bison population is initially expected to improve compared to Alternative 1 due to increased viability. However, if frequent, large culls are needed to slow population growth when abundance approaches or exceeds 7,000 bison, then there could be adverse demographic and genetic effects (White et al. 2011; Halbert et al. 2012).

Wildlife

Affected Environment: Current Status and Expected Future Conditions

Seven ungulates other than bison use YNP and nearby areas seasonally or year-round, including elk, pronghorn, bighorn sheep, mule deer, moose, mountain goats, and white-tailed deer. Large predators in and near YNP include black and grizzly bears, cougars, and wolves. Historical narratives generally describe plentiful and widespread wildlife in the GYA during the 1880s prior to European American colonization (Whittlesey et al. 2018; Whittlesey and Bone 2020). Colonists and settlers drastically reduced numbers of large ungulates, predators, valuable fur-bearing mammals such as beavers, and plume-bearing birds such as trumpeter swans, in the region by the middle to late 1800s. Market hunters overharvested ungulates and poisoned, shot, or trapped predators to protect settlers and reduce livestock depredations. People eradicated wolves and decimated numbers of bears and cougars by the 1930s. Continued settlement with agriculture, logging, and mining degraded and fragmented habitats during the 1900s. The protection of animals and their habitats within YNP and surrounding areas gradually increased numbers of many animals to sustainable levels over the next century, but numbers of some large animals, such as pronghorn and predators, remained low (Whittlesey et al. 2018; Whittlesey and Bone 2020; White et al. 2022a). Other actions in the winter that may continue to impact other wildlife is the presence of over-snow vehicles in YNP. Details of these impacts are included in the *Final Winter Use Plan and Supplemental EIS (SEIS)*. This SEIS and associated ROD establish a framework that allows the public to experience winter resources at YNP. This document, and additional details related to adaptive management are found at https://www.nps.gov/yell/learn/management/winter-use-archive.htm. Generally, the presence of over-snow vehicles and related noise can temporarily displace wildlife and have the potential to increase the heart rate and stress levels of wildlife. Additionally, compacted over-snow

vehicle routes may provide low energy winter travel routes for some species, reducing energetic expenditure.

The following summaries focus on ungulates and predators prevalent in the northern Yellowstone area where most bison management activities occur. A discussion of other wildlife species not carried forward for detailed analysis is included in appendix C.

Elk—The northern Yellowstone elk population spends winter on more than 580 square miles (1,500 square kilometers) of grasslands, sagebrush steppe, and lodgepole pine forests adjacent to the Yellowstone River and its tributaries. About two-thirds of this winter range is within the northern portion of YNP, while the remainder is in Montana to the north. During the 2000s, predation, in combination with liberal hunter harvests in Montana and occasional severe weather, rapidly decreased numbers of northern Yellowstone elk by about 70% from a high count of more than 19,000 in the mid-1990s (White and Garrott 2005; Eberhardt et al. 2007). MFWP eliminated the late season hunter harvest of fertile, prime-aged female elk to increase adult female survival and reproduction and offset consistently lower recruitment due to predation (Proffitt et al. 2014). In turn, numbers of elk increased to between 5,000 and 7,500 after a low count of 3,915 in 2013 (MacNulty et al. 2020b). A biologist from MFWP observed 6,651 elk in March 2023 (Northern Yellowstone Cooperative Wildlife Working Group 2022).

Northern Yellowstone elk are partially migratory with most animals moving seasonally between summer and winter ranges and others remaining on the same range year-round. Many elk spend winter in the lower-elevation Gardiner Basin and southern Paradise Valley, with numbers increasing during winters with deep snowpack at higher elevations (White et al. 2010, 2012). Spring migrations generally begin from late April to mid-May but vary among years based on the severity and duration of the previous winter which, in turn, affects snowmelt and the growth of new forage (White et al. 2010). Elk initially follow the green-up of vegetation as snow progressively melts at higher elevations, with many elk migrating through the Sepulcher Mountain foothills, across Mount Everts, or along the Yellowstone and Gardner Rivers (White et al. 2010). Many female elk calve in these areas before moving between 6 and 93 miles (10 and 150 kilometers; straight-line distance) to a dozen different summer ranges throughout the park (White et al. 2010).

Autumn migration begins in late September to mid-October following snow accumulation, with two-thirds of movements starting within 72 hours of a major snowstorm on the summer range. For elk migrating to winter ranges inside the park, the autumn migration lasts about 7 days. For elk migrating to winter ranges outside the park, migrations last about 43 days (White et al. 2010). Many females with calves move to lower elevations in and outside the park where snowpack is lower and there are fewer predators and, in the 2000s, a larger portion (80% by 2020) of the smaller elk population began to migrate outside the park. Elk spending winter outside the park have higher survival and recruitment compared to elk spending winter inside the park where predator densities are much higher (White et al. 2012).

Pronghorn—During an aerial survey in April 2023, a biologist counted 341 pronghorn in the Yellowstone population. This count was lower than those made in 2022 (448), 2020 (416), and 2019 (476; no count in 2021), suggesting severe winter conditions in 2022-2023 contributed to a significant decrease in pronghorn numbers (Northern Yellowstone Cooperative Wildlife Working Group 2023). The population is partially migratory with all pronghorn spending winter in the Gardiner Basin and southern Paradise Valley, and about 80% of them migrating in spring to higher elevations in the park (White et al. 2007, 2022a). These movements enable pronghorn to use nutritious food when it is available and release the lower-elevation winter range from intensive use for a portion of the year (Barnowe-Meyer et al. 2017). Migrating pronghorn and their fawns have higher survival rates through summer than non-migrants that remain on the winter range year-round (Barnowe-Meyer et al. 2010, 2011). Non-migratory pronghorn remain in the Gardiner Basin during summer but increase their use of the foothills from Sepulcher Mountain and Electric Peak, as well as the northwestern portion of Mount Everts, including McMinn

Bench. Most pronghorn use the same migration strategy and summer range each year (White et al. 2007, 2022a).

Migratory pronghorn gather at the southeastern end of the Gardiner Basin winter range in late March and early April on an open flat north of Mount Everts and on its slopes. As snow recedes, these animals travel southeast about 7 miles (11 kilometers) over Mount Everts, which separates their winter and summer ranges. Pronghorn travel along grassland-sagebrush passageways through gaps in surrounding conifer forests, most of which are less than 328 yards (300 meters) wide with occasional constricted areas of 22 to 66 yards (20 to 60 meters). Once spring migrants reach the southeastern end of Mount Everts, they disperse somewhat to travel to their individual summer ranges. Most pronghorn generally follow the Yellowstone River to summer ranges farther east, including the Blacktail Deer Plateau, slopes of Hellroaring Mountain, Little America and Specimen Ridge, and the Lamar Valley and Soda Butte area. Spring migrations occur over 1 to 2 months during mid-March to mid-May with most pronghorn reaching their summer ranges during April. Females migrate when vegetation green-up begins but before giving birth in late May and June. Autumn migrations occur over 1 to 2 months from mid-September to mid-November with all pronghorn crossing Mount Everts and most reaching the Gardiner Basin winter range during October. Animals mostly migrate after breeding but before snow covers their summer ranges. Most animals migrate between their seasonal ranges in less than one week by moving 3 to 9 miles (5 to 15 kilometers) each day (White et al. 2007, 2022a).

In the 2000 final EIS and ROD for the IBMP, the NPS acknowledged the potential for moderate to major impacts from bison management operations on pronghorn that spend winter in the Gardiner Basin (USDOI and USDA 2000b). However, those impacts did not occur, and pronghorn numbers increased from about 200 to 500 during 2001 to 2018 (White et al. 2022a).

Bighorn Sheep—About a dozen bands of bighorn sheep in the northern portion of YNP and nearby areas of Montana appear to function as a metapopulation with periodic movements and gene flow among them. These bands are relatively small, slow growing, and low in productivity, with overall numbers remaining relatively stable over the past decade (White et al. 2008, 2021; White and Gunther 2013; Garrott et al. 2021). During a helicopter survey in March 2019, a biologist from MFWP counted 312 bighorn sheep from Point of Rocks in the southern Paradise Valley of Montana to Barronette Peak in the northeastern portion of YNP, which was slightly lower than the 10-year average of 358 sheep (Loveless 2019). The biologist observed a ratio of 14 lambs per 100 ewes, compared to an average of 28 lambs per 100 ewes during 1995 to 2017.

Most of the bighorn sheep in these bands are migratory and spend winter in lower-elevation areas before moving to higher-elevation summer ranges during May through October. However, some sheep remain resident year-round (Houston 1982; Keating 1982; Meagher et al. 1992; Legg 1996; Ostovar 1998). There is a group of bighorn sheep that spends winter on about 1,185 acres (480 hectares) of Mount Everts between the Yellowstone and Gardner Rivers (Keating et al. 1985). Counts have ranged between approximately 36 and 110 bighorn sheep since 1995 (average = 63, with 65 counted in 2019; Loveless 2019). The core of this range is McMinn Bench, on the northwestern corner of Mount Everts, where bighorn sheep congregate for the breeding season (rut) from about mid-November to mid-December and continue to use the area through winter and spring green-up (Houston 1982; Garrott et al. 2021). Some bighorn sheep depart the Mount Everts winter range in late April or May, while others remain in the area through the year, including on McMinn Bench (Keating et al. 1985; Ostovar 1998). Lambing occurs in late May and early June (Lowrey et al. 2021).

Adult females that spend winter on Mount Everts have various lambing and summer ranges. Some ewes remain resident and give birth on McMinn Bench or Mount Everts. Others migrate south across Mount Everts, through the Blacktail Deer Plateau to Tower Junction, and then south along Antelope Creek and the Yellowstone River to Mount Washburn (28 miles; 45 kilometers). Most of these ewes give birth to lambs on cliffs along the Yellowstone River near Tower, Specimen Ridge, or the Grand Canyon of the

Yellowstone before moving to Mount Washburn by middle to late June, where they spend the summer (Ostovar 1998). Another group crosses the flood-damaged North Entrance Road and Gardner River on or near the bridge by Eagle Nest rock in late May or early June and travels about 4 to 5 miles (6 to 8 kilometers) west to give birth on the east-facing cliffs of Sepulcher Mountain. Many of these ewes return with their lambs to McMinn Bench and Mount Everts in late June and early July (Ostovar 1998). A third group gives birth about 3 to 5 miles (5 to 8 kilometers) east of McMinn Bench on cliffs in the Black Canyon of the Yellowstone River before returning to spend summer on Mount Everts and nearby Rattlesnake Butte (Ostovar 1998).

Some adult males (rams) that spend winter on Mount Everts remain year-round. Others migrate about 18 miles (30 kilometers) southwest to the Gallatin Mountain Range during summer. These migrants travel south across Mount Everts, cross the Grand Loop Road near Bunsen Peak, and move west toward Quadrant Mountain, Little Quadrant Mountain, and Bannock Peak (Ostovar 1998). Other rams remain on Mount Everts during summer but then move northwest to the Electric Peak and Cinnabar areas (7 to 8 miles; 11 to 13 kilometers) or a few miles east to Deckard Flats for the autumn rut (breeding season) before returning to Mount Everts for the winter.

Mule Deer—During a helicopter survey in April 2019, a MFWP biologist counted 1,480 mule deer (287 fawns, 1,111 adults, 82 unclassified) in the Gardiner Basin area of Montana, compared to a range of 1,299 to 2,343 (average = 1,901) since 1995. A ratio of 26 fawns per 100 adults was observed, which compares to an average spring recruitment estimate of 40 fawns per 100 adults (range = 18 to 56) since 1995. Mule deer numbers have been relatively stable for the past three decades. This population is partially migratory, with about one-quarter remaining on the winter range year-round in the Gardiner Basin (including on the Sepulcher Mountain foothills and slopes of Mount Everts) and three-quarters migrating 6 to 65 miles (10 to 104 kilometers) to summer ranges in and near YNP. Migrants travel to summer ranges during late April to mid-June over a period of 2 to 40 days and tend to use the same winter and summer ranges each year (Gogan et al. 2019).

Some migratory deer that spend winter east of the Yellowstone River in the Gardiner Basin move east along the Yellowstone River to spend summer in the Hellroaring and Buffalo Creek drainages and the Slough Creek and Flint Creek drainages of the Lamar River. Other deer move south to the Firehole River drainage and Heart and Shoshone Lake areas (Gogan et al. 2019). Migratory deer that spend winter on the west side of the Yellowstone River primarily move south to spend summer in and near the Gibbon and Madison River drainages. Some migrants move through the Sepulcher Mountain foothills or over Mount Everts. Migrant deer begin traveling back to the winter range in the Gardiner Basin during mid-October (Gogan et al. 2019).

Bears—From the late 1950s through the 1970s, most black bear and grizzly bear mortality inside YNP was due to human causes, primarily management removals of bears involved in human-bear conflicts (White et al. 2017). Managers in YNP and surrounding national forests and states implemented changes to limit access to human foods by food storage orders, limit motorized access, retire livestock allotments, and prevent the loss of secure habitat. Over time, these actions increased the annual survival and abundance of bears in YNP (White et al. 2017). Most bear mortality in YNP from 1980 to present has been from natural causes, primarily old age and intra- and inter-specific strife (White et al. 2017; van Manen et al. 2021; Gunther 2022). Today, there are about 965 grizzly bears (range = 800 to 1,100) occupying more than 27,200 square miles (70,500 square kilometers) in the GYA, with enough reproductive females to sustain a viable population over the long term (van Manen et al. 2021; Interagency Grizzly Bear Study Team, unpublished data, 2023). In addition, there are between 150 and 275 black bears in northern YNP (Bowersock 2020). Black and grizzly bears rarely kill adult ungulates, but they are effective hunters of newborn calves and fawns, especially elk. They intensely search areas near female ungulates during the birthing season to locate calves and fawns in hiding. More information on grizzly bears is provided in the "Threatened Animals and Plants" section, below.

Cougars—Colonists and settlers decimated the number of cougars in and near the northern portion of YNP by the 1930s, but cougars reestablished a viable population by the mid-1980s and then continued to increase to as many as 50 animals during the 2000s (Murphy 1998; Ruth et al. 2019; Anton 2020). At least 8 adult cougars (3 males, 5 females) had a core range overlapping the Black Canyon of the Yellowstone River and Mount Everts during the winter of 2020–2021 (Stahler et al. 2021). Cougars are solitary hunters that stalk and ambush their prey. They are opportunistic and often select smaller prey to minimize the risk of injury during attacks (Ruth et al. 2019). About 55% of cougar diets in and near YNP consist of elk, primarily calves (65%) and adult females (34%). Cougars kill more elk calves as summer progresses and continue through winter as calves move around the landscape with groups of adult females (Stahler et al. 2020). After wolf restoration, cougars began killing more adult female elk, probably due to fewer available calves. Another 35% of their diet consists of mule deer, with the portion of this prey source increasing from 20% to 35% in recent years (Stahler et al. 2020).

Gray Wolves—Wolves were reintroduced to YNP between 1995 and 1997, and numbers increased to 174 wolves in as many as 16 packs over the next decade but have since stabilized between 80 and 123 wolves in 7 to 10 packs (Smith et al. 2020). There were 108 wolves in 10 packs in the park during December 2022, including 7 breeding pairs. Several packs used portions of the bison management area in and outside northern YNP during 2022 and 2023, especially during winter and spring when many hundreds of ungulates spent winter in the Gardiner Basin and surrounding foothills. Wolves typically hunt in packs during winter and travel long distances through relatively flat grasslands close to rivers and streams. This strategy facilitates the detection of elk, their primary prey (80% to 95%), foraging in grasslands or near habitat transitions, such edges between grasslands and forests, and allows wolves to scan groups for individual elk susceptible to attack (MacNulty et al. 2007). About 7% to 12% of wolf kills during spring and summer are deer that migrate into the park. Wolves kill more bison (primarily calves) during spring (10%) but scavenge on bison carcasses frequently through the winter (Metz et al. 2020a,b; Stahler et al. 2020). Wolves also opportunistically kill some bighorn sheep and pronghorn (less than 1% of kills).

Disturbances—Many wild animals in the Gardiner and Hebgen Basins are used to the day-to-day activities of people and often feed, move, and rest near houses, roads, agricultural fields, and recreational areas. Animals adjust their behaviors and movements to recurring activities, though some unexpected disturbances may cause short-term movements. Some ungulates, such as deer, elk, and pronghorn, may be disturbed during bison hazing operations within or outside the park and move short distances away with minor energetic costs. These impacts are mitigated by avoiding, temporarily halting, or ceasing hazing if other ungulates are affected. There are no disturbances to other animals from the processing of bison because these activities occur within the capture facility area and pastures.

Bison Grazing Effects—With approximately 3,500 to 5,900 bison and less than 10,000 elk present in YNP over the past decade, grazing intensities on grasslands in northern YNP during summer have varied across the landscape, with heavily grazed areas and nearly ungrazed areas, producing a variety of vegetation conditions (Geremia and Hamilton 2019, 2022). This increases the mosaic of habitats for other wild animals because some need various habitats, while others favor disturbed or undisturbed habitats (Fuhlendorf et al. 2012).

During the 2000s, numbers of elk decreased by more than 70% in YNP following the recovery of large predators such as wolves, bears, and cougars. A much greater portion (80%) of the smaller northern Yellowstone elk population now spends winter on lower-elevation areas with less snow outside the park (White et al. 2012). At the same time, bison numbers in northern YNP increased from about 550 in 2000 and 1,350 in 2005 to around 4,900 in 2023 due to high survival and calving combined with movements of bison from the central to the northern part of the park. Bison began using grasslands in this area quite differently than elk during summer. They moved upslope as new vegetation growth occurred along the Yellowstone River corridor, but once they reached the Lamar Valley and surrounding areas, thousands stopped and repeatedly grazed portions of the valley and nearby areas through summer rather than

continuing to higher or more distant summer ranges like elk (Geremia et al. 2019, 2022). Bison began using this winter range area for elk as a summer grazing area. In turn, far fewer elk now use this area during winter.

Direct impacts on other herbivores from bison grazing could include competition for desired foods, reduced forage availability, and improved forage quality. Bison grazing impacts could influence migration patterns of large mobile herbivores, as some areas become suitable during different seasons. It is unlikely that bison grazing impacts would have demographic impacts on elk, mule deer, bighorn sheep, or pronghorn because bison grazing impacts are geographically constrained to relatively small areas used by those species.

Barriers to Movements—Wild animals in YNP and nearby areas of Montana are familiar with bison management operations and existing fencing patterns and routinely move around them. The facilities and operations do not hinder the movements of wildlife.

Food Web—Some bison culled from the population by the NPS might otherwise have died and become carrion for predators, scavengers, and decomposers. However, higher bison numbers during the IBMP period likely resulted in a greater potential for predation or scavenging. Continuing current management is expected to sustain the number of bison for predators, scavengers, and decomposers. Some wildlife may continue to consume brucellosis bacteria while scavenging bison carcasses, but this should not result in sickness, and they cannot spread brucellosis (Cheville et al. 1998; National Academies of Sciences, Engineering, and Medicine 2020).

Brucellosis Transmission—Brucellosis, a nonnative disease, was introduced to the Yellowstone area when cattle were added to the landscape in the early 1900s; the source of the initial infection is unknown (Meagher and Meyer 1994; Yonk et al. 2018). The prevalence of brucellosis in about 1,700 elk captured or shot in the northern Yellowstone area during 1961–1962 was less than 1% (Greer 1962). The northern Yellowstone elk population expanded its winter range north of the park and into the Paradise Valley of Montana during the late 1970s in response to increasing abundance and other factors (Lemke et al. 1998). The number of elk using this area increased after extensive fires in the park during the summer of 1988 and varied thereafter around 3,000 elk (Coughenour and Singer 1996; Singer et al. 1997; Taper and Gogan 2002). This range expansion resulted in the mingling of elk and cattle in the Paradise Valley during the potential abortion and birth period for elk from February through mid-June. Thus, the timing of spring migration and duration that elk remain on winter range north of the park affect the risk of brucellosis transmission to cattle. Risk is higher following winters with increased snowpack when elk initiate spring migrations later and spend the brucellosis transmission period in areas where mingling with cattle occurs (Cross et al. 2010; White et al. 2010, 2012).

From 1985 to 2009, the prevalence of brucellosis in about 2,900 elk harvested during the Gardiner late season hunt north of the park was 2% to 4% (Cheville et al. 1998; Lemke 2009). Brucellosis prevalence in 300 adult female elk captured inside YNP for radio-collaring from 2000 to 2020 was 8% (Barber-Meyer et al. 2007, 2008). However, the prevalence of brucellosis in elk harvested north of the park in hunting district 313 from 2010 to 2020 was about 13% to 15% and 20% to 30% farther north in the southern Paradise Valley (hunting district 317; MFWP 2018, 2020). Elk have become more concentrated in the Paradise Valley of Montana during the last several decades, in part, because of access to irrigated alfalfa fields. This nutritious, year-round forage source decreases the tendency for elk to migrate away from these areas during late winter and spring (Barker et al. 2019a,b). Many large groups, totaling thousands of elk, are spending more time in this area and mixing with cattle, which presents significant challenges for landowners and MFWP, including competition with livestock for forage and hay, damage to fences, and brucellosis transmission (Cross et al. 2010; Rayl et al. 2019; Tilt 2020).

Brucellosis is spreading in elk throughout the GYA, and genetic data indicate elk have infected cattle herds with brucellosis at least 27 times since 1998. Elk exposed to brucellosis now inhabit an area encompassing about 17 million acres, and the current spread is not linked to Yellowstone bison or elk, but

rather other lineages in elk (Kamath et al. 2016). The eradication or suppression of brucellosis would require eliminating the disease in elk by attempting to capture, test, and vaccinate or slaughter many elk across the entire GYA, which most people consider unacceptable and impossible at this time (National Academies of Sciences, Engineering, and Medicine 2020). There is one lineage of *Brucella* (brucellosis) bacteria in bison and northern Yellowstone elk that range from YNP to the southern Paradise Valley. This lineage has not spread west of the park even though bison and elk mix in this area (Kamath et al. 2016). Continuing current management would not increase the risk of brucellosis spreading from bison to elk.

Hunting Harvests—Estimates of harvests by public hunters are provided by MFWP at https://myfwp.mt.gov/fwpPub/harvestReports. Hunting permits from some American Indian Tribes authorize the harvest of other ungulates than bison outside YNP. Thus, tribal hunters sometimes harvest elk, bighorn sheep, deer, or pronghorn outside YNP. American Indian Tribes do not consistently report numbers, ages, and sexes of ungulates harvested under these permits to federal and state biologists, but observations indicate tribal hunters took several dozen elk in most years; perhaps approaching or exceeding 100 during the winters of 2021 and 2023. These hunter harvests probably have minimal effects on elk population trends, based on best available information.

Some of the indirect effects of hunting bison on wildlife outside the park where the NPS does not have regulatory authority or jurisdiction could include noise from hearing gunfire from a distance, resulting in wildlife avoiding the area; the presence of gut piles and carcasses of bison that could result in disease transmission to wildlife; lead ammunition and the ingestion of lead by scavenger species that could result in lead poisoning mortality; and the presence of large groups of people and hunters that would discourage use of certain areas of habitat. These impacts would continue to affect wildlife species within and adjacent to the park.

Additional Trends and Planned Actions—As described in the previous section ("Yellowstone Bison"), the area around YNP has experienced rapid increases in numbers of people and land development that continue to damage habitat and movement corridors. These impacts could increase disturbances to wild animals and losses of habitat. Present and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges, implementation of the USFS LMP, and hunting that occurs outside the park boundary (see appendix D). Three of six of these repair and replacement projects are a result of the catastrophic flooding in June 2022 that caused severe damage and loss of several sections of road and access. Some wildlife may avoid or be excluded from habitat at or near construction areas, which could alter patterns in wildlife distribution, movement, and behavior during the construction period for these projects. The repair and replacement of park roads and bridges would temporarily reduce ungulate forage habitat availability in areas at and adjacent to construction sites. However, given the ample forage habitat available within the park, these temporary changes, lasting only while construction occurs and for a short duration after as revegetation occurs, are unlikely to impact forage habitat for these ungulate populations in a meaningful way. These projects will not change brucellosis prevalence beyond what is described under each alternative because they would not affect the risk of transmission. While replacement or repair of park roads and bridges could temporarily alter patterns in distribution, movement, and behavior, the NPS does not anticipate impacts to wildlife populations overall because none of the construction projects would result in an effect on population numbers beyond what is described under each alternative.

The LMP includes an objective to complete three habitat improvement projects for bison every three years while continuing to work with partners to reduce conflicts with livestock and private property. This may indirectly benefit other wildlife species. No adverse effects to wildlife species are anticipated from implementation of this plan. Indirect impacts resulting from changes in NPS management actions that would affect hunting outside the park are discussed above and in the impact analysis below. However, some hunting outside the park would continue in the future regardless of NPS actions, and impacts would be the same as those described above. Since 2006, when bison hunting adjacent to the park recommenced, there have been no noticeable impacts to wildlife populations.

Climate change would affect forage production in the same ways described under the "Additional Trends and Planned Actions" section under "Yellowstone Bison." The regional warming trend is predicted to continue, with an increase in average annual temperatures of another 2°F across all seasons, milder winters with fewer days below freezing, and earlier spring vegetation green-up (Hostetler et al. 2021). With less snow and an earlier snowmelt, the growing season could start about two weeks earlier during some summers, but there would be more hotter days and more frequent droughts (Gross and Runyon 2020; Yellowstone Center for Resources 2021). These changes will modify the timing and production of forage, as well as ungulate body condition, movement patterns, and demographic rates in complex and contrasting ways (Wilmers et al. 2013; Lachish et al. 2020). For example, shorter winters could increase the length of the growing season while hotter, drier summers could result in the senescence of vegetation earlier in the summer (Lachish et al. 2020). These conflicting changes could have substantial, but divergent, impacts on population trends by increasing and decreasing nutrition and body condition (Wilmers and Getz 2005; Lachish et al. 2020). Research on elk populations in the northwestern United States has already detected a decrease in recruitment from 1989 to 2010 due, in part, to changes in precipitation patterns and forage conditions (Lukacs et al. 2018).

Prior to wolf restoration, carcasses primarily were available in late winter when elk died from starvation (Stahler et al. 2020). Black and grizzly bears emerging from their dens after hibernating through the winter fed on these carcasses. However, wolves changed this pattern by killing elk throughout the year (Wilmers and Getz 2005; Metz et al. 2012, 2020b; Stahler et al. 2020). Wolves kill more adult elk in winter when bears are hibernating and fewer adult elk during summer, so fewer carcasses are available for scavenging by bears at that time (Wilmers and Getz 2005; Metz et al. 2012, 2020b; Stahler et al. 2020). As elk numbers decreased and bison numbers increased in northern Yellowstone, wolves began to scavenge on carcasses of bison that died during calving, from injuries sustained during the rut, starvation, or other causes (Tallian et al. 2017; MacNulty et al. 2020b; Metz et al. 2020a,b). Scavenging increased as bison abundance increased, and bison carcasses now make up about 25% of the meat that wolves eat during winter (MacNulty et al. 2020b; Metz et al. 2020b). This scavenging reduced predation on elk from about 18 to 12 elk per wolf each year based on kill rates during winter (Metz et al. 2020a).

Following wolf reintroduction, predation studies between 1998 and 2006 found cougars increasingly used elk (74%) and relied less on deer (14%) and other prey (12%; Ruth et al. 2019; Stahler et al. 2020). Cougars sometimes lose kills to bears and wolves and need to kill more frequently, especially when they are raising kittens (Ruth et al. 2019; Stahler et al. 2020). As a result, their kill rates of elk increased after wolf restoration and are about twice the per capita kill rate of wolves (Ruth et al. 2019; Anton 2020; Stahler et al. 2020). From 2016 to 2022, cougar diets have shifted to less use of elk (49%) than prior decades, with increasing use of deer (35%) and about 16% other prey (Stahler et al. 2021). These patterns of prey selection through time are likely most influenced by changes in elk abundance and carnivore competition in northern Yellowstone (Stahler et al. 2020).

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts on wildlife would be like those described above in the "Affected Environment" section, which contains a description of the current and expected future conditions of wildlife.

Impacts of Alternative 2

Disturbances—Like Alternative 1, animals would adjust their behaviors and movements to recurring activities, though some unexpected disturbances, such as hazing of bison or the ad hoc capture of bison in the interior of the park, and other indirect effects from hunting such as gunshot noise and the presence of large groups of people may cause short-term movements with minor energetic expenditures that have no impact on survival and reproduction.

Bison Grazing Effects—Grazing intensities and effects on grasslands in central and northern YNP during summer would be similar to those described for Alternative 1 due to similar numbers and distribution of bison. However, more bison could be on the landscape, which could increase grazing pressure in some areas. More bison likely would graze portions of the Lamar and Hayden Valleys during summer, as well as the Gardiner and Hebgen Basins during winter and spring. The grazed areas would make up a small portion of available habitat for bison and other ungulates in YNP and on the Custer Gallatin National Forest. Most summer ranges and all winter ranges generally experience low to moderate grazing during the summer growing season (Geremia and Hamilton 2019, 2022). Thus, it is unlikely grazing by bison would substantially affect the seasonal movement patterns or demographics of other ungulates such as bighorn sheep, deer, elk, and pronghorn. Numbers of ungulates in YNP have remained high for numerous decades, with many thousands of animals attaining adequate forage to sustain body condition, reproduction, and survival (Geremia and Hamilton 2019, 2022).

Barriers to Movements—Like Alternative 1, wild animals in YNP and nearby areas of Montana would become familiar with bison management operations and existing fencing patterns as they routinely move around them. For this reason, Alternative 2 is unlikely to impact any movement for wildlife species.

Food Web—Shipping fewer bison for processing would result in higher bison numbers on the landscape than under Alternative 1, resulting in more carcasses for consumption by predators, scavengers, and decomposers. This should reduce predation on elk and other ungulates and result in higher survival and reproductive success of the consumers.

Brucellosis Transmission—The risk of brucellosis spreading from bison to elk would be similar to Alternative 1 but could increase slightly because the population range and distribution of bison could increase under this alternative. As noted above, the prevalence of brucellosis in elk has been on an increasing trend since the 1980s and elk exposed to brucellosis now inhabit an area encompassing about 17 million acres (Kamath et al. 2016). However, because the current spread is not linked to Yellowstone bison or elk, but rather other lineages of elk (Kamath et al. 2016), the slight increase in the risk of brucellosis transmission from bison to elk would be minimal and would not likely result in measurable effects on elk populations.

Hunter Harvests—The numbers of deer, elk, and pronghorn removed by tribal harvests outside the park may increase somewhat with more American Indian Tribes harvesting bison in the area and hunters dispersed over a larger area, but these harvests would have little to no effect on population trends of wildlife if small numbers of animals are harvested. The NPS in collaboration with the Northern Yellowstone Cooperative Wildlife Working Group would continue to monitor population trends of these species.

The indirect effects of hunting bison outside the park on wildlife would be similar to Alternative 1 but may slightly increase if more bison are on the landscape, resulting in larger migrations of bison out of the park and more bison available for hunting. Since 2006, when hunting adjacent to the park recommenced, there have been no noticeable impacts to wildlife populations, and this is expected to continue under Alternative 2.

Impacts of Alternative 3

Disturbances—Because the NPS may not manage bison as intensely under Alternative 3 as under Alternative 1, impacts from hazing beyond what is currently described under the "Affected Environment" section may be immeasurable initially. However, in years where bison numbers need to be reduced, hazing may be more prevalent. Like Alternative 1, animals would adjust their behaviors and movements to recurring activities, though some unexpected disturbances, such as hazing of bison, and other indirect effects from hunting such as gunshot noise and the presence of large groups of people may cause short-term movements with minor energetic expenditures that have no impact on survival and reproduction.

Bison Grazing Effects—More bison likely would intensely graze portions of the Lamar and Hayden Valleys during summer, as well as the Gardiner and Hebgen Basins during winter and spring. Intensively grazed areas likely would still make up a small portion of available summer habitats for bison and other ungulates in YNP and on the Custer Gallatin National Forest. Most summer ranges and all winter ranges generally experience low to moderate grazing during the summer growing season (Geremia and Hamilton 2009, 2022). Thus, it is unlikely grazing by bison would substantially affect the seasonal movement patterns or demographics of other ungulates such as bighorn sheep, deer, elk, and pronghorn. Numbers of ungulates in YNP have remained high for numerous decades, with many thousands of animals attaining adequate forage to sustain body condition, reproduction, and survival (Geremia and Hamilton 2019, 2022).

Barriers to Movements—Like Alternative 1, wild animals in YNP and nearby areas of Montana would become familiar with bison management operations and existing fencing patterns as they routinely move around them.

Food Web—With higher numbers of bison than Alternative 1, more bison carcasses should be distributed over a larger area, providing more food to predators, scavengers, and decomposers. This should reduce predation on elk and other ungulates. These effects are still anticipated even if it is necessary to reinitiate shipments for processing when bison numbers approach food-limited carrying capacity.

Brucellosis Transmission—The risk of brucellosis spreading from bison to elk would likely be similar to Alternative 1 but could increase somewhat because the population range and distribution of bison could increase under this alternative. Relative to the roughly 17 million-acre are currently inhabited by elk exposed to brucellosis (Kamath et al. 2016) any potential increase associated with Alternative 3 would be minimal. Additionally, as noted above, the current spread is not linked to Yellowstone bison or elk, but rather other lineages of elk (Kamath et al. 2016). Therefore, Alternative 3 would not likely result in measurable effects on elk populations.

Hunter Harvests—The NPS does not anticipate the numbers, ages, and sex of elk and other ungulates removed by tribal harvests would increase substantially compared to Alternative 1 due to more bison and the distribution of bison hunting opportunities over a larger area of Montana. The NPS in collaboration with the Northern Yellowstone Cooperative Wildlife Working Group would continue to monitor population trends of these species. The indirect effects of hunting bison outside the park on wildlife would be similar to Alternatives 1 and 2 but may increase if more bison are on the landscape, resulting in larger migrations of bison out of the park and more bison available for hunting. Since 2006, when bison hunting adjacent to the park recommenced, there have been no noticeable impacts to wildlife populations, and this is expected to continue under Alternative 3.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are included above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, implementation of the USFS LMP, and hunting that occurs outside the park boundary (appendix D). Wildlife may avoid or be excluded from habitat at or near construction areas during the construction period for these projects. The projects proposed in the USFS LMP would benefit wildlife because they would support habitat improvement while the impacts of hunting outside the park could result in habitat disturbance, disease transmission, increased presence of humans in concentrated areas, and the presence of lead ammunition on the landscape. Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, under Alternative 1, impacts, including those from past, present, and reasonably foreseeable future actions would result in conditions that are the same or similar to those described in the "Affected Environment" section.

As discussed above, bison management actions proposed under Alternative 2 could result in a slightly higher number of bison in YNP compared to Alternative 1, which could increase grazing pressure in some areas of the park and result in less forage available for other ungulates and perhaps alter their behavior and movements somewhat. However, these effects should not adversely impact their population numbers. An increase in bison numbers under Alternative 2 would benefit predators, scavengers, and decomposers that consume bison by increasing bison carcasses on the landscape and providing more food than what is occurring now. This should reduce predation on elk and other ungulates. When combined with the temporary loss of habitat from repairs and replacements to park roads and bridges, beneficial impacts from the LMP that include actions to support habitat improvement, impacts from hunting outside the park such as habitat disturbance and the presence of people and lead ammunition on the landscape, and impacts of other past and present actions, the overall conditions of wildlife populations are expected to remain the same or improve to a small degree compared to what is described in the "Affected Environment" section, with most beneficial impacts resulting from implementation of Alternative 2.

Under Alternative 3, a larger population of bison would be on the landscape, which would increase grazing pressure in some areas of the park and result in less forage available for other ungulates. This could alter their behavior and movements somewhat but is not expected to impact their overall populations numbers. A larger bison population under Alternative 3 would benefit predators, scavengers, and decomposers that consume bison by increasing bison carcasses on the landscape. This should reduce predation on elk and other ungulates. When combined with the temporary loss of habitat from repairs and replacements to park roads and bridges, impacts from the LMP that include actions to support habitat improvement, impacts from hunting outside the park such as habitat disturbance and the presence of humans and lead ammunition on the landscape, and impacts of other past and present actions, the overall conditions of the wildlife populations are expected to remain the same or improve compared to what is described in the "Affected Environment" section, with most beneficial impacts resulting from implementation of Alternative 3.

Threatened Animals and Plants

Affected Environment: Current Status and Expected Future Conditions

This section addresses the potential impacts of bison management on the threatened Canada lynx, grizzly bear, wolverine, western glacier stonefly, and whitebark pine; critical habitat for lynx; and candidate species listing, including the monarch butterfly. The Endangered Species Act (ESA) (16 USC 1531 et seq.) directs federal agencies to conserve threatened and endangered plants and animals and their habitats. Widespread human development has continued in the GYA in recent times, with accelerated climate warming and exotic species invasions (Cole and Yung 2010). Some areas around YNP have experienced rapid increases in numbers of people and rural residential development that continue to damage habitat and movement corridors. These changes likely increase disturbances to grizzly bears, lynx, and wolverines. The suppression of wildland fires over many decades in some areas has resulted in conditions where more frequent, bigger, and hotter wildfires could be unfavorable for whitebark pine survival and could reduce cone production and the likelihood of natural seedling establishment (Greater Yellowstone Coordinating Committee Whitebark Pine Subcommittee 2011; Greater Yellowstone Whitebark Pine Monitoring Working Group 2020). However, some studies suggest fire suppression has had minor impacts on the dynamics of most subalpine forests in the Yellowstone area (Meyer and Pierce 2003; Whitlock et al. 2003). Widespread loss of whitebark pine in the GYA occurred during the 2000s due to extensive mortality from native mountain pine beetles (Logan et al. 2010). The rapid expansion of pine beetles into high-elevation areas occupied by whitebark pine during the past two decades is unprecedented and probably a result of warmer temperatures and altered precipitation patterns from a warming climate (Logan et al. 2010; Shanahan et al. 2016, 2017). Bison management actions would not affect the upper-most extent of high-elevation streams originating from glacial meltwater and inhabited by the western glacier stonefly. Thus, this species was removed from further analysis.

In general, effects to grizzly bears, Canada lynx, and wolverines are insignificant from brief disturbances during bison management operations, including the processing of bison. Bison capture in the Stephens Creek Administrative Area typically occurs during January to mid-March. Few, if any, grizzly bears are in this area during winter. In addition, fewer hazing events of bison back to YNP have occurred in recent years because of the increased tolerance for bison in larger areas north and west of the park in Montana. The NPS does not expect lynx and wolverines to occupy the relatively low-elevation, high-desert, grassland area with sparse vegetation around the capture facility or quarantine pastures due to their preference for thick forest. In the event a grizzly bear, lynx, or wolverine encountered bison operations, they would likely run a short distance away or move away from the area. Some bison removed from the population might otherwise have died and become carrion for grizzly bears, lynx and wolverines. However, higher numbers of bison have resulted in a higher potential for predation or scavenging across the landscape and continuing current management would not decrease the number of carcasses relative to the last 10 years (Green et al. 1997). Grizzly bears, lynx, and wolverines may continue to consume brucellosis bacteria while scavenging bison carcasses, but this should not result in sickness, and they cannot spread brucellosis (National Academies of Sciences, Engineering, and Medicine 2020).

Other actions in the winter that may continue to impact threatened animals is the presence of over-snow vehicles in YNP. Details of these impacts are included in the *Final Winter Use Plan and Supplemental EIS (SEIS)*. This SEIS and associated ROD establish a framework that allows the public to experience winter resources at YNP. This document, and additional details related to adaptive management are found at https://www.nps.gov/yell/learn/management/winter-use-archive.htm. Impacts to Canada lynx and wolverines could include temporary disturbances to individual animals in areas where over-snow vehicles are present. These impacts would be rare, ephemeral, and have little metabolic cost. The SEIS and ROD did not identify any meaningful impacts to grizzly bears because impacts occur during the winter when bears are hibernating.

Grizzly Bear—The FWS listed the grizzly bear as threatened in the lower 48 states during 1975 due to low numbers (230 to 315) and low survival of adult females (USDOI, FWS 1975). Managers in YNP and surrounding national forests and states implemented changes to limit access to human foods by implementing food storage orders, limiting motorized access, retiring livestock allotments, and preventing the loss of secure habitat (White et al. 2017). Annual survival of adult females increased and has remained at 95% for three decades. In turn, substantial population growth occurred through the late 1990s, with range expansion continuing to present day. Lower survival of cubs and yearlings and a modest decrease in reproduction slowed population growth in the 2000s, and the population has been relatively constant thereafter, including the number of bears in YNP. The recent change in population trend apparently was associated with high bear densities in YNP and nearby portions of the ecosystem, rather than a decrease in food resources (van Manen et al. 2021). Most grizzly mortality in YNP from 1980 to present has been from natural causes, primarily old age and intra- and inter-specific strife (Gunther 2022).

Today, there are about 965 bears (range = 800 to 1,100) occupying more than 27,200 square miles (70,500 square kilometers) in the GYA, with enough reproductive females to sustain a viable population over the long term (van Manen et al. 2021; Interagency Grizzly Bear Study Team, unpublished data, 2023). With more grizzly bears occupying areas outside protected parks and wilderness areas where human influence and the potential for management conflicts are greater, the primary causes of mortality have shifted to management removals for livestock depredations, self-defense kills, hunting-related incidents, vehicle strikes, and poaching in range expansion areas (White et al. 2017, van Manen et al. 2021).

Whitebark pines occur on about 14% of the area occupied by grizzly bears in the GYA (Interagency Grizzly Bear Study Team 2013). Whitebark pine seeds are an important food for many bears in the GYA from mid-August through September, making up 50% to 80% of scat volume when cone production is good (Mattson et al. 1991). When cone production is poor and seeds are scarce, bears tend to forage in

lower elevations, which increases the risk of conflict with humans and lowers the survival of bears (Schwartz et al. 2010, Costello et al. 2014). Annual cone production along 21 transects in the GYA monitored by the Interagency Grizzly Bear Study Team has averaged 17 cones per tree since 1980 (range = 1 to 50). Seventy-six percent of 190 monitored trees along the transects died between 2002 and 2009, with no mortality thereafter (Haroldson 2021). However, this mortality did not affect the home range sizes or demographic rates (reproduction, survival) of grizzly bears (Bjornlie et al. 2014; van Manen et al. 2016). Bears reduced their use of whitebark pine stands without increasing their movements, suggesting they obtained alternative foods in the area (Costello et al. 2014). Bears had similar levels of body fat (nutritional condition) between years of good and poor whitebark pine production (Interagency Grizzly Bear Study Team 2013). Additional information on the status, biology, and threats to Yellowstone-area grizzly bears can be found in White et al. (2017).

Canada Lynx—The FWS listed the Canada lynx in the continental United States as threatened under the ESA in 2000 due to inadequate regulatory protections for lynx or their habitats. The FWS designated critical habitat for lynx in 2009 that included YNP and surrounding lands in southwestern Montana and northwestern Wyoming. Lynx in the continental United States are part of a larger population whose core is in the northern forests of Canada. Historical information describes lynx as uncommon in YNP during 1880 to 1980. The NPS detected a few lynx near Yellowstone Lake and on the Central Plateau in YNP from 2001 to 2004 (Murphy et al. 2006). A photographer observed another lynx near the Indian Creek Campground in the northwestern portion of YNP during 2010, and reliable detections of lynx continue to occur in surrounding national forests. Lynx successfully reproduce in the region, though production is limited. In accordance with the Canada Lynx Conservation and Assessment Strategy, personnel from YNP mapped suitable lynx habitat, typically mature forests dominated by subalpine fir, Engelmann spruce, and lodgepole pine, and lynx habitat currently in an unsuitable condition, such as forests 1 to 20 years after disturbance. The NPS identified 20 Lynx Analysis Units in the northern and eastern portions of YNP. The NPS uses the Canada Lynx Conservation and Assessment Strategy to gauge the effects of projects on lynx (Ruediger et al. 2000). Few, if any, bison management activities occur in lynx habitat or analysis units, and bison management does not modify critical habitat for lynx. Additional information on the status, biology, and threats to lynx is available in the *Federal Register* (74:66937-66950; USDOI, FWS 2009a,b).

Wolverine—In November 2023, the FWS announced its final rule to list the distinct population segment of the North American wolverine as a threatened species under the ESA. The FWS also issued an interim rule under ESA section 4(d) tailored to the wolverine's conservation needs that exempts take related to research activities, take incidental to lawful trapping for other species, and take resulting from forest management activities associated with wildfire risk reduction in the contiguous United States. (USDOI, FWS 2023a). The wolverine is a wide-ranging mustelid (weasel family) that naturally exists at low densities, and the southern portion of its range extends into portions of Idaho, Montana, and Wyoming. They are adapted to cold temperatures and life in environments with snow on the ground for much of the year. Wolverines are opportunistic feeders that primarily scavenge on carrion and are sensitive to human disturbance from February to May when young are born and cannot travel far (Hornocker and Hash 1981; Magoun and Copeland 1998). The primary threat to the wolverine in the contiguous United States is the projected effect of climate change on its habitat. Other threats, which may be exacerbated by climate impacts, include effects from multi-lane highways, disturbance due to back country winter recreational activity, and other human disturbances and development (USDOI, FWS 2023b).

Wolverines are rare and sparsely distributed in YNP and adjacent national forest areas (Beauvais and Johnson 2004; Inman et al. 2011). From 2005 to 2009, wolverines were captured or detected in the Absaroka-Beartooth wilderness along the north boundary of the park, the Thorofare region (southeast corner), and the adjoining Washakie and Teton wilderness areas (Murphy et al. 2011). No wolverines were captured or detected inside the park in the Gallatin Range (northwest), the Central Plateau and Washburn Range (central), the Madison Plateau and Bechler region (southwest), and the Snake River

Range (south). No wolverines were detected in the North Absaroka wilderness and adjoining areas along the east boundary of the park, including the upper Lamar River. Radio-marked wolverines selected mountainous habitats above 8,000 feet (2,438 meters) with persistent snow cover and adequate ungulates during winter to provide carrion for food (Murphy et al. 2011). In YNP, reproductive rates were low, and survival rates were similar to other estimates for other populations in the conterminous United States. Dispersal from other areas in the region may be necessary to maintain wolverines in YNP, given low recruitment of offspring born to resident females (Murphy et al. 2011). Additional information on the status, biology, and threats to wolverines is available in the *Federal Register* (88:83726-83772; USDOI, FWS 2023a).

Whitebark Pine—In December 2022, the FWS published a rule (87 *Federal Register* 76882–76917) to list whitebark pine as a threatened species under the ESA. Whitebark pine is a long-lived, cold hardy, five-needle conifer that typically grows at high subalpine elevations greater than 7,000 feet (2,135 meters), often mixed with other conifers. It grows either as trees with a single trunk that extends about 40 to 60 feet (12 to 18 meters) high or in short, dense mats (called krummholtz) at higher elevations exposed to high winds, cold temperatures with snow, and short growing seasons (Tomback et al. 2001). Trees grow and mature slowly and begin producing cones at 20 to 30 years of age; however, they do not produce large cone crops until 60 to 80 years of age. The long-term persistence of whitebark pine in the GYA is threatened by altered fire regimes, blister rust, bark beetles, and a warming climate (Shanahan et al. 2016; Greater Yellowstone Inventory and Monitoring Network 2022).

Whitebark pines occur on about 314,000 acres (127,000 hectares) within YNP, either as a dominant portion of forests above 8,400 feet (2,560 meters) or a mixed understory component in lodgepole pine forests from 7,000 to 8,400 feet (Greater Yellowstone Coordinating Committee Whitebark Pine Subcommittee 2011; USDOI, NPS 2012c). From 2004 to 2015, botanists monitored 5,215 whitebark pines taller than 4.5 feet (1.4 meters) on 176 transects throughout the GYA. Across all age classes, about 26% of monitored trees died, with the highest mortality in trees greater than 4 inches (10 centimeters) diameter at breast height. Most mortality occurred from 2008 to 2011 after the abundance of native mountain pine beetles increased substantially due to above-average temperatures from 2006 to 2008 (Shanahan et al. 2016). The beetle outbreak appeared to wane after 2011. About 14% to 26% of whitebark pine trees were infected by white pine blister rust (caused by a nonnative fungus), with smaller diameter trees experiencing higher mortality (Shanahan et al. 2016, 2017; Greater Yellowstone Whitebark Pine Monitoring Working Group 2020).

The mortality of whitebark pine from 2008 to 2011 shifted the age and size distribution from larger to smaller diameter trees, which lowered reproduction due to fewer seeds and decreased survival (Shanahan et al. 2016; Yellowstone Center for Resources 2018; Greater Yellowstone Whitebark Pine Monitoring Working Group 2020). About 26% of trees greater than 4.5 feet tall were cone-producing, and the density of understory saplings and seedlings averaged 51 trees per 5,280 square feet (500 square meters). Unfortunately, 43% of the reproducing trees were infected with blister rust and 16% had signs of pine beetles; less than 1% of the smaller trees had blister rust infection (Shanahan et al. 2017). Counts of seedlings and saplings varied from zero to 521 per transect, and 447 trees grew to more than 4.5 feet tall by the end of 2015 and were recruited into the population (Shanahan et al. 2017). Few, if any, bison management activities occur in whitebark pine habitat, and no trees have been adversely affected. Additional information on the status and biology of whitebark pine is available in the *Federal Register* (85:77408–77424; USDOI, FWS 2020).

Monarch Butterfly— In December 2020, the FWS determined that listing the monarch butterfly under the ESA is warranted but precluded by higher priority actions. Therefore, the monarch butterfly remains a candidate species under the ESA (USDOI, FWS 2020). Threats to monarchs include the loss and degradation of habitat, widespread use of herbicides and insecticides, logging at overwintering sites in Mexico, incompatible management of overwintering sites in California, urban development, drought, and effects of climate warming. The migratory western population in North America has been decreasing over

the last 20 years due, in part, to decreases in the availability of milkweed and nectar resources. Smaller populations are more vulnerable to catastrophic events, such as extreme storms at the overwintering sites, and the number of days and the area in which monarch butterflies will be exposed to unsuitably high temperatures will increase with climate warming. Protection and restoration of habitat is a primary component of monarch butterfly conservation (USDOI, FWS 2020).

Naturalists working with the park's non-profit partner, Yellowstone Forever, have conducted annual counts of butterflies in northern YNP on a single day in mid-July for 18 years (2004–2021) as part of the North American Butterfly Association's July Butterfly Count. The counts were taken within a 15-mile (24-kilometer) diameter circle centered on the intersection in Mammoth, Wyoming, near the hotel. This area includes wetlands, sagebrush, ponds, forests, creeks, grasslands, and geothermal terraces between elevations ranging from about 5,000 feet at the northern park boundary (Reese Creek) to 11,000 feet on Electric Peak. During these surveys, only one monarch butterfly was detected during 2013. Other sightings of monarchs have occurred at Storm Point and the Nine Mile trailhead along the shoreline of Yellowstone Lake and in the Hayden Valley (Bumann, pers. comm. 2022). Naturalists have only observed a handful of monarch butterflies in upland, dry areas of YNP where they seem to be transitory and feed on pollen from plants like rabbitbrush. Naturalists are not aware of any milkweed-specific associations with monarchs in YNP despite some milkweed presence and its importance as a host plant for monarch caterpillars (Bumann, pers. comm. 2022). There have not been any meaningful adverse impacts to monarch butterflies from current bison management activities. Additional information on the status, biology, and threats to monarch butterflies is available in the *Federal Register* (85:81813–81822; USDOI, FWS 2020).

Indirect Effects of Hunting Outside the Park—In general, effects to grizzly bears, Canada lynx, and wolverines are insignificant from disturbances related to hunting outside the park but can include avoidance of an area due to noise from gunfire at a distance, lead ammunition and the ingestion of lead by scavenger species, and the presence of large groups of people and hunters that could discourage use of certain areas of habitat. Tribal harvest and public hunting of bison generally occurs from September 1 through April 1, with most hunting occurring in February and March, and concentrated near Beattie Gulch, outside the park where the NPS does not have regulatory authority or jurisdiction. Few, if any, grizzly bears are in this area during winter. Lynx and wolverines are not likely to occupy the relatively low-elevation, high-desert, grassland area with sparse vegetation near Beattie Gulch because of their preference for thick forest. In the event a grizzly bear, lynx, or wolverine encountered hunters outside the park, they would likely run a short distance away or move away from the area. Grizzly bears, lynx, and wolverines may continue to consume brucellosis bacteria while scavenging bison carcasses and gut piles, but this should not result in sickness, and they cannot spread brucellosis (National Academies of Sciences, Engineering, and Medicine 2020). There remains a possibility that scavenging any carcass could result in the transmission of other diseases. There have been no noticeable impacts to whitebark pine or monarch butterfly from bison hunting outside the park.

Additional Trends and Planned Actions—As described in the "Yellowstone Bison" section, the area around YNP has experienced rapid increases in human population and land development that continue to damage habitat and movement corridors and could cause increased disturbances to grizzly bears, lynx, and wolverines. Present and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges, impacts from the USFS LMP, and hunting outside the park (see appendix D). Some threatened species will avoid or be excluded from habitat at or near construction areas while other species, such as bears, may be attracted to construction areas. Construction could alter patterns in distribution, movement, and behavior for the term of these projects. Overall, NPS does not anticipate impacts to threatened species populations because none of the construction projects would result in an effect to population numbers beyond what is described under each alternative.

The USFS LMP would benefit threatened animals through habitat improvement projects. The LMP includes an objective to complete three habitat improvement projects every three years while continuing

to work with partners to reduce conflicts with livestock and private property. Indirect impacts resulting from changes in NPS management actions that would affect hunting outside the park are discussed above and in the impact analysis below. However, some hunting outside the park would continue in the future regardless of NPS actions, which could result in noise from hearing gunfire from a distance; the presence of gut piles and carcasses of bison that could result in disease transmission to threatened animals; lead ammunition and the ingestion of lead by scavenger species, which could result in lead poisoning mortality; and the presence of large groups of people and hunters that would discourage use of certain areas of habitat and impact threatened animal species within and adjacent to the park.

Warmer and drier conditions will enable more mountain pine beetles to survive winter, produce multiple broods, and spread. Warmer temperatures also could facilitate the transmission and spread of white pine blister rust or root diseases at higher elevations (Greater Yellowstone Coordinating Committee Whitebark Pine Subcommittee 2011, Jewett 2011). Blister rust has been found in the GYA since at least 1945, but warmer temperatures with higher humidity provide more conducive conditions for its spread (Kendall and Keane 2001; Newcomb 2003; Thoma et al. 2019). Climate change is anticipated to result in direct and indirect effects to whitebark pine, leading to habitat loss across their range (USDOI, FWS 2018). A migration rate of at least a magnitude higher (3,280 feet [1,000 meters]) per year is estimated to be necessary for tree species to be capable of tracking suitable habitats under projected warming trends (Malcolm et al. 2002). Latitudinal migration rates on this scale may significantly exceed the migration abilities of many plant species, including whitebark pine (Malcolm et al. 2002; McKenney et al. 2007).

Whitebark pine faces major threats from climate change and habitat loss from fire-suppression activities. Habitat loss is expected across the entire range of whitebark pine, with additional habitats becoming unsuitable from the direct and indirect impacts of climate warming. Fire is an important natural disturbance process within high-elevation forests of the GYA. It can kill all life stages of whitebark pine and affect forest succession. Researchers anticipate there will be significant habitat loss as temperatures exceed the thermal tolerance of whitebark pine in many areas. Warmer temperatures favor other conifer species, and they outcompete whitebark pine in high-elevation habitats, and the frequency and intensity of disturbances such as fire and disease are altered to such an extent that whitebark cannot persist. The pace of predicted climate warming could outpace the ability of whitebark pine to adapt and respond to expected warming temperatures in previously cool, high-elevation habitats (USDOI, FWS 2021).

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to threatened animals and plants would be like those described above in the "Affected Environment" section, which contains a description of the current and expected future conditions of threatened animals and plants.

Impacts of Alternative 2

Impacts to grizzly bears, lynx, wolverines, and whitebark pine under this alternative would also be similar to those described above in the "Affected Environment" section. With slightly more bison on the landscape, there could be more carcasses for grizzly bears, lynx, and wolverines, which would have a minor, beneficial effect by providing more food and increasing nutrition for a limited time. Indirect impacts from hunting would be similar to or slightly greater than those described for Alternative 1 because more bison could migrate out of the park. These impacts include noise from hearing gunfire from a distance, the presence of gut piles and carcasses of bison, lead ammunition and the ingestion of lead by scavenger species, and the presence of large groups of people and hunters that would discourage use of certain areas of habitat within the park. Similar to Alternative 1, these impacts are unlikely to result in any noticeable impacts to threatened animal species.

Should the NPS capture bison in the interior of the park on an ad hoc basis, threatened animal species may be impacted by the presence of people and noise from capture operations, resulting in dispersal from certain areas of habitat within the park. The NPS would complete additional site-specific NEPA analysis

before implementing this action and would complete all required consultation under Section 7 of the ESA before project implementation.

During December 2012, the FWS concurred with the NPS's determination of not likely to adversely affect for potential impacts to grizzly bears from bison hazing operations, including helicopters. Hazing operations would not increase beyond those identified under Alternative 1 and, therefore, would have the same impacts. The NPS will complete additional consultation with FWS before signing its ROD for this plan/EIS. Similar to Alternative 1, few, if any bison management activities occur in whitebark pine habitat, and no trees would be adversely affected. There would be insignificant effects to monarch butterflies from bison management operations, such as the rare, inadvertent trampling of forage plants and larvae by bison, horses, or people, similar to Alternative 1.

Impacts of Alternative 3

Impacts to grizzly bears, lynx, wolverines, and whitebark pine under this alternative would be similar to those described above in the "Affected Environment" section. With more bison on the landscape, there should be more carcasses distributed over a larger area for grizzly bears, lynx, and wolverines, which would have a greater beneficial effect by providing more food. More hazing may need to occur, and larger hazing operations may be needed in Montana if larger numbers of bison attempt to leave the existing management areas. However, many grizzly bears would still be denning, and few bears, lynx, and wolverines are observed at this time of year in areas when hazing would occur. Thus, the chance of disturbances would be small and ephemeral. Like Alternatives 1 and 2, some of the indirect effects of hunting bison outside the park could include noise from hearing gunfire from a distance, the presence of gut piles and carcasses of bison, lead ammunition and the ingestion of lead by scavenger species, and the presence of large groups of people and hunters that would discourage use of certain areas of habitat within the park. Impacts may be slightly greater than Alternatives 1 and 2 with more bison migrating out of the park due to a larger population, but it is unlikely this indirect effect would meaningfully impact threatened animal species, as detailed for Alternative 1. Like Alternative 1, few, if any bison management activities occur in whitebark pine habitat. A larger bison population may result in the inadvertent trampling of some seedlings, but this would have a negligible effect on recruitment. Effects to monarch butterflies from bison management operations, such as the rare, inadvertent trampling of forage plants and larvae by bison, horses, or people, should be insignificant, similar to Alternatives 1 and 2.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are included above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, implementation of the USFS LMP, and hunting outside the park (appendix D). Threatened animal species may avoid or be excluded from habitat at or near construction areas during the construction period for these projects. The USFS LMP would benefit threatened animals through projects that support habitat improvement while the impacts of hunting outside the park could result in habitat disturbance, the presence of humans in a concentrated area, gut piles, and the presence of lead ammunition on the landscape. Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, under Alternative 1, impacts, including those from past, present, and reasonably foreseeable future actions would result in conditions that are like those described in the "Affected Environment" section.

As discussed above, bison management actions proposed under Alternative 2 could result in a slightly higher number of bison in YNP compared to Alternative 1. This could result in more bison carcasses for grizzly bears, lynx, and wolverines, which would have a beneficial effect to these species from increased food sources. Alternative 2 is unlikely to meaningfully impact whitebark pine or the monarch butterfly as described above in the impact analysis. When combined with the temporary loss of habitat from repairs and replacements to park roads and bridges, impacts from the LMP that include actions to support habitat

improvement, impacts from hunting outside the park such as habitat disturbance, gut piles, and the presence of humans and lead ammunition on the landscape, and impacts of other past and present actions, the overall condition of threatened animal and plant species is expected to improve to a small degree compared to what is described in the "Affected Environment" section, with most changes resulting from Alternative 2.

Under Alternative 3, the population of bison on the landscape would be larger, resulting in more carcasses available for threatened animals. Bison hazing operations may increase in Montana if larger numbers of bison attempt to leave the existing management areas. Many grizzly bears would still be denning, and few bears, lynx, and wolverines are observed at this time of year in areas where hazing would occur. Thus, the chance of disturbances would be small and ephemeral. Alternative 3 is unlikely to meaningfully impact whitebark pine or the monarch butterfly as described above in the impact analysis. When combined with the temporary loss of habitat from repairs and replacements to park roads and bridges, impacts from the LMP that include actions to support habitat improvement, impacts from hunting outside the park such as habitat disturbance, gut piles, and the presence of humans and lead ammunition on the landscape, and impacts of other past and present actions, the overall condition of threatened animal and plant species is expected to improve compared to what is described in the "Affected Environment" section, with most changes resulting from Alternative 3.

American Indian Tribes and Ethnographic Resources

Affected Environment: Current Status and Expected Future Trends

Twenty-seven tribal governments are associated with YNP through ancestral ties to the landscape as well as a historical presence within YNP (figure 8; Nabokov and Loendorf 2002; Tarka 2008; Smith 2009; USDOI, NPS 2014b; Wallen et al. 2015b). Associated American Indian Tribes include the Assiniboine and Sioux Tribes, Blackfeet Tribe, Cheyenne River Sioux Tribe, Coeur d'Alene Tribe, Comanche Tribe of Oklahoma, Confederated Salish and Kootenai Tribes, Confederated Tribes of the Colville Indian Reservation, Confederated Tribes of the Umatilla Indian Reservation, Crow Tribe, Crow Creek Sioux Tribe, Eastern Shoshone Tribe, Flandreau Santee Sioux Tribe, Gros Ventre and Assiniboine Tribes, Kiowa Tribe of Oklahoma, Little Shell Chippewa Tribe, Lower Brule Sioux Tribe, Nez Perce Tribe, Northern Arapaho Tribe, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Shoshone-Bannock Tribes, Sisseton–Wahpeton Sioux Tribe, Spirit Lake Sioux Tribe, Standing Rock Sioux Tribe, Turtle Mountain Band of the Chippewa Indians, and Yankton Sioux Tribe.

YNP maintains its connection to these American Indian Tribes through collaboration to include Indigenous Knowledge in management and decision-making, ethnographic research, interviews with tribal elders, and ongoing government-to-government consultations. Detailed information about tribal affiliations and the importance of YNP to American Indian Tribes is available in the ethnographic summary *American Indians and Yellowstone National Park* (Nabokov and Loendorf 2002).

The Executive Office of the President defines Indigenous Knowledge as a body of observations, oral and written knowledge, innovations, practices, and beliefs developed by American Indian Tribes and Indigenous Peoples through interaction and experience with the environment (OSTP and CEQ 2022). A group of scholars and researchers in the NPS developed a working definition of Indigenous Knowledge or Traditional Ecological Knowledge: [Traditional Ecological Knowledge] refers to the ongoing accumulation of knowledge, practice and belief about relationships between living beings in a specific ecosystem that is acquired by indigenous people over hundreds or thousands of years through direct contact with the environment, handed down through generations by cultural transmission, and used for life-sustaining ways. This knowledge includes the relationships between people, plants, animals, natural phenomena, landscapes, and timing of events that are used for activities such as hunting, fishing, trapping, agriculture, and forestry. It encompasses the world view of indigenous people, which includes ecology, spirituality, human and animal relationships, and more (Ramos et al. 2016). Appropriately recognizing, considering, and applying Indigenous Knowledge requires growing and maintaining strong and mutually

beneficial relationships between the NPS and American Indian Tribes and Indigenous Peoples. Such relationships provide opportunities to identify shared values and goals, build trust and common understanding, and facilitate the exchange of information (OSTP and CEQ 2022). Through planning and implementation, the NPS will continue to consult and collaborate with Tribal Nations to include Indigenous Knowledge in the management of Yellowstone bison.

The NPS defines ethnographic resources as the traditional sites, structures, objects, landscapes, and natural resources that are significant to the present way of life for a particular group (USDOI, NPS 2002). According to NPS cultural resource management guidelines, ethnographic resources are documented by applied cultural anthropologists, whose research is reviewed and approved by the communities they study (USDOI, NPS 2002). Yellowstone's ethnographic resources represent important religious, historical, and/or cultural concepts, such as American Indian Tribes' creation stories or the birth of the NPS system and the conservation movement. Ethnographic resources are associated with several groups, including American Indian Tribes, explorers, trappers, soldiers, miners, concessionaires, neighboring communities, and park visitors.

In the twentieth and twenty-first centuries, land use practices such as road construction and maintenance, fencing, transmission line corridors, cultivation, grazing, and the application of herbicides have affected American Indian Tribes and ethnographic resources in YNP and the GYA. Changes in land use have resulted in disturbance to or removal of cultural objects and historical structures. Adverse impacts to American Indian Tribes and ethnographic resources include, but are not limited to, restricted access to ethnographic resources, impeding traditional uses; increased public access to areas used for traditional purposes, and reduced quantity and distribution of biotic resources, such as plants and animals. With the passage of federal cultural resource protection laws, projects are often designed and routed to avoid impacts on cultural resources. Ethnographic resources within YNP remain important to the American Indian Tribes' sense of themselves and in maintaining their traditional practices. Yellowstone bison are culturally significant to many American Indian Tribes because they are perhaps the only remaining link to the indigenous herds that once roamed the area (Smith 2009; Wallen et al. 2015b).

People have occupied the Yellowstone area for more than 11,000 years. Archeological, ethnographic, and historical evidence shows bison have been an important resource throughout the span of human occupation of the GYA, including the present-day YNP. Native cultures relied on bison for food, shelter, clothing, tools, and fuel, and bison held significant spiritual value for such groups (Nabokov and Loendorf 2002; Smith 2009; Wallen et al. 2015b). European American settlement significantly impacted the relationship between American Indians and bison. The wide-scale slaughter of bison in the late nineteenth century deprived American Indian Tribes of a key component of their economy and culture. European American expansion affected both indigenous traditional territories and Indian reservations. Treaties with the federal government limited native use of lands in the region, and early YNP administrators discouraged American Indian Tribes from using areas in the park (Nabokov and Loendorf 2002; Wallen et al. 2015b).

The NPS recognizes the importance of Yellowstone bison to many American Indian Tribes. These bison represent a connection to the plentiful, wide-ranging bison herds that were central to the lifeways of their native ancestors (Wallen et al. 2015b). Bison are considered sacred to many American Indian Tribes (Smith 2009). Throughout history and today, bison play a crucial role in the cultural, ceremonial, and spiritual practices of many American Indian Tribes (Tarka 2008; Smith 2009). To ensure this connection continues, the ITBC was created to restore bison to tribal lands and share knowledge about bison management. As of 2015, 20 of the tribal governments associated with YNP were members of the ITBC (USDOI, NPS 2014b; Wallen et al. 2015b).

Figure 8. The associated American Indian Tribes of Yellowstone National Park

Tribal representatives have informed managers at YNP about many issues concerning Yellowstone bison, and many American Indian Tribes have been critical of the modern management of Yellowstone bison (Wallen et al. 2015b). Commenting on the refusal of the ITBC to receive processed bison from YNP, an Assiniboine tribal member equated the treatment of these bison to that of livestock (Smith 2009). Some American Indian Tribes believe the management of Yellowstone bison reflects the history of the United States' treatment of American Indian Tribes (USDOI, NPS 2014b; Wallen et al. 2015b). The 2014 final EIS by YNP on the brucellosis remote vaccination program listed several issues identified by tribal representatives during government-to-government consultations (USDOI, NPS 2014b). These issues included management policies, such as herd movement, infectious disease control, vaccination, and termination practices. In addition, tribal representatives indicated the involvement of tribal members in bison management programs and the protection of cultural resources related to bison were important (USDOI, NPS 2014b). The Confederated Salish and Kootenai Tribes of the Flathead Nation and Nez Perce Tribe, and the ITBC, joined the IBMP in 2009 (IBMP Agencies 2011). The tribal entities have since participated in the development of adaptive management strategies and operational plans for bison. Other American Indian Tribes with harvest rights for bison, such as the Shoshone-Bannock Tribes of the Fort Hall Reservation, Confederated Tribes of the Umatilla Indian Reservation, Yakama Nation, and Blackfeet Nation, also participate in some IBMP meetings. In addition, the NPS has continued government-to-government consultation with American Indian Tribes historically associated with bison in the GYA. Additional information on tribal involvement in the preparation of this plan/EIS are included in chapter 4.

Beginning in 2014, 28 American Indian Tribes signed The Buffalo: A Treaty of Cooperation, Renewal and Restoration to honor and recognize their relatives, the bison, as wild free-ranging animals and an essential partner in the natural world. The treaty describes their intertwined and interdependent relationship with bison and conveys their collective intention to provide a safe space and environment in North America so bison can once again lead them in nurturing the land, plants, and other animals. The signatories of the treaty committed to restoring bison to their rightful place in their respective cultures and territories so future generations can realize the bison ways culturally, materially, and spiritually. This significant action to preserve and restore their sacred web of relationships with the natural world also provided USDOI with an opportunity to partner more effectively with them to address interests of mutual benefit, such as restoring sustainable populations of bison to tribal and public lands, conserving habitat for bison and other wildlife, and supporting treaty rights. In 2016, the Buffalo Treaty Nations provided the Secretary of the Interior with a resolution supporting the BCTP and partnership with the Fort Peck Tribes.

In 2020, USDOI released a Bison Conservation Initiative committed to five overarching goals: (1) conserving bison as healthy wildlife; (2) restoring gene flow among conservation herds; (3) sharing stewardship with states, American Indian Tribes, and other stakeholders; (4) establishing and maintaining large wide-ranging bison herds on appropriate large landscapes; and (5) restoring cultural connections to honor and promote the unique status of bison as an American icon. The Buffalo Treaty Nations communicated their support for the Bison Conservation Initiative to the Secretary of the Interior, indicating it was an important step toward better health, ecological and cultural recovery, and continent-wide reconciliation. They agreed to collaborate with USDOI and others through shared stewardship to make this vision a reality.

The NPS has committed to continue fulfilling its trust responsibilities (USDOI and USDA 2021) to American Indian Tribes by sustaining a large population of bison that supports hunter harvests outside the park and restoring more brucellosis-free bison to tribal lands. The transfer of brucellosis-free Yellowstone bison to suitable tribal lands has a beneficial impact on federal-tribal trust relationships. American Indian Tribes use transferred bison to establish or supplement tribal herds for conservation, hunting, nutrition, and cultural purposes. The continued movements of Yellowstone bison onto public lands in Montana would benefit some American Indian Tribes by enabling the hunting and harvest of several hundred bison

in many winters. A range of about 2,900 to 5,900 bison after calving has resulted in movements to the park boundary during most winters that, in combination with year-round tolerance for bison in some adjacent areas of Montana, would sustain or increase tribal and hunter harvest opportunities of Yellowstone bison. The Confederated Salish and Kootenai Tribes of the Flathead Nation, Nez Perce Tribe, Shoshone-Bannock Tribes of the Fort Hall Reservation, Confederated Tribes of the Umatilla Indian Reservation, Yakama Nation, Northern Arapaho Tribe, Blackfeet Nation, and Crow Nation hunt bison on unoccupied lands outside the park pursuant to their own regulations and seasons. Yearly hunter harvest levels vary based on the movement of Yellowstone bison onto these lands (USDOI, NPS 2014b). Other American Indian Tribes historically associated with bison in the Yellowstone area are not members of the IBMP and have not exercised treaty rights to hunt bison migrating from YNP onto national forest lands in Montana. As a result, these American Indian Tribes are less frequently involved with the management of Yellowstone bison. However, many of these American Indian Tribes are members of ITBC.

The IBMP members and American Indian Tribes engaging in tribal harvests have removed (through hunter harvests, culls, and placement in the BCTP) about 11,700 bison since 2001, which exceeds deaths from natural causes such as injuries, predation, and starvation. Capture and transfer for processing or to research facilities removed about 6,500 bison during winters from 2001 through 2023. Since 2016, about 580 bison were placed in the BCTP. Public hunts and tribal harvests removed about 4,300 bison during winters from 2001 through 2023 (table 2) outside the park where the NPS does not have regulatory authority or jurisdiction. Public hunts and tribal harvests removed about 260 bison per winter during 2012–2022 and around 1,175 bison in the winter of 2022–2023. The NPS expects a similar range of harvests would continue under current management. Some bison move to lower-elevation ranges in Montana each winter, depending on food production and consumption, snowpack, and bison numbers (figure 6; Geremia et al. 2011, 2014). Thus, bison should continue to be available for harvests in Montana during many winters. In 2011 and 2023, the NPS held about 800 bison in captivity and fed them hay for several weeks to prevent a mass migration north of the park. These bison were released during spring, but confinement and feeding conflict with the management of bison as wildlife and could lead to food-conditioning, disease transmission during confinement, and disruption of traditional migratory patterns.

Since 2013, the NPS has provided several American Indian Tribes and a tribal organization with more than 3,000 bison for transfer to processing facilities and distribution of meat, hides, and horns to their members. The NPS and APHIS have transferred 414 brucellosis-free Yellowstone bison to the Fort Peck Tribes since 2019. The NPS expanded the quarantine facility near the Stephens Creek Administrative Area during 2021–2022, thereby increasing the number of animals that enter the BCTP. The Fort Peck Tribes built a quarantine facility and currently receive brucellosis-free Yellowstone bison for assurance testing and eventual release on tribal lands. Under current management, YNP would continue to implement the BCTP with the expanded quarantine facility. The NPS has involved tribal personnel in these operations. The Fort Peck Tribes have agreed to transfer approximately 70 percent of the bison that complete testing to ITBC for restoration on tribal lands elsewhere. Since 2020, the ITBC has transferred about 300 bison of Yellowstone-origin from the Fort Peck Indian Reservation to 26 other American Indian Tribes in 12 states.

Additional Trends and Planned Actions—Present and reasonably foreseeable actions impacting American Indian Tribes and ethnographic resources include multiple repairs and replacements to park roads and bridges, implementation of the USFS LMP, updated testing procedures from APHIS, additional tribal bison facilities in support of the BCTP, and hunting outside the park (see appendix D). Construction of repair and replacement projects may involve several project elements that could result in adverse effects to American Indian Tribes and bison, as an ethnographic resource. Project elements resulting in potential adverse effects may include, but are not limited to, ground disturbance and the presence of people in the area, which could cause bison to avoid such areas, and temporary changes in access and traditional uses in areas where construction would occur. The exact nature of the adverse effects will not be known until project designs are developed and consultation with American Indian Tribes is completed. The duration

of the adverse effects is expected to occur until construction is completed. The USFS LMP includes commitments to American Indian Tribes to implement programs and activities honoring Native American treaty rights and fulfilling trust responsibilities to the extent they are determined applicable to the National Forest System lands. Additionally, the LMP recognizes culturally significant species and habitats (including bison), availability of forest resources for collection by tribal members with reserved treaty rights and tribal member access to sacred sites and places, religious and ceremonial sites, and tribal cultural landscapes (USDA, USFS, 2022a). Implementation of the LMP is expected to benefit American Indian Tribes.

Updated testing procedures from APHIS for approved bison quarantine facilities to classify bison as brucellosis-free could result in beneficial impacts to American Indian Tribes because these updated procedures would increase the number of brucellosis-free bison available annually from the GYA and decrease the number of required days for bison in quarantine. VS Guidance 6605.1 established UM&R describing rigorous testing over several years to establish disease freedom because APHIS regulations do not permit infected bison to move other than to process. VS recently evaluated data collected from bison that have cleared quarantine since 2005 and suggested reducing the testing burden. VS Guidance 6605.1 post-quarantine requirements include testing the bison 12 months after release to verify that it remains test negative. Bison would be kept separate from all other animals until the 12-month test has been completed and classified.

Secretarial Order 3410 directs the NPS to initiate discussions with American Indian Tribes and other conservation partners to develop a plan to increase quarantine capacity for bison from YNP so that they may undergo disease testing to further increase both shared stewardship and the number of live bison transferred to American Indian Tribes. It is possible that additional American Indian Tribes may construct facilities to support the BCTP because of this, which may result in beneficial impacts to American Indian Tribes through the increased transfer of live bison through the BCTP.

The State of Montana and American Indian Tribes would continue to harvest bison and hunt outside the northern boundary of the park where the NPS does not have regulatory authority or jurisdiction. Harvesting bison outside the park would provide for ceremonial and subsistence use of bison that would continue to benefit American Indian Tribes. Indirect impacts resulting from changes in NPS management actions that would affect hunting outside the park are discussed above and in the impact analysis below. However, some hunting outside the park would continue in the future regardless of NPS actions, which would continue to benefit American Indian Tribes and their ability to exercise their treaty rights to harvest bison and other wildlife. The number of American Indian Tribes participating in tribal harvest could increase in the future. Based on the NPS management actions presented in chapter 2, it is unlikely that this would result in more bison being harvested outside the park. An increase in the number of American Indian Tribes participating could affect the ability or chances of harvesting a bison with more competition for the bison on the landscape; however, the NPS does not have the authority or jurisdiction to regulate these actions or mitigate these impacts.

Climate change may increase the severity and/or frequency of temperature changes, precipitation changes, flooding, droughts, and wildfires (Rockman 2015). These factors could affect the way American Indian Tribes interact with the environment and affect ethnographic resources from disruptions to the GYA. Climate change may also result in changes to vegetation that could lead to changes in bison distribution across the landscape as they seek different areas to graze. This could affect the ability of some American Indian Tribes to hunt on areas adjacent to park if bison change movement patterns.

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to American Indian Tribes and ethnographic resources would be the same or similar to what is described above in the "Affected Environment" section, which describes the current and expected future conditions of American Indian Tribes and ethnographic resources.

Impacts of Alternative 2

The NPS would continue government-to-government consultation with American Indian Tribes historically associated with bison in the GYA. American Indian Tribes would have continued involvement in decision-making regarding the management of Yellowstone bison. Under Alternative 2, the NPS would continue to work with partners to help improve the efficiency and safety of hunting outside the park and increase the restoration of brucellosis-free bison to tribal lands through the BCTP. These efforts would support tribal rights and collaborative partnerships with American Indian Tribes to augment or enhance bison populations with Yellowstone genetics. The NPS would work directly with treaty tribes and IBMP partners to improve coordination and reduce conflicts when bison are captured; thus, reducing stress on bison and improving the condition of this ethnographic resource. The NPS would shift away from shipments for processing as a primary tool for population management, thereby, helping to restore more bison to the landscape that would be available for hunting by American Indian Tribes. Fewer captures for processing and more opportunities for hunter harvests may be beneficial to several American Indian Tribes. However, other agencies may initiate more intensive management outside the park, with increases in hazing and removals of bison, if there are increases in conflicts with cattle, people, and property. The NPS would continue to work with treaty tribes and IBMP partners to implement measures to improve communication and safety, which would benefit American Indian Tribes.

Impacts of Alternative 3

The NPS would continue government-to-government consultation with American Indian Tribes historically associated with bison in the GYA. American Indian Tribes would have continued involvement in decision-making regarding the management of Yellowstone bison. American Indian Tribes with treaty rights would continue to hunt bison on National Forest System lands pursuant to their own regulations and seasons, and more American Indian Tribes may assert and implement their rights. Initially, the NPS would cease capturing bison for shipments for processing, but captures for the BCTP would continue. Hence, American Indian Tribes could still establish or supplement herds with Yellowstone bison for conservation, hunting, nutrition, and cultural purposes.

More bison could result in larger and earlier movements outside YNP, which in combination with year-round tolerance for bison in some adjacent areas of Montana, could enhance tribal harvest opportunities and hunter harvests of Yellowstone bison. The NPS would not capture bison for processing except if numbers approach 7,000 bison. Many American Indian Tribes may support this minimal management approach. Other agencies may conduct more intensive management outside the park with increases in capture, hazing, and lethal removals. If bison distribute over larger portions of existing management areas in Montana, there would be more hunter harvest opportunities and, likewise, more tribal members could participate in hunts, which would be a beneficial impact to American Indian cultures. However, increased hunting and harvest opportunities for American Indian Tribes are contingent on best practices established by NPS' partners for human safety and minimization of conflicts with nearby residents due to shooting near roads and houses, gut piles left on the landscape, shooting of elk and other ungulates, and occasional incidents of shooting toward other hunters, houses, and cars.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are described above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, implementation of the USFS LMP, updates to APHIS rules that influence how long bison are required to be quarantined, implementation of Secretarial Order 3410 to construct tribal bison facilities in support of the BCTP, and hunting outside the park (appendix D). Repair and replacement project elements resulting in potential adverse effects would include ground disturbance, the presence of people in the area, which could cause bison to avoid such areas, and temporary changes in access and traditional uses in areas where construction would occur. Implementation of the USFS LMP would continue to benefit American Indian Tribes through various commitments to honor treaty rights

and access to religious and ceremonial sites. Updates to APHIS rules could reduce the quarantine time for bison, potentially allowing more bison to be shipped from YNP to receiving tribes. Construction of bison facilities on tribal lands to support the BCTP could allow more tribal involvement and increase the number of bison transferred to American Indian Tribes. Lastly, hunting outside the park would continue to benefit American Indian Tribes through access to bison for ceremonial and subsistence purposes. Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, impacts including those from past, present, and reasonably foreseeable actions would result in conditions that are the same or similar to those described in the "Affected Environment" section.

Alternative 2 would have a beneficial impact to American Indian Tribes and ethnographic resources by providing more opportunity for tribal harvests, fewer shipments for processing, and expansion of the BCTP. When the impacts of Alternative 2 are added to the impacts of past, present, and reasonably foreseeable actions, a near-term, adverse cumulative impact would occur to American Indian Tribes and ethnographic resources from construction-related intrusions on the landscape. This adverse impact would cease once the construction of these projects is completed. Over the long term, there would be a cumulative beneficial effect through improved trust relationships with American Indian Tribes and more bison on the landscape, implementation of the ongoing USFS LMP with commitments to honoring tribal treaty rights, the reduction in the amount of time bison are required to be quarantined under revised APHIS rules, construction of tribal bison facilities, and continuation of hunting outside the park to allow for tribal harvest to occur, with most impacts resulting from Alternative 2.

As discussed under Alternative 3, a larger bison population and fewer captures would enhance harvest opportunities and result in a beneficial impact to ethnographic resources and trust relationships with American Indian Tribes. However, an increase in the number of tribal members hunting in the Beattie Gulch area outside the northern park boundary could increase issues such as "firing lines" that prevent bison from distributing across the larger landscape, wounding of bison that returned to the park, concentrations of gut piles near roads and residences, and human safety issues. When the impacts of Alternative 3 are added to the impacts of past, present, and reasonably foreseeable actions disclosed in the affected environment, a near-term, adverse cumulative impact would occur to American Indian Tribes and ethnographic resources from construction-related intrusions on the landscape. This adverse impact would cease once the construction of these projects is completed. Over the long term, there would be a cumulative beneficial effect through improved trust relationships with American Indian Tribes and more bison on the landscape, implementation of the ongoing USFS LMP with commitments to honoring tribal treaty rights, the reduction in the amount of time bison are required to be quarantined under revised APHIS rules, construction of tribal bison facilities, and continuation of hunting outside the park to allow for tribal harvest to occur, compared to both current conditions and Alternative 2, with most impacts resulting from Alternative 3.

Human Health and Safety

Affected Environment: Current Status and Expected Future Conditions

Brucellosis is a zoonotic disease that can infect people, causing undulant fever with the symptoms described previously. Cattlemen, slaughterhouse workers, veterinarians, wildlife biologists, and hunters careless in field dressing their game may be most at risk for accidental exposure (Luce et al. 2012). The CDC indicates most infected people respond favorably to antibiotic therapy, but symptoms can be painful and persistent (CDC 2012).

Public hunting and tribal harvest occur outside the park where the NPS does not have regulatory authority or jurisdiction (16 USC 24, 54 USC 100101, USDOI NPS 2006a). Some residents near Gardiner, Montana, support hunting bison but believe subsistence hunts are sometimes not safe and result in more wounding loss and too many carcasses, gut piles, and other remains. Others have expressed concerns over the safety of hunting in Beattie Gulch, citing too many people hunting in one small area and the potential

for injury of hunters. The Bear Creek Council and others have indicated carcasses could increase the transmission of brucellosis from bison to elk; attract predators such as grizzly bears that create the potential for conflicts; and attract scavengers such as eagles, magpies, and ravens that fly off with pieces of carcasses and drop them near homes; thereby creating a risk of disease transmission to people and pets (Nara 2019). Some residents characterize carcasses left close to public roads and homes as a visual blight to residents and visitors. No evidence is available that supports disease transmission to humans from gut piles or from remnants of gut piles being carried away from Beattie Gulch. In April 2019, the IBMP agencies met with the Bear Creek Council (2019a) and other residents for a field trip to the Beattie Gulch and Eagle Creek areas and more discussion the following day. Residents shared concerns about the hunt, and attendees brainstormed solutions to increase the safety of hunters and residents. In July 2019, the Bear Creek Council presented recommendations to the IBMP agencies for consideration. These recommendations included requiring hunters to remove carcasses from Beattie Gulch, expanding the zone where no carcasses are allowed deeper into Beattie Gulch, and creating no-carcass zones along portions of the roads in the Eagle Creek area. The recommendations included increasing residents' awareness of the bison hunt, increasing hunter awareness about resident's concerns, and educating them in safe practices, and reducing parking congestion and trash along Old Yellowstone Trail Road (Bear Creek Council 2019b). Public comments on the draft plan/EIS also noted safety concerns related to hunting in the Beattie Gulch area, specifically noting that in January 2023, there was an incident where a bullet fragment struck someone causing injury.

The USFS, the State of Montana, and other IBMP agencies considered these recommendations and concerns and have taken several actions in response, including closing areas near residences and roads to hunting and encouraging hunters to place unused parts of carcasses at least 150 yards from roads and homes. Hunters also are instructed to spread stomach contents on the ground to reduce attractions to scavengers. Other risk mitigation methods, such as incineration of remains and trucking remains to local landfills, are being considered by IBMP members and NGOs (Drimal 2020; IBMP Subcommittee 2020). In 2023, staff from the Custer Gallatin National Forest, State of Montana, and the FWS, and members of the Shoshone-Bannock Tribes, removed gut piles and other parts from bison harvested in Beattie Gulch to reduce the chance of grizzly bears congregating in the area (French 2023). In addition, there is coordination among hunting parties, oversight by law enforcement officers, and the designation of a "lead hunter" in each party to implement safe practices and good decision-making in tribal harvest groups. These actions should reduce the likelihood of injuries to hunters, residents, or visitors traveling on Old Yellowstone Trail South Road. The NPS would continue to support IBMP partners in their efforts to protect human safety and property outside the park. The NPS would continue to use a variety of annual, weekly, and daily meetings during the winter to coordinate hunt-capture actions with American Indian Tribes that hunt bison on lands adjacent to the park. Each summer, representatives from American Indian Tribes that hunt Yellowstone bison outside the park meet with representatives from the State of Montana and the Custer Gallatin National Forest to discuss issues and concerns from previous hunts, safety concerns, access, and enforcement. The NPS attends these meetings to provide information on the status of the bison population and to discuss management objectives for the overall population and each breeding group.

The NPS is aware that some hunters may not comply with hunting regulations in and near Beattie Gulch or engage in illegal activities related to hunting outside the park. However, the NPS has no authority or jurisdiction to regulate or prohibit such activities. The NPS would continue to support IBMP partners in their efforts to curb illegal activities and provide for a safe hunting experience. In 2023, 1,133 bison were taken by public and tribal harvest near the northern boundary of the park, the largest number taken since 2006 when hunting began in earnest, and no meaningful impacts to human health and safety occurred.

Injuries—Bison may appear tame but are wild and unpredictable. They can be more dangerous to humans during the rut (mating season) and when they perceive danger to calves. Bison generally injure five or fewer visitors to YNP each year by butting, goring, or tossing them. In most incidents, the visitor

approached to within 25 yards (23 meters) of the animal, which park regulations prohibit (Cherry et al. 2018). Handouts by YNP and IBMP members include warnings to residents and visitors about approaching bison. Outside the park, there have been no documented cases of bison injuring hunters during the winter hunt near Beattie Gulch. Commenters on the draft plan/EIS also raised concerns about increased conflict with people and property outside the park if bison numbers increase. Numbers of bison migrating out of the park during winter increase with bison population abundance and winter severity. However, there is not a direct relationship among bison population abundance and conflicts outside the park. During the last decade (2014–2023), YNP and IBMP partners successfully managed bison moving outside the park with a population averaging around 4,800, after calving, and varying from about 4,600 to 5,900 animals. Property damage and private-land complaints remained low despite higher numbers of bison, and this is expected to remain the same.

Bison managers sometimes need to approach Yellowstone bison as part of their duties to preserve and manage them (e.g., for hazing to protect people and property, and counting, classifying, and collaring animals to monitor movement and population dynamics). Physical injuries to these employees are possible and occasionally occur, such as employees spraining ankles or falling from horseback. These are occupational hazards for fieldwork not unique to bison handling. On surrounding lands, federal and state employees may sometimes need to approach bison to alleviate conflicts with cattle or people and move them away from private property. This work is often done on foot, from horseback, or in a vehicle. Landowners in the Gardiner and Hebgen Basins also occasionally haze bison off private property.

As mentioned under the "Affected Environment" section for "Yellowstone Bison," the Stephens Creek Administration Area Plan included construction of a barn for corral operations that improved the health and safety of staff and livestock and the efficiency of these operations (USDOI, NPS 2006b). Safe practices and training keep the risk of severe injuries to employees engaging in bison management activities low.

Brucellosis Infection—With the pasteurization of milk and near eradication of brucellosis in livestock, the occurrence of undulant fever in the United States is rare. Infected bison and elk are a minor health risk for people who properly handle animal carcasses or birth tissues (Luce et al. 2012). The NPS provides protective equipment such as gloves, masks, and eyewear, in addition to training, to minimize the risk of exposure of employees to brucellosis bacteria during activities such as sampling animals at processing facilities and conducting laboratory analyses. The NPS also has screened employees involved with bison management for brucellosis exposure. No employees disclosed a positive test. With the use of safe practices, training, and protective equipment, the risk of exposure to brucellosis bacteria among NPS employees and bison managers is low, including during on-site processing of bison in the Stephens Creek Administrative Area. The NPS expects few, if any, cases.

Limited bison migration outside the park occurs during most winters, with most migration in late winter; however, migration increases substantially during severe winters. Hunting occurs in the Hebgen and Gardiner Basins, and portions of carcasses often remain on the landscape; especially on National Forest System lands in Beattie Gulch, Corwin Springs, and Eagle Creek. The Custer Gallatin National Forest, the State of Montana, and other partners have implemented actions to reduce the risk associated with carcasses and brucellosis transmission. There is no evidence gut piles from bison have increased the transmission of brucellosis to elk, with prevalence much higher in the Paradise Valley where bison are not allowed (see the "Wildlife" section; Barber-Meyer et al. 2007, 2008; MFWP 2018, 2020). Actual infection rates in elk are not known. There also is low risk that residents and visitors would contract the disease and subsequently transmit it from person to person if they do not approach and handle offal from bison or elk. Avian scavengers have flown off with pieces of carcasses and dropped them by nearby homes; thereby creating a risk of disease transmission to pets. Residents are aware of this risk, which also occurs throughout the area during more widespread and dispersed hunts of elk each autumn, but some infections of pets have occurred. To date, there have been no documented cases of brucellosis

transmission from bison gut piles in Beattie Gulch to hunters or residents. While this remains a possibility, it is unlikely to occur in the future.

Additional Trends and Planned Actions—Present and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges, and hunting outside the park (see appendix D). Three out of six of these repair and replacement projects are a result of the catastrophic flooding in June 2022 that caused severe damage and loss of several sections of road and access. NPS staff and contractors would follow all best management practices for construction to minimize and avoid injury. Therefore, it is unlikely that the health or safety of personnel involved in the repairs and replacement would be impacted. Indirect impacts resulting from changes in NPS management actions that would affect hunting outside the park are discussed above and in the impact analysis below. However, some hunting of bison and other species outside the park would continue in the future regardless of NPS actions, which could result in noise from hearing gunfire from a distance, the presence of gut piles and carcasses of bison, and the presence of large groups of people and hunters in certain areas within the park. Although there are inherent risks associated with hunting, when appropriate safety practices are followed, it is unlikely hunting outside the park would jeopardize the health or safety of NPS staff, contractors, residents, or park visitors.

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to human health and safety would be like those described above in the "Affected Environment" section, which describes the current and expected future conditions of human health and safety.

Impacts of Alternative 2

Injuries—Like Alternative 1, the NPS would continue safe practices, use of protective equipment, and training. Thus, injuries to staff should continue to be rare and not life threatening. Injuries to visitors when people approach bison too closely would occur at a similar rate to Alternative 1 but may increase slightly if more bison are on the landscape. Migrations into Montana could increase with more bison and a reduction in captures for processing. In turn, state employees or county officials may implement more bison management actions, such as moving bison off private property, preventing bison from mingling with cattle, or initiating capture operations. Increased management beyond the park could raise the risk of injury for employees of other agencies and landowners when attempting to move or prevent bison from moving into certain areas.

Brucellosis Infection—Like Alternative 1, safe practices with protective equipment and training would continue along with testing of higher-risk employees. The already low risk of infection would decrease even more due to a reduction in captures and handling. However, beyond the park, more bison management activities may occur such as moving bison off private property or preventing bison from coming in direct contact with cattle. However, transmission risk during management activities would be negligible with proper training and procedures.

More bison moving outside the park could result in more hunting in nearby areas, compared to Alternative 1. Migrations are often weather-dependent because fewer bison migrate under more moderate weather and productivity conditions, so the range can be anywhere from a few individuals to more than approximately 1,000 bison in any given winter (Geremia et al. 2011, 2014, 2015a). Carcasses and other remains could increase on the landscape, especially near Beattie Gulch and Eagle Creek. Increased exposure to brucellosis could occur from individuals that hunt bison and individuals in these areas who interact with carcasses and other remains. However, federal, state, and tribal agencies would continue to educate hunters on how to reduce their risk of brucellosis exposure by properly field dressing bison and how to cook and handle bison to ensure the bacteria is killed.

Impacts of Alternative 3

Injuries—Like Alternative 1, the NPS would continue safe practices, use of protective equipment, and training. Thus, injuries to staff should continue to be rare and not life threatening. However, more bison in the park could result in more injuries to visitors, although exact causal relationships are difficult to quantify because most injuries result from visitors approaching bison too closely rather than the total number of bison in the park. With more bison, migrations should increase, and more bison management actions could be required beyond the park, such as situations where state employees or county officials are called to move bison off private property, prevent bison from mingling with cattle, or for capture operations. Calls for assistance from private citizens could increase substantially, which could affect the ability of federal and state staff to promptly respond to conflicts with people and cattle. Increased management beyond the park would raise the risk of injury for employees of other agencies and neighboring landowners.

Brucellosis Infection—Like Alternative 2, safe practices with protective equipment and training would continue along with testing of higher-risk employees. The already low risk of infection would decrease even more due to less capture and handling. However, beyond the park, more bison management activities may occur (e.g., moving bison off private property or preventing bison from coming in direct contact with cattle). The number of calls for assistance may surpass the abilities of federal and state staff to respond promptly. However, transmission risk during management activities would remain low with proper training and procedures.

More bison moving outside the park could result in more hunting in nearby areas, compared to Alternatives 1 and 2. Migrations are often weather-dependent because fewer bison migrate under more moderate weather and productivity conditions, so the range can be anywhere from a few individuals to more than approximately 1,000 bison in any given winter (Geremia et al. 2011, 2014, 2015a). Carcasses and other remains could substantially increase on the landscape, especially near Beattie Gulch and Eagle Creek. Increased exposure to brucellosis could occur from individuals who hunt bison and individuals in these areas who interact with carcasses and other remains. However, federal, state, and tribal agencies would continue to educate hunters on how to reduce their risk of brucellosis exposure by properly field dressing bison and how to cook and handling bison to ensure the bacteria is killed. Thus, the overall probability of transmission would remain low.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are described above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, and hunting outside the park (appendix D). Construction projects have the potential to impact human health and safety; however, NPS staff and contractors would follow all best management practices for construction to minimize and avoid injury. Hunting outside the park has the potential to impact human and health and safety, although, when appropriate safety practices are followed, it is unlikely hunting outside the park would jeopardize the health or safety of NPS staff, contractors, residents, or park visitors.

Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, impacts including those from past, present, and reasonably foreseeable actions would result in conditions that are the same or similar to those described in the "Affected Environment" section.

Alternative 2 could minimally affect human health and safety because of the limited potential for injuries to visitors, NPS staff, residents, and other agency staff when in proximity to bison, and because of the low potential for potential brucellosis transmission. When combined with the unlikely impacts from repairs and replacements to park roads and bridges and potential impacts to human safety from hunting outside the park (i.e., concerns around disease transmission and conflicts with multiple hunters operating in a small area), and other past and present actions, impacts to human health and safety overall are expected to be the same as those described under the "Affected Environment" section.

The effects on human health and safety from Alternative 3 would be similar to those described for Alternative 2 but there could be a limited increase in injuries to visitors compared to what is described in the "Affected Environment" section because more bison would be on the landscape. Because fewer bison would be captured and transferred for processing, interactions between NPS staff and bison would be reduced compared to what is described in the "Affected Environment" section. When combined with the unlikely impacts from repairs and replacement to park roads and bridges, and potential impacts to human safety from hunting outside the park (i.e., concerns around disease transmission and conflicts with multiple hunters operating in a small area), and other past and present actions, impacts to human health and safety are expected to remain similar to what is described in the "Affected Environment" section, with a lower overall potential for injuries related to bison handling associated with the implementation of Alternative 3.

Socioeconomics

Affected Environment: Current and Expected Future Conditions

YNP is primarily located in the northwestern corner of Wyoming (Park and Teton Counties) but extends into Montana (Gallatin and Park Counties) and Idaho (Fremont County). The affected area for this analysis focuses on Gallatin and Park Counties in Montana because few bison currently migrate into Wyoming and Idaho.

Population Characteristics and Trends—According to the 2020 US Census, the population in the study area was about 136,150 people. Most people in Gallatin and Park Counties identify as white (89% and 93%, respectively; US Census Bureau 2000, 2010, 2020). Although only 1% of people in Gallatin and Park Counties identify as American Indian and Alaska Native, the park is significant to American Indians. Before the park was established, American Indians hunted, fished, gathered plants, and used the waters for religious and medical purposes (see the "American Indian Tribes and Ethnographic Resources" section).

Between 2000 and 2020, the population increased by 63%, and during the same period, the population of Gallatin County, the most populated of the two study area counties, increased by 75%. Gallatin County is currently the fastest growing county in Montana. If the county's population continues to grow at the projected 2.75 annual growth rate, the number of people could increase to 200,000 by 2040. As a result of the county's population increase, residential development has also expanded into wildland-urban interface areas, degrading habitat and contributing to conflicts with wildlife. The wildland-urban interface is defined as "any area where the combination of human development and vegetation have a potential to result in negative impacts from wildfire on the community" (Gallatin County 2021).

Residential development has grown along with population increases. Montana's Census and Economic Information Center provides county-level population projections, produced by Regional Economic Models, Inc. Between 2000 and 2020, the population of Park County increased by 10% and is projected to be around 17,800 by 2036. Park County's Growth Policy notes conflicts could arise as the population and subsequent development increase (Park County 2017). More private property owners could experience increased interactions with bison in the Gardiner and Hebgen Basin portions of the study area as the human population increases.

Industry and Tourism—Although livestock farms continue to be a large and vital part of Montana's economy, there have been trends away from cattle ranching, partly attributed to recent improvements in animal productivity, health, and live-weight gain rates, which allow ranchers to graze fewer cattle or have a smaller herd size while still ensuring profitability (Herrero 2016). In 2020, there were more than 26,000 farms and ranches in the state across 58 million acres, which is 62% of the state's total acreage. This number is down 7% from more than 28,000 farms and 60 million acres in 2011. In economic terms, revenue from livestock has dropped 32% from a 10-year high of $2.2 billion in 2015 to $1.5 billion in 2020 (USDA 2021b).

The benefits of cattle production to the ranching community include selling land access for hunting and wildlife viewing, amenity values, wildlife conservation, and ranching legacy across multiple generations. However, brucellosis transmission to cattle, especially from elk, poses a risk to the ranchers' economic welfare. A 2016 cost-benefit analysis of reducing elk brucellosis prevalence found that it could cost a rancher an estimated $150,000 to quarantine a herd of 400 cattle from one positive brucellosis case (Boroff et al. 2016). The cost can significantly increase if the disease spreads beyond the affected area, especially if infected cattle move to new high-risk areas. The potential economic costs of brucellosis include a decrease in profits stemming from a decline in the productivity of ranches infected by the disease, which ultimately leads to a reduction in market values of goods and services. Additionally, costs can increase related to consumers' concerns about infection and from activities associated with risk mitigation and adaptation (National Academies of Sciences, Engineering, and Medicine 2020). Continuing to maintain separation between bison and cattle would maintain a low risk of brucellosis transmission. Point conflict is still expected, requiring state and federal employees to respond, which comes with an economic cost.

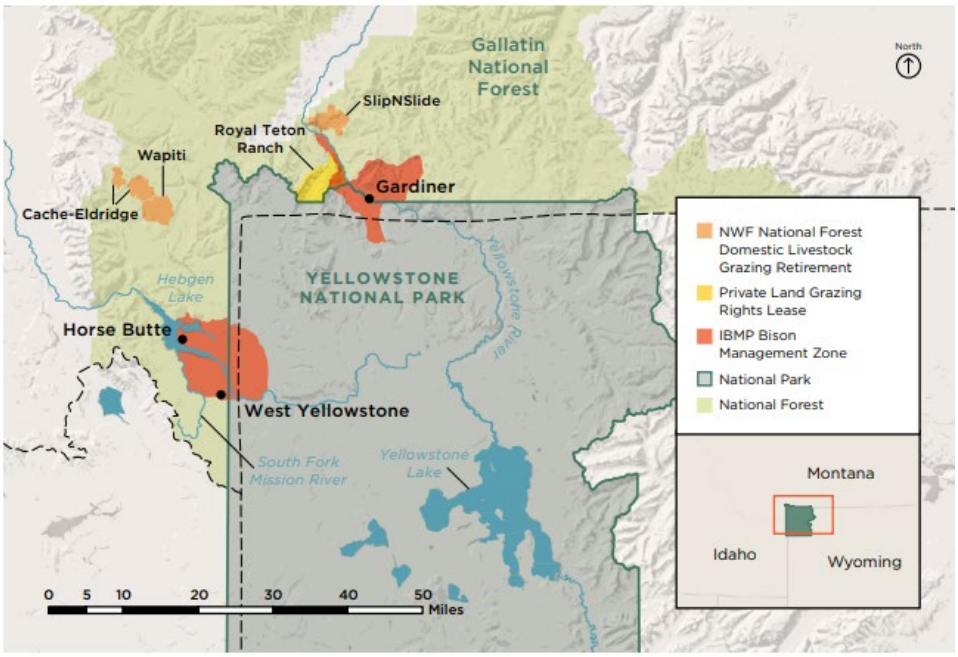
In 2010, APHIS changed its regulations and reduced the risk of Montana losing its brucellosis-free status and experiencing associated economic costs. The new regulations allow livestock producers to deal with brucellosis outbreaks in cattle on a case-by-case basis and eliminated the need to remove whole herds and test cattle across the entire state (USDA, APHIS 2010). MDOL (2011) estimated these regulations with the designation of a brucellosis surveillance area provided a net annual benefit of at least $5.5 million to producers. In 2013, Montana evaluated allowing a greater distribution of wild bison on lands near the park (MFWP and MDOL 2013) and concluded it would not increase the risk of bison spreading brucellosis to cattle or result in trade sanctions by other states or nations (Bullock 2015). Given the change in livestock regulations outside the park, however, culling of entire herds due to a potential infection would be avoided, minimizing the economic impact of an unlikely transmission. No brucellosis transmission has occurred from bison to cattle and therefore, the risk of these economic effects is minimal when compared to elk.

Over the past two decades, the GYA's economy has diversified from a focus on commodity extraction to include more recreation, tourism, and service-related industries (USDOI and USDA 2000a). Recreation and tourism-related jobs are reflected in the retail trade and service sectors. Recreation and tourism are important contributors to the economy of Gallatin and Park Counties. Outdoor recreation accounted for 4% of Montana’s gross domestic product last year, a higher percentage than any other state (Bureau of Economic Analysis 2021). In 2017, outdoor recreation resulted in $4.7 billion in economic impact in the state (Sage et al. 2018). In the 2018 summer visitor survey for YNP, respondents rated viewing wildlife a as a motivating factor in their visit to the park (USDOI, NPS 2019).

In 2020, park visitors spent approximately $444 million in local gateway regions of YNP. Gateway regions are the areas directly surrounding YNP, and gateway economies include the cities and towns where visitors typically stay and spend money while visiting (Cullinane and Koontz 2021). The revenue from visits to YNP and the surrounding area supported 6,110 jobs, $194 million in labor income, $326 million in value-added, and $560 million in economic output. The lodging and restaurant sectors had the largest share of labor income from visitor spending at the park, accounting for $44 million (23%) and $26.7 million (14%), respectively (Cullinane and Koontz 2021). Between 2011 and 2021, Gallatin and Park Counties experienced a drop in unemployment rates. In 2011, the unemployment rate in Gallatin County was 6% and decreased to 2% in 2021. The 2011 unemployment rate in Park County was 8% and by 2021, it had decreased to 4% (US Bureau of Labor Statistics 2021). Tourism and recreation will continue to be a vital part of the economy, currently in the range of 13% to 15% and growing, delivering billions of dollars in revenue and employment in the region. Maintaining current bison management practices is not expected to impact that trend, and long-term, beneficial impacts would continue. Increased tourism, hunting, and other recreation does bring additional costs, including the need to build and maintain infrastructure, protect private lands, and respond to law enforcement calls for assistance.

Managing Migration and Limiting Conflicts—Due to harsh winter weather, cattle grazing is limited in the Hebgen Basin to the west and Gardiner Basin to the north from October to June when bison are most likely to migrate outside park boundaries (Kilpatrick et al. 2009). In 1999, the Rocky Mountain Elk Foundation assigned 1,508 acres of lands on the Royal Teton Ranch located north of YNP between Devil's Slide and Beattie Gulch to the Gallatin National Forest for administration as a conservation easement. USDOI Funds ($1,799,270) were used to acquire this land. The conservation easement was designed "to aid and assist in the preservation of the Yellowstone National Park bison and other wildlife by setting aside a portion of its lands, in perpetuity, thereby providing in the natural world, a safe haven for the bison." The easement was intended "to facilitate the use, movement, or migration of the surface estate by bison, elk, bighorn sheep, pronghorns, grizzly bear, black bear or mule deer, and to avoid destruction or impairment of the natural habitat." In 2008, MFWP purchased the grazing rights on the Royal Teton Ranch for a 30-year period. The NPS provided $1.5 million to implement the initial payment.

In another case, the National Wildlife Federation and USFS entered into an agreement with grazing permit holders at Horse Butte that transferred their rights to the nearby Targhee National Forest, where there are no significant livestock/wildlife conflicts (National Wildlife Federation 2003). These and several other examples shown on figure 9 have reduced the number of livestock grazing in the private lands immediately adjacent to the park in the Gardiner and Hebgen Basins and provided a natural connection for migration of bison between the park and the Custer Gallatin National Forest. Ultimately, this connection has reduced the potential for conflicts between migrating bison and livestock grazing.



Source: National Parks Conservation Association (2015)
Note: NWF = National Wildlife Federation
Note: The IBMP Bison Management Zones depicted show conditions in 2015. Current management zones are depicted in figures 4 and 5.

Figure 9. Examples of conservation efforts that reduced the number of livestock grazing adjacent to the park and provided corridors for migration of bison between the park and the Custer Gallatin National Forest

Private Property—The risk of brucellosis transmission to cattle increases if bison move onto private properties or public lands where cattle graze during the parturition season. The risk of human injury and private property damage would increase as bison move into populated areas. In recent years, human habitation and development have significantly increased outside the park's northern and western boundaries, and this trend is expected to continue. Gallatin County spans over 2,600 square miles (6,734 square kilometers), with about 1,250 square miles (3,238 square kilometers) of public land. Fifty-three percent of the county's 1,685,617 acres is privately owned (Gallatin County 2021).

MFWP is responsible for addressing public safety, property damage, and hazing calls. According to the 2021 IBMP annual report, MFWP spent more than 1,000 hours managing bison, including responding to complaints and dealing with injured or sick bison. In 2021, MFWP responded to 29 calls in the West Yellowstone and Gardiner areas. MFWP and the Montana Highway Patrol also reported a one-vehicle collision resulting in the bison's death. Additionally, another bison-vehicle crash resulted in a traffic backup. Seven incidents of bison threatening private property or public safety were also reported to MFWP in 2021. Only one report of property damage occurred; it involved a picnic table at a privately run campground (IBMP Agencies 2021). Several programs designed with the focus of helping reduce conflict between landowners and wild bison that roam beyond park borders also focus on addressing the socioeconomic impact of these interactions. For example, the Yellowstone Bison Coexistence Program offers financial and technical assistance to property owners who would like to build fences to prevent property damage. Since the organization's founding in 2011, it has completed more than 50 fencing projects in the Gardiner and Hebgen Basins and provided more than $45,000 in reimbursements and materials and additional project expenses such as staff time and travel. While programs exist to help mitigate private property owners that come in conflict with bison, private property owners in Montana ultimately accept the responsibility of dealing with wild animals. The Supreme Court of Montana ruled in 1940 (*State v. Rathbone*. 110 Mont. 225 (Mont. 1940) 100 P.2d86) that wildlife is a natural part of the landscape, and the rights and privileges of private property ownership also come with the challenge and benefits associated with having wildlife on the landscape.

There would be no noticeable change in calls for assistance from private citizens or increased management beyond the park or increases in the risk of injury for employees of other agencies and landowners if current management continues. Proactive strategies to educate the public on safe engagement of bison, hunting practices, and improved fencing and other practices for ranchers and private owners would continue and would reduce the potential for more serious impacts. Incidents of bison causing injuries to visitors should remain at or near current levels (fewer than five incidents per year). Property owners should not see increased costs associated with bison management or lost income from reduced cattle and other livestock grazing. The already limited livestock grazing that occurs in the winter when bison are migrating outside the park is trending downward and is unlikely to result in increased economic costs. The risk of injury to landowners and federal and state employees because of bison migration outside the park should not change from existing conditions.

Food Insecurity—According to the USDA, more than 38 million people, including 12 million children, in the United States are food insecure (USDA 2021a), and 9,400 people in Park and Gallatin Counties are identified as food insecure due to incomes below the poverty line (Feeding America 2020). The meat yield of a single bison averages 50% of its weight, meaning a single 1,000-pound female bison can yield 500 pounds (227 kilograms) of meat, or the equivalent of 2,000 quarter-pound bison patties. Some American Indian Tribes would continue to benefit by receiving meat from bison harvested or shipped for processing that are made available to their families or other tribal members, including seniors, diabetics, Head Start centers, school lunch programs, homeless shelters, and cultural and traditional ceremonies. In addition, bison completing the BCTP are available to American Indian Tribes for conservation, cultural, and nutritional purposes.

Additional Trends and Planned Actions—Present and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges (see appendix D). Three of six of these repair and

replacement projects are a result of the catastrophic flooding in June 2022 that caused severe damage and loss of several sections of road and access. These actions are anticipated to benefit socioeconomics over the long term by either reestablishing travel corridors into the park that were damaged during the flooding or improving the circulation of visitors on existing park roads, and possibly increasing visitation to gateway communities.

Climate change has the potential to impact socioeconomics through changes in visitor use patterns that could increase visitation to national parks, which could benefit local gateway communities, and through changes to the landscape that could preclude visitors from coming to national parks, such as the 2022 flooding at YNP. The NPS published research on the temperature-visitation relationship in 340 units of the US national park system in 2015. Researchers evaluated the historical relationship between long-term average monthly air temperature and visitation (1979–2013) and modeled potential future visitation (2041–2060) based on two warming climate scenarios and two visitation-growth scenarios across the national park system, parks varied widely in the historical relationship between long-term average monthly visitation and temperature. Temperature was a significant predictor of visitation at 95% of parks (324 of 340), and temperature explained 12% to 99% (average = 79%) of the variation in visitation at these individual parks. The historical visitation-temperature relationship at YNP was strong (Fisichelli et al. 2015; USDOI, NPS 2016d).

Potential visitation changes for YNP based on air temperature and a potential growth maximum could be a 16% to 52% increase in annual visitation, a 12% to 35% increase in peak season visitation (three busiest contiguous months), a 36% to 103% increase in shoulder season visitation (two months prior and two months after peak season), a 29% to 53% decrease in low season visitation (three contiguous months with least visitation), and a 15- to 45-day expansion of the visitation season (defined as beginning on the date when 10% of historical cumulative visitation was achieved and ending on the date when 10% of historical cumulative visitation remained for the year). An increase in visitation to YNP because of changes in air temperature resulting from climate change could benefit local gateway communities, particularly the tourism industry through increased visitor spending in these communities.

In June 2022, four days of rain and snowmelt caused devastating flooding and mudslides in and adjacent to YNP. Some experts suggest the frequency of these types of events could increase in the future due to warming temperatures caused by climate change (Ripple et al. 2022). Following the flood event in 2022, the NPS closed the north and northeast entrance roads for several months to implement repairs and develop alternate routes, which contributed to decreased visitation to the northern area of the park. This decrease affected the local economies of the gateway communities, including Gardiner and Cooke City, Montana.

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to socioeconomics would be the same or similar to what is described above in the “Affected Environment” section, which describes the current and expected future conditions of socioeconomics.

Impacts of Alternative 2

Industry and Tourism—Alternative 2 would likely have a positive impact on the tourism and recreation industry by increasing opportunities for wildlife viewing, hunting outside the park, tour guides, and other associated goods and services both inside and outside the park. The higher population of bison on the landscape would allow more tribal harvests and economic activities outside the park. Wildlife would continue to be a major draw for visitors to the region, and a higher bison population would support these opportunities at higher levels.

Park and Gallatin Counties are home to 1,698 farms with 1.4 million acres of land that yields approximately $65 million in revenue annually from livestock. A considerable percentage of that revenue stems from the 78,000 head of cattle in these counties (USDA 2021b). Under Alternative 2, brucellosis

transmission risk would remain low because bison and cattle would continue to be separated. Beyond the park, more bison management activities may occur, such as moving bison off private property or preventing bison from leaving management areas; however, those activities would not increase the risk of brucellosis transmission or associated economic costs.

Managing Migration and Limiting Conflict—Under Alternative 2, nominal increases may occur in calls for assistance from private citizens and increased management by state and federal wildlife agencies beyond the park. The risk of injury for employees of other agencies and landowners could increase slightly because there may be slightly more bison on the landscape than under Alternative 1.

Private Property—Private property owners adjacent to the park and within the tolerance zones may see limited adverse impacts from increased bison on their property, including reduced ability to lease their property for cattle grazing and damages to fences and fields that may require repairs and other improvements to prevent further damage. Bison migration outside the park results in calls for assistance to MFWP and MDOL, which would likely increase as the number of bison increases. Under adaptive management, there would be limited damage to private property when bison migrate outside the park with minimal costs associated with fence repair and other improvements—the same as Alternative 1. There also would be isolated incidence of damage to property inside the park, such as bison rubbing against vehicles or puncturing car tires, which may be associated with a higher bison population compared to existing conditions.

Food Insecurity—There should be an increase in the amount of bison meat available to help address food insecurity with more bison on the landscape. Increased coordination with American Indian Tribes under this alternative would have long-term benefits because additional bison would be available as a resource. Any reduction in available meat from transfer for processing would be offset by the increase in bison placed in the BCTP and an increase in tribal harvest outside the park and the resulting meat available to American Indian Tribes. With this offset, negative impacts are not expected. American Indian Tribes exercising their treaty rights to hunt bison near the northern boundary of the park would continue to benefit from harvested bison.

Impacts of Alterative 3

Industry and Tourism—Alternative 3 would likely have a long-term, beneficial impact on the tourism and recreation industry by substantially increasing opportunities for wildlife viewing, hunting outside the park, guides, and other associated goods and services both inside and outside the park from an increased presence of bison in the park. This benefit would be counteracted somewhat because a higher density of bison is more likely to result in conflicts, injuries, and property damage. Exact causal relationships are difficult to quantify because most injuries are a result of visitors approaching bison too closely rather than the total number of bison in the park, but Alternative 3 would increase the potential for these conflicts. Implementing Alternative 3 would increase the number of bison leaving the park due to the overall increase in the bison population. However, bison would still be kept separate from cattle within the existing management areas. Therefore, the risk of brucellosis transmission would still be small and associated economic costs would not be expected to increase.

Managing Migration and Limiting Conflict—With more bison, migration of bison outside the park would increase, and more bison management actions would be required beyond the park, such as situations where state employees or county officials are called to move bison off private property or to prevent bison from leaving the management area. Calls for assistance from private citizens could increase which, could affect the ability of federal and state staff to promptly respond to conflicts with people and cattle. Increased management beyond the park would raise the risk of injury for employees of other agencies and neighboring landowners.

Private Property—Under Alternative 3, there would be greater potential for damage to private property when bison migrate outside the park, including additional costs associated with fence repair and other

improvements. There also would be greater incidence of damage to property inside the park, such as bison rubbing against vehicles or puncturing car tires.

Food Insecurity—Compared to Alternatives 1 and 2, more bison meat would be available to help address food insecurity because more bison would be on the landscape. Increased coordination with American Indian Tribes under this alternative would have long-term benefits because additional bison would be available as a resource. Any reduction in available meat from transfer for processing would be offset by the increase in bison placed in the BCTP and an increase in tribal harvest outside the park and the resulting meat available to American Indian Tribes. With this offset, negative impacts are not expected. American Indian Tribes exercising their treaty rights to hunt bison near the northern boundary of the park would continue to benefit from harvested bison and possibly from a larger number of bison on the landscape and available for hunting outside the park.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are described above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges (appendix D). These projects are anticipated to benefit socioeconomics over the long term by either reestablishing travel corridors into the park that were damaged during the flooding or improving the circulation of visitors on existing park roads, possibly increasing visitation to gateway communities. Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, impacts including those from past, present, and reasonably foreseeable actions would result in conditions that are the same or similar to those described in the "Affected Environment" section.

Alternative 2 would increase the number of bison on the landscape, which would benefit the growing outdoor culture, recreation, and the tourism industry that has increased the number of visitors, created jobs, launched and supported businesses, and resulted in increased revenue and tax collection for the region. These positive socioeconomic impacts would be countered in part by the growing pressure that tourism places on legacy agriculture industries by reducing public land for livestock. Increased bison numbers on the landscape would slightly increase impacts from traffic congestion and strains on infrastructure associated with higher populations and visitors. When combined with the impacts of past, present, and reasonably foreseeable actions, there could be a slight beneficial impact to socioeconomics in the GYA, resulting from more opportunities for outdoor recreation and tourism, with implementation of Alternative 2 contributing most of the beneficial impacts.

Alternative 3 would have similar impacts to Alternative 2, but the impacts would be greater because there would be more bison on the landscape. When combined with the impacts of past, present, and reasonably foreseeable actions, there would a greater beneficial impact to socioeconomics compared to Alternatives 1 and 2, with implementation of Alternative 3 contributing most of the beneficial impacts.

Visitor Use and Experience

Affected Environment: Current Status and Expected Future Conditions

The purpose of YNP is to preserve the scenery, cultural heritage, geothermal wonders, and plants and animals for the benefit and enjoyment of people (USDOI, NPS 2014a). The 1894 *Act to Protect the Birds and Animals in Yellowstone National Park, and to Punish Crimes in said Park, and for Other Purposes* prohibits hunting in the park but allows fishing (16 USC 26). Visitors experience natural wonders, scenery, wildness, solitude, unpolluted air, and dark night skies, while their needs and expectations are accommodated and adverse impacts to natural and cultural resources are minimized. Over half the visits to YNP each year occur during summer with an increasing number in spring and autumn. Overall visitation has increased by more than 40% since the early 2000s. Most visitors see wildlife viewing, including bison, as a fundamental part of their experience. About 80% of visitors surveyed during 2016

rated bison as one of the most important resources in the park, equivalent to Old Faithful Geyser (Resource Systems Group 2017). During a similar survey in 2018, 91% of visitors listed wildlife viewing as extremely important or very important to their visit. Other features in the park, such as seeing geysers and thermal features, viewing scenery, and experiencing a wild place are also important to visitors (USDOI, NPS 2019).

Traffic congestion due to people stopping their vehicles to watch wild animals, known as animal jams, is common along the park's major roadways. Bison jams occur because visitors stop or slow their vehicles to view bison near roads or because bison are crossing or moving along roadways. While common, bison jams are not a major source of visitor frustration (USDOI, NPS 2019).

Visitation is lowest during winter when wheeled-vehicle travel is limited to the far northern portion of YNP, and access to the interior is only via snowmobile, snow coach, skiing, or snowshoeing. Winter visitation depends on snow conditions and are governed by a cap on the total number of transportation events each day. As a result, winter visits during 2008 through 2014 were limited to fewer than 43,000 (USDOI, NPS 2013). Most visitors on snow machines enter YNP through the entrance near West Yellowstone, Montana. In winter, visitation by automobile only occurs between Gardiner and Cooke City, Montana, by way of the North and Northeast Entrance Roads; no other roads are plowed or maintained for automobiles.

Bison are widely distributed over the park landscape and often visible from roadways and developed areas. Some bison are collared for tracking and other scientific purposes. During summer in the Hayden and Lamar Valleys, bison tend to gather in large herds of several hundred animals or more. Grasses dominate both valleys and trees are sparse at lower elevations; as a result, visitors have expansive views of bison on the landscape. Both valleys are cut by rivers with the Lamar River running through its namesake valley and the Yellowstone River running through the Hayden Valley. Watercraft of any type are not allowed on either river. In the Lamar Valley, there are few roads, one developed camping area (Pebble Creek Campground), and the Lamar Buffalo Ranch, which is primarily used for administrative and educational purposes. The Hayden Valley contains no campgrounds or major developments. Because of the combination of factors described above, the Lamar and Hayden Valleys are prime areas for bison viewing during spring, summer, and autumn. In both valleys, visitors can view large herds of bison in an expansive natural environment, which is a unique opportunity available in few areas of North America.

During July, average daily traffic in the Hayden Valley is 7,540 vehicles, which equates to 19,604 visitors per day in the road corridor. The average per day for the same period in the Lamar Valley is 2,030 vehicles, or 5,278 visitors (USDOI, NPS 2019). In winter, many bison move to the Gardiner (north) and Hebgen (west) Basins because these areas are at lower elevations, have less snow, and more readily accessible forage. The Stephens Creek Administrative Area is in the Gardiner Basin near the northern boundary of the park. This area (about 50 acres; 20 hectares) is closed to visitors year-round. During spring, 1,977 acres (800 hectares) of hills and prairie around the Stephens Creek Administrative Area are closed to visitors for bison operations.

Bison Viewing—Some bison are radio-collared, which is noticeable to visitors. Valleys and non-wooded areas, such as the Hayden and Lamar Valleys and geyser basins, offer excellent opportunities for bison viewing. During summer and autumn, visitors can see large herds of bison grazing in the Hayden and Lamar Valleys. During winter, visitors in automobiles can see groups of bison in the Lamar Valley, on the Blacktail Deer Plateau, and in the Gardiner Basin. Bison jams occur frequently, especially during summer. Exact locations and extent of jams vary based on bison distribution and traffic volumes. Grassland areas with relatively high traffic volumes have the highest potential for bison jams. However, previous visitor survey results do not indicate bison jams negatively impact the visitor experience.

Visitor Perceptions—Few visitors see bison operations because of area closures in the Gardiner Basin and Stephens Creek Administrative Area. Also, visitation is comparatively low during winter and early spring, and there are no major visitor destinations along Old Yellowstone Trail South Road. The NPS

conducts bison processing activities, such as quarantine and brucellosis testing, out of public view. However, some visitors and Gardiner residents may observe hazing operations or hear noise from vehicles or helicopters used by officials outside the park if they are used near the park boundary. Some visitors do not support the NPS capturing and processing wild bison even if they do not observe these operations, while others support decreasing bison numbers and the prevalence of brucellosis. On-site shooting of captured bison by park staff (not hunting) would occur within pastures in the Stephens Creek Administrative Area, which is already closed to visitors. Firearms would be used in the pastures to cull bison that would then be transferred to interested American Indian Tribes for processing and distribution. The sound of gunfire may be audible to visitors and residents traveling on Old Yellowstone Trail South Road and Highway 89. Knowing that animals are being shot and killed inside the park would not be supported by some visitors.

Viewing Scenery—Bison management facilities are concentrated in the Stephens Creek Administrative Area, which is away from busy travel corridors like Highway 89 and the Grand Loop Road. No additional facilities are planned for construction in areas of high visitor use. Overall, visitors do not experience impacts to opportunities to view scenery. As noted above, bison jams occur frequently, especially during summer. Exact locations and extent of jams vary based on bison distribution and traffic volumes. Grassland areas with relatively high traffic volumes have the highest potential for bison jams. However, previous visitor survey results do not indicate bison jams negatively impact the visitor experience.

Restrictions on Visitor Access—Park visitors and Gardiner residents cannot access about 1,977 acres (800 hectares) of the Gardiner Basin during bison management operations. The NPS closes the Stephens Creek Administrative Area, where bison capture and quarantine facilities are located, to the public year-round to ensure public safety and protect government property, equipment, and buildings. The NPS also closes surrounding lands when operating the facility. However, this area has sparse vegetation and, as a result, visitors can view wild animals in the area from a distance, such as from the Old Yellowstone Trail South Road and Highway 89, which parallels the park boundary.

Hunting Outside the Park—In addition to the current bison hunting season, which generally runs from December to April, hunting may occur year-round in the Gardiner Basin outside the park, where the NPS does not have regulatory authority or jurisdiction. A plethora of big-game species, including elk, mule deer, and bighorn sheep make the Gardiner Basin home throughout the year. American Indian Tribes assert that their treaty rights acknowledge the ability to hunt year-round. The state has various big-game hunting seasons running from August to May each year. Additionally, there is a location where the public openly target practices (i.e., the public shoots firearms) on National Forest System land within a 1 mile from Beattie Gulch, which the public uses daily during daylight hours.

Year-round and during hunting seasons, there is a significant chance that residents living near Beattie Gulch and visitors driving along Old Yellowstone Trail South Road or Highway 89 may hear gunshots beyond the park boundary. During the bison hunting season in the winter, there are no major visitor destinations in this area, so visitor use is low. Due to cold temperatures, most visitors drive through the area with windows up, which reduces the audible noise of gunfire. Gunfire may be audible to residents and visitors staying adjacent to the park near Beattie Gulch.

The two main noise sources of a rifle gunshot are produced by different mechanisms (Maher 2007). The first source is muzzle blast, produced by the explosive shock wave as gas rapidly expands from the barrel. Close to the firearm, this is the primary source. The second source is also a shock wave, produced by the projectile traveling at supersonic speed.

Using the NPS Attenuation Calculator software (Joyce 2018) and the spectrum of a previously recorded rifle, the common sound level metric $L_{Aeq,1s\ [12.5-20000\ Hz]}$ at various distances from the muzzle was estimated (table 3). The range of distances at which bison hunting typically occurs (roughly 762–225 meters from a residence calculated using the 150-meter USFS hunting closure, distance of the nearest residence from the county road, and topography in Beattie Gulch that limits where most hunters seek

bison) corresponds to sound levels from 50–64 decibels. Sound levels outside this range may occur due to the direction of fire, local atmospheric conditions (e.g., wind, temperature), or terrain shielding—none of which are accounted for by the Attenuation Calculator. Nevertheless, based on these calculations, gunshots could be noticeably audible considering how far they are expected to exceed the existing median sound level in the area, $L_{Aeq,1s\ [12.5-20000\ Hz]}$ = 33 decibels (Mennitt, Sherrill, and Fristrup 2014).

Table 3. Estimated rifle sound level at various offset distances[a]

Distance from Rifle (meters)	Sound Level (decibels)
100	71.3
250	62.4
500	55.1
1000	46.8

[a] Sound level calculated using $L_{Aeq,1s\ [12.5-20000\ Hz]}$

For context, a decibel level of 50–65 is similar to a household refrigerator or normal conversation at a distance of 3–5 feet (National Hearing Conservation Association n.d.; Yale University Environmental Health and Safety n.d.). Additional indirect effects of bison hunting outside the park could include the presence of large groups of hunters at certain concentrated times during the year and aesthetic issues such as a concentration of gut piles and bison carcasses on the landscape in Beattie Gulch.

Because of the concentrated nature of these effects during bison hunting seasons, the presence of hunters year-round in this area permitted by the state and American Indian Tribes, the public target practice area, and hunting closures that limit the distance from which a gunshot could be heard, the indirect effects of hunting bison outside the park are expected to have minimal adverse effects on the visitor experience and the residents that live directly adjacent to Beattie Gulch.

Additional Trends and Planned Actions—Visitors from around the world will continue to travel to YNP to experience its geothermal wonders, wild animals, inspiring scenic views, cultural heritage, and spectacular wilderness (USDOI, NPS 2014a). Annual visits to YNP averaged fewer than 500,000 until the 1940s but increased to more than 2 million during the 1960s and 1970s, about 3 million during the 1990s and 2000s, and 4 million in recent years (Gunther et al. 2015). The NPS will continue to provide high-quality educational opportunities, and visitor enjoyment and satisfaction are high according to recent surveys. However, many facilities are aging, and roads, trails, and campsites are in continual need of maintenance (USDOI, NPS 2014a). These maintenance activities would continue to temporarily impact visitors through closures and disturbances in localized areas but would improve the visitor experience overall. In addition, increasing visitation has resulted in traffic congestion in some areas, conflicts between people and wild animals, vehicle strikes, and wild animals becoming habituated or too comfortable around people (Gunther et al. 2015). Diseases or parasites may occasionally be transmitted from wild animals to visitors using the same areas (USDOI, NPS 2014a). Visitation and recreation in the GYA are also increasing, resulting in additional pressures on facilities, roads, and resources.

Present and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges, the implementation of the USFS LMP, and hunting outside the park (see appendix D). As noted previously, three of six of these repair and replacement projects are a result of the catastrophic flooding in June. These actions are anticipated to benefit the visitor experience at YNP over the long term by either reestablishing travel corridors that were damaged during the flooding or improving the experience and circulation of visitors on existing park roads. There may be short-term, adverse impacts to the visitor experience during construction if traffic patterns change or from the noise and presence of construction-

related vehicles in the area. Roadway closures, changes in traffic patterns, and construction noise could impact visitor experience in the short term by driving bison away from areas where visitors can view them to areas in the park farther from roadways. The projects proposed in the USFS LMP would benefit visitor use and experience because they would create or connect suitable habitat for bison on the national forest, create more bison viewing opportunities, and reduce conflicts with livestock and private property. The LMP would also provide enhancements on National Forest System lands that provide additional recreational opportunities in the region. Indirect impacts resulting from changes in NPS management actions that would affect hunting outside the park are discussed above and in the impact analysis below. However, some hunting outside the park would continue in the future regardless of NPS actions, which could result in noise from hearing gunfire from a distance, the presence of gut piles and carcasses of bison that could be unsightly, and the presence of large groups of people and hunters that could be a disturbance.

Climate change is expected to affect visitation patterns. Where, when, and how many people visit parks is likely to change with continued warming. For example, visitors may avoid extremely warm months in low-latitude parks, and the visitation season may extend across additional weeks to months at northern parks. Whether park visitors track climate change and shift their behavior would depend on multiple environmental and socioeconomic factors, which are described in the "Socioeconomics" section.

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to visitor use and experience would be like those described above in the "Affected Environment" section, which describes the current and expected future conditions of visitor use and experience.

Impacts of Alternative 2

Bison Viewing—More opportunities would be available for visitors to see more bison under this alternative. Excellent viewing opportunities would continue in the Hayden and Lamar Valleys during summer and autumn, and the Lamar Valley, Blacktail Deer Plateau, and Gardiner Basin during winter. Some bison would continue to be radio-collared, which is noticeable to visitors. The total number and duration of bison jams could increase with more bison, especially in busy travel corridors with grasslands on either side of the roadway. Bison jams would continue to slow traffic in the immediate area and could slow overall travel through the park, though visitors do not report high levels of frustration with animal jams. For visitors wishing to see fewer bison on the landscape, Alternative 2 could negatively impact their experience because bison numbers may increase above current conditions.

Visitor Perceptions—Visitors that oppose intensive bison management, such as capture, processing, and vaccination, would benefit from a reduction in capture operations and the use of low-stress management of bison. These visitors may see more bison on the landscape and be less likely to see active management while inside the park. However, they could see more intensive management just beyond the park boundary if Montana decides to conduct capture or hazing operations. In contrast, not attempting to reduce the prevalence of brucellosis or bison numbers may concern visitors who support Montana's cattle industry or are worried about their safety and property damage. Some visitors would continue to object to hazing, capture, and processing of Yellowstone bison, even if they do not observe these operations, while others would continue to support decreasing brucellosis and bison numbers.

Viewing Scenery—Under this alternative, there would be no change to where bison management occurs. For this reason, impacts would be the same as those described for Alternative 1.

Restrictions on Visitor Access—Like Alternative 1, park visitors would not be able to access about 1,977 acres (800 hectares) of the Gardiner Basin during bison management operations. This action could reduce the ability of visitors to see some bison in the area. However, the area has sparse vegetation, and visitors can view most wild animals in the area from Old Yellowstone Trail South Road and Highway 89. Should the NPS capture bison in the interior of the park on an ad hoc basis, the NPS would restrict access to

certain areas of the park during capture operations. This action would reduce the ability of visitors to see some bison, or recreate in these areas. The NPS would complete additional NEPA analysis for this action prior to project implementation.

Hunting Outside the Park—Impacts from hunting outside the park would be similar to those described for Alternative 1 but may slightly increase if more bison are available for harvest outside the park. Migrations are often weather-dependent because fewer bison migrate under more moderate weather and productivity conditions, so the range can be anywhere from a few individuals to more than approximately 1,000 bison in any given winter (Geremia et al. 2011, 2014, 2015a). During hunting seasons, there is a significant chance that visitors driving along Old Yellowstone Trail South Road or Highway 89 and residents near Beattie Gulch would hear gunshots beyond the park boundary, with similar or slightly greater impacts than described for Alternative 1. However, there are no major visitor destinations in this area so visitor use is low, and due to cold temperatures, most visitors would likely be driving through the area with windows up. Thus, implementation of this alternative would increase the chance visitors and residents may hear gunfire from a distance during short periods of times in the winter, increase the presence of large groups of hunters, and create aesthetic issues such as gut piles and bison carcasses. These impacts, resulting from bison hunting, are likely most pronounced in February and March, with little to any impact the rest of the year.

Impacts of Alternative 3

Bison Viewing—Under this alternative, many more bison could be on the landscape compared to the last decade, and visitors would have more opportunities to see bison in the park. Grasslands in the Hayden and Lamar Valleys and the geyser basins would continue to offer excellent opportunities for bison viewing. During summer and autumn, visitors would see large herds of bison grazing in the Hayden and Lamar Valleys. Herd sizes may increase under this alternative, with a small beneficial impact on visitor experience. During winter, visitors in automobiles would likely see groups of bison in the Lamar Valley, on the Blacktail Deer Plateau, and in the Gardiner Basin with increased frequency, a small beneficial impact on the visitor experience. Like Alternative 2, the total number and duration of bison jams could increase, especially in busy travel corridors. Bison jams would continue to slow traffic in the immediate area and could slow overall travel through the park. However, an increase in the total number and duration of bison jams is unlikely to measurably improve or degrade the visitor experience. For visitors wishing to see fewer bison on the landscape, Alternative 3 could negatively impact their experience because bison numbers may increase above current conditions.

Visitor Perceptions—Like Alternative 2, visitors that oppose intensive bison management, such as capture and processing, would benefit from far fewer capture operations and less intensive management. These visitors may see more bison on the landscape and would be less likely to see active management while inside the park. However, they may see more intensive management near the northern park boundary if the park or Montana eventually decide to conduct capture or hazing operations. Not attempting to reduce bison numbers or brucellosis to lower levels may concern visitors who support Montana's cattle industry or are worried about their safety and property.

Viewing Scenery—Abundant bison may overgraze some areas of the park, which may affect viewscapes for visitors. if overgrazing occurs in some areas, it could result in die-offs of some animals, resulting in more carcasses on the landscape compared to Alternative 1, which some visitors may perceive as a negative impact.

Restrictions on Visitor Access—Park visitors would not have access to the Stephens Creek Administrative Area but could readily view wild animals in the surrounding area. The annual closure of 1,977 acres (800 hectares) in the Gardiner Basin may be shortened with fewer bison capture operations for processing. There are no major visitor destinations in this area, so lifting or shortening this closure would not measurably change visitor use patterns. The NPS expects few visitors would enter the area for hiking or other purposes.

Hunting Outside the Park—Impacts would be similar to those described for Alternative 1; however, hunting beyond the park boundary likely would increase with implementation of this alternative. Migrations are often weather-dependent as fewer bison migrate under more moderate weather and productivity conditions, so the range can be anywhere from a few individuals to more than approximately 1,000 bison in any given winter (Geremia et al. 2011, 2014, 2015a). When hunting occurs, there is an increased chance compared to Alternative 1 that residents and visitors near Old Yellowstone Trail South Road or Highway 89 would hear gunshots beyond the park boundary. However, there are no major visitor destinations in this area so visitor use is low, and due to cold temperatures, most visitors would likely be driving through the area with windows up. Thus, implementation of this alternative would increase the chance that visitors and residents may hear gunfire from a distance during short periods of times in the winter, increase the presence of large groups of hunters, and create aesthetic issues such as gut piles and bison carcasses. These impacts would likely be most pronounced in February and March, with little to any impact from bison hunting the rest of the year.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are described above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, implementation of the USFS LMP, and hunting that occurs outside the park boundary (appendix D). These actions are anticipated to benefit the visitor experience at YNP over the long term by either reestablishing travel corridors that were damaged during the flooding or improving the experience and circulation of visitors on existing park roads. There may be short-term, adverse impacts to the visitor experience during construction if traffic patterns change or from the noise and presence of construction-related vehicles in the area. The projects proposed in the USFS LMP would benefit visitor use and experience because they would create or connect suitable habitat for bison on the forest and reduce conflicts with livestock and private property and provide habitat enhancements that would provide additional recreation opportunities in the region. The impacts of hunting outside the park could result in noise from hearing gunfire from a distance, the presence of gut piles and carcasses of bison, and the presence of large groups of people and hunters that would cause a disturbance.

Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, impacts including those from past, present, and reasonably foreseeable actions would result in conditions that are the same or similar to those described in the "Affected Environment" section.

Alternative 2 would slightly increase opportunities for visitors to view bison with more bison on the landscape but could increase bison jams related to such viewing. For those visitors who oppose intensive park management of bison, this alternative would improve their experience. Bison hunting outside the park could increase under this alternative, which could impact visitor experience when they are near the park boundary or when they exit the park. When combined with the beneficial impacts from road and bridge repairs and the LMP, the adverse impacts from hunting outside the park and other past and present actions, the overall experience of park visitors is expected to improve slightly compared to existing conditions, with most changes resulting from implementation of Alternative 2.

Alternative 3 would have similar impacts to Alternative 2 but to a greater degree because there would more bison on the landscape and even less management by NPS staff. When combined with the impacts from past, present, and reasonably foreseeable actions, the overall experience of park visitors is expected to improve to a greater degree than under Alternatives 1 and 2, with most changes resulting from implementation of Alternative 3.

Vegetation

Affected Environment: Current and Expected Future Conditions

Some scientists disagree on impacts of bison grazing on vegetation. Differences in the point of reference for assessing vegetation cause divergent opinions on whether bison improve or degrade vegetation. Vegetation in the same habitat can exist in many different types of plant communities (states) depending on the aggregate effects of land use, climate change, and natural and unnatural disturbances. Plant communities in various habitats used by bison exist in multiple different states throughout YNP, with different degrees of native and nonnative plants. Some scientists debate whether current plant communities should resemble the communities present when the park was created, whether current plant communities should support certain levels of ecosystem services, and whether grazing animals should be actively managed in the park. Per statute and policy, the NPS manages wildlife and vegetation to sustain them in their natural condition, which includes allowing plant communities to change in response to wildlife.

YNP and nearby areas of Montana support a variety of plant communities due to variable topography, soils, and weather. About 1,150 native plants occur in YNP, including 3 plants found only in or near the park (Ross's bentgrass, Yellowstone sand verbena, and Yellowstone sulfur wild buckwheat) and 97 other state-sensitive rare plants. Vegetation is composed primarily of typical Rocky Mountain plants in montane forests, sagebrush steppe, alpine meadows, wetlands and riparian areas, and geothermal communities. About 217 nonnative plant species occurred in the park by 2013, and about 40 of the nonnative plant species are priorities for control, because of their ability to become invasive.

Bison use about 500,000 acres of land across the park. Most of their use occurs in wet grassland, riparian, sagebrush-steppe, and wetland habitats. The area of analysis focuses on these habitats in the northern region of YNP, as numbers of bison using northern YNP increased substantially since the creation of the IBMP and are likely to remain high under all alternatives considered (figure 3). Grazing intensities on grasslands in central and northern YNP during summer vary across the landscape with heavily grazed areas and nearly ungrazed areas (Plumb et al. 2009; Geremia and Hamilton 2019, 2022; Geremia 2022). Vegetation in the Lamar and Hayden Valleys, where there are large seasonal congregations of bison, is primarily composed of sagebrush steppe, with native and nonnative plants on the slopes and in the valley bottoms. Impacts to vegetation in other areas of the park do occur; however, bison use these areas less intensively, reducing grazing pressure and resulting impacts on vegetation.

The composition of plant communities depends on disturbance, soil conditions, disease, and climate. Disturbance can alter composition by providing competitive advantages to some species, altering soil dynamics, introducing seeds, and providing places for germination. Changes in plant community composition can reduce ecosystem services, such as net primary production, soil nutrient storage, and biodiversity. Nonnative plant invasion, fire, and herbivory impact plant communities in YNP. Herbivory, which encompasses feeding by insects, birds, and small and large herbivores, is commonly referred to as grazing. Although the definition of overgrazing differs among professional fields, it is recognized as the point where the ecosystem services of the plant community suffer negative impacts (Coughenour 2008; Fuhlendorf et al. 2012; Briske 2017; Crawley et al. 2021; Freese et al. 2014). However, there is considerable variation in defining what constitutes negative impacts.

In the 1900s, the NPS intentionally introduced cool-season nonnative plants to areas of northern YNP to support wildlife recovery. Between 1904 and 1952, about 575 acres (233 hectares) in the Lamar Valley were cleared of native vegetation and cultivated with nonnative grasses, including oats, smooth brome, and timothy, to grow hay in support of bison restoration (Rush 1932; Skinner et al. 1942). These cool-season exotics are well adapted for the cool, wet, nitrogen-rich habitats of the mid- to high-elevations of northern YNP. Moreover, they thrive when grazed and are often more productive than native bunchgrasses (Geremia and Hamilton 2019, 2022; Frank et al. 2023). As a result, these cultivars displaced native plants in wet areas across much of northern YNP and now dominate plant communities across

many areas of northern YNP (Geremia and Hamilton 2019, 2022). Other cool-season nonnatives invaded from outside the park including Kentucky bluegrass, clover, dandelion, and Canada thistle. More recently, winter annuals, including cheatgrass, desert madwort, and annual wheatgrass, invaded the park and are spreading (Wacker 2022; Renkin 2022). Invasive plants can outcompete native plants, displacing them from communities. Invasions can result in monocultures where plant communities no longer have a variety of species representing diverse functional traits, which can reduce the ecosystem services provided by the community.

The recovery of large herbivores in YNP provided the NPS with a unique challenge to manage for natural conditions within the constraint that sufficient critical winter range was not included in the park's boundaries. At one point, elk were perceived as overabundant, providing rationale to reintroduce wolves and recover other predators in the park (Coughenour and Singer 1996; Singer at al 1997; Taper and Gogan 2002). Successful predator recovery reduced elk populations, which changed plant communities in some areas (NRC 2002a; Wolf et al. 2007; Marshall et al. 2014; Beschta and Ripple 2016; Singer et al 1997). Bison replaced elk as the dominant grazer based on species biomass during the 2010s. Bison are less vulnerable to predators. Their increasing numbers have had increasing effects on plant communities despite a fully recovered predator guild (Ripple et al. 2010; Mosely and Mundinger 2018; Geremia et al. 2019; Geremia and Hamilton 2019; Kauffman et al. 2023). Though the transition of the northern area of YNP to nonnative conditions occurred prior to large increases in the bison herd and regular use of wintering areas by bison, bison grazing creates conditions that increase the competitive advantage of invasive plants. As described for each habitat type below, a challenging dynamic is emerging where invasive plants are capitalizing on the ecosystem modification caused by disturbance, such as from bison (Kauffman et al. 2023).

Wet Grassland Habitats—Wet grassland habitats occur in areas with moisture-rich soils and cooler temperatures, such as the Lamar, Hayden and Blacktail Valleys. Soil textures include loam, clay-loam and sandy-clay-loam. Soil chemistry is near neutral pH. At the time of European colonization, plant communities in what is now YNP were likely dominated by tufted hairgrass, oatgrass, native timothy, needle grass, Idaho fescue, and a variety of rushes and sedges (Despain 1975, 1990). Plant communities would have produced one to three tons of aboveground plant material per acre each year.

Cool-season invasives invaded wet grassland habitats across nearly all areas of the park used by bison starting in the early 1900s. Invasives include Kentucky bluegrass, timothy, smooth brome, creeping clover, dandelion, and Canada thistle. In many areas of the Lamar Valley, particularly along the floodplain, invasives nearly completely displaced native plants prior to when bison numbers increased. However, these cool-season invasives are a component of wet grassland habitats throughout the park. The extent of their presence varied from occurring sporadically to forming dense colonies depending on location.

Invasions are most pronounced on the grazing lawns of the Lamar Valley. Bison have and would continue to create grazing lawns like those found in the Savanah of the Serengeti. Grazing lawns are areas that animals intensively graze during the time when plants are actively growing (McNaughton 1985; Knapp et al. 1999; Geremia et al. 2019). Large numbers of bison congregating and repeatedly visiting the same areas, like areas in the Lamar Valley, keep plants actively growing at low stubble heights, which increases nutritional value. The consistent grazing and low stubble heights combined with fertile, wet soils promote the competitive advantage of sod-forming plants that reproduce vegetatively, and plants with chemical and physical defenses against herbivory. Kentucky bluegrass, creeping clover, smooth brome, and Canada thistle have these characteristics and have completely, or nearly completely displaced native plants from the lawns in northern YNP (Geremia and Hamilton 2019; Kauffman et al. 2023). Also, these species have higher potential to grow and regrow after being grazed compared to native species, with this difference magnified with the elevated levels of atmospheric carbon dioxide that are present today (Frank et al. 2023). Compared to ungrazed native grasslands, the lawn communities have lower diversity and less variation in plant functional traits (Geremia and Hamilton 2019). Animal dung replaced senesced plant

tissue as the primary source of litter as a source of organic matter (Frank and Groffman 1998; Geremia and Hamilton 2019). Dung decomposes more rapidly than plant litter and provides more rapid nutrients to plants. Lawn communities continue to produce one to three tons of aboveground plant matter each year; soil carbon concentrations between the early 2000s and late 2010s are similar; soil bulk densities remain within ranges that promote plant growth; soil organic matter is sustained; and proportions of soil nutrients remain balanced (Frank et al. 1998, 2011, 2016; Penner et al. 2019; Geremia and Hamilton 2019).

Overall, the alternate "grazing-lawn-invasive" state of wet-habitats in the park has supported and is expected to continue to support many ecosystem services within ranges that would be provided by uninvaded communities.

Riparian Habitats—Riparian zones occur at the interface of aquatic and terrestrial environments and provide ecosystem services such as water storage, sediment retention, and contaminant removal (NRC 2002b). Riparian zones dominated by woody vegetation are valued for the resources and habitat they provide to many species of birds, mammals, and insects (Naiman and Décamps 1997; Naiman et al. 2005). Riparian zones across the park exist in multiple states, including willow-dominated, aspen-dominated, cottonwood-dominated, and grassland-dominated. Multiple factors including resource availability, flooding events, changing climatic conditions, and ungulate herbivory may influence the state of a riparian zone (Rose and Cooper 2016; Brice et al. 2022). Transitions among states has been observed throughout the recorded history of YNP, especially on the northern range. Transitions in riparian zones from woody-dominated states to grassland-dominated states during the 20th century have been attributed to grazing by elk whose population steadily increased following the decimation of large predators (Wolf et al. 2007; Peterson et al. 2020; Singer et al 1997; Hobbs and Cooper 2013; Beschta et al. 2016). It has been proposed that grassland-dominated states would return to woody-dominated states following the reintroduction of wolves and recovery of other large predators, thus reducing ungulate browsing (Ripple et al. 2014; Beschta and Ripple 2016); however, broad support for a trophic cascade is lacking. While a positive response of woody-dominated states has been observed (Beschta and Ripple 2007; Beschta and Ripple 2012; Painter et al. 2014, 2015, 2018), state transitions have not been observed in all riparian areas due to variation in microclimate, soil type, and water table depth (Wolf et al. 2007; Johnston et al. 2007; Bilyeu et al. 2008; Tercek et al. 2010; Johnston et al. 2011; Marshall et al. 2013). Recent observational studies also found a correlation between bison use and grassland-dominated riparian areas (Painter and Ripple 2012; Painter and Tercek 2020; Beschta et al. 2020; Kauffman et al. 2023) suggesting bison use maintains grassland-dominated riparian areas. Grassland-dominated riparian areas were positively correlated with exotic species and negatively correlated with species richness, native species diversity, cover, and wetland species (Kauffman et al. 2023).

The findings are not surprising given the history of northern YNP. Willow dominated many riparian areas at the time of the park's establishment (Houston 1982; Wolf et al. 2007); however, increased elk herbivory during the 20th century transitioned many of these areas to grassland-dominated states (Houston 1982; Singer et al. 1994). As willow-dominated riparian areas declined, beavers also declined because they depend on willows for food and habitat (Baker and Hill 2003). The loss of beavers created fundamental shifts in hydrologic processes of riparian areas that ultimately caused channel incision, loss of fine sediments, and lowered water tables, which has inhibited the transition back to willow-dominated states even in areas that experienced reduced ungulate herbivory (Bilyeu et al. 2008; Marshall et al. 2013). Through the 1990s and early 2000s, elk density and browsing intensity decreased (Vucetich et al. 2005; White and Garrott 2005; Geremia and Hamilton 2019). Willow heights increased slowly from 2001 to 2016, but growth was especially slow in many areas where water tables were low due to stream channel incision, and willows could not access sufficient groundwater (Beyer et al. 2007; Painter and Ripple 2012). As a result, riparian communities have not recovered to their historical tall distributions (Hobbs and Cooper 2013; Peterson et al. 2020). Willow and beavers are likely intertangled in a mutual feedback loop where willows cannot reestablish without beavers, and beavers cannot reestablish without willows (Wolf et al. 2007). Decreases in ungulate herbivory may not be enough to transition grassland-

dominated riparian areas to willow-dominated states (Marshall et al. 2013). Bison have been observed grazing young willow and damaging larger willow via horning behavior such as rubbing or removing bark from trees (Painter and Ripple 2012). Bison are likely contributing to the maintenance of grassland-dominated states; however, fundamental shifts in hydrologic processes are also likely contributing (Bilyeu et al. 2008; Ripple et al. 2010; Painter and Ripple 2012; Marshall et al. 2013; Peterson et al. 2020). Maintenance of grassland-dominated states would likely continue and be localized to areas of intense bison use, specifically areas of the Lamar Valley where bison aggregate during the breeding season.

Aspen cover has declined since the establishment of the park (MacNulty 2022). The decline in aspen cover has been attributed to elk herbivory during the latter half of the 20th century (Ripple and Larsen 2000; Ripple and Beschta 2012; Painter et al. 2014; Beschta et al. 2018, 2020; Beschta and Ripple 2020) and currently to bison trampling and horning behavior (Beschta et al. 2020; Painter et al. 2023). However, recent research has questioned the extent to which ungulate herbivory limits aspen growth and recruitment, and suggests factors such as resource availability and anthropogenic climate change likely also contribute to the loss of aspen cover (Piekielek et al. 2015; MacNulty 2022; Brice et al. 2022; Stanke et al. 2021). The effect of bison on the growth and recruitment of aspens is currently unknown, although observational studies suggest bison may be limiting aspen growth and recruitment (Beschta et al. 2020; Painter et al. 2023). Some aspen-dominated areas may transition to grassland-dominated areas under intense bison use due to their trampling and horning behavior.

The spatial distribution of cottonwood trees is similar in areas along the Lamar River and Soda Butte Creek to when the park was established (Meagher and Houston 1998; Rose and Cooper 2016), although cottonwood abundance has declined (Keigley 1997; Beschta 2003). The recruitment of cottonwood sprouts has been attributed to rare flooding events that provide necessary habitat for cottonwood seedling establishment and survival (Rose and Cooper 2016). For example, the establishment of cottonwood along Lamar River during the 1990s has been attributed to infrequent, large snowmelt flows that provided necessary habitat for seedling recruitment (Rose and Cooper 2016). Bison and elk have been documented to significantly browse and trample cottonwood seedlings (Beschta 2005; Painter and Ripple 2012; Beschta et al. 2020), keeping cottonwood forest in a shrubby growth form (Rose and Cooper 2016). Recent research has suggested bison and elk limit cottonwood height during times of low seedling recruitment but not during times of high seedling recruitment that is dependent on rare flooding events (Rose and Cooper 2016). It is debated whether bison cause sufficient seedling morbidity to cause mortality.

Sagebrush Steppe Habitats—Sagebrush-steppe habitats occur in areas with sandy-loam, sand-clay-loam, and clay-loam soils, with slightly acidic pH, warmer temperatures, and drier conditions. Plant communities at the time of European colonization would likely have included bluebunch wheatgrass, Sandberg's bluegrass, Wyoming big sagebrush, mountain big sagebrush, Idaho fescue, and Columbia needlegrass. Depending on moisture, plant communities would likely have produced 0.5 to 1.5 tons of aboveground herbaceous plant material each year.

Bison use sagebrush-steppe habitats through the year at lower intensities than the wet grassland habitats. Bison graze sagebrush steppe in early spring when plants are emerging (Geremia et al. 2015b). Bison follow the greenwave, the onset of spring phenologies in which plant's immature leaves and shoots offer high-quality forage to herbivorous animals, returning to summering areas in the Lamar and Hayden Valleys (Geremia et al. 2019). Bison also use sagebrush steppe as corridors linking grazing lawns on wet grassland habitats during summer. As a result, sagebrush steppe east of Tower Junction, including the Lamar Valley, receive substantial bison use, although not necessarily grazing. Other bison impacts include wallowing, horning, bedding, pawing, and trampling. Similar impacts occur locally in the Hayden Valley. Sagebrush steppe receives fall and winter grazing throughout the full extent of the northern region of YNP and Hayden, Firehole, Madison, and Gibbon Valleys.

Plant communities within sagebrush steppe across northern YNP are trending away from conditions present at the time the park was created (NRC 2002a; Hunter et al. 2018). Most change occurred from 1963 to present day (NRC 2002a; Hunter et al. 2018). Lower-elevation areas around Gardiner, Montana, converted to grassland states with limited sagebrush and some occurrence of other shrubs, like greasewood and rabbitbrush. Higher-elevation areas have communities with more early successional species that are more competitive under higher grazing (Hunter et al. 2018; Geremia and Hamilton 2019). Despite these changes, ecological services provided by sagebrush steppe were within reasonable ranges through 2002 (NRC 2002a). Qualitative estimates in the mid-2010s suggested that sagebrush steppe no longer supported ecosystem services such as primary production and nutrient cycling (Hunter et al. 2018). Quantitative assessments by the NPS starting in 2015 suggested that the ecological processes of sagebrush steppe east of Mammoth Hot Springs across northern YNP are functioning well within the range of variations known for such wildland systems elsewhere in the world (Geremia and Hamilton 2019). Dung replaced decaying plant matter as the primary form of litter, resulting in increased bare ground, particularly in bison summering areas east of Tower Junction. Yet, soil organic matter, soil nutrient concentrations, and soil bulk densities remain within ranges that promote plant growth (Geremia and Hamilton 2019). Primary production is within expected ranges, and communities consist of broad arrays of native forbs and grasses (Geremia and Hamilton 2019; Wacker 2022).

Cool and warm season invasives are spreading across sagebrush steppe used by bison. Kentucky bluegrass, dandelion, timothy, desert madwort, and cheatgrass are the most abundant invasives in sagebrush steppe (Renkin 2022; Wacker 2022). Contrary to wet grassland areas, sagebrush steppes are predominantly composed of native vegetation and invasive plants, particularly winter annuals, which are more likely to disrupt the ecosystem services provided by these habitats. Under the right conditions, winter annuals germinate in the fall when native seeds lay dormant, gaining a competitive advantage. By spring, winter annuals can outcompete germinating native seeds for limited soil moisture; however, this is highly dependent on spring and fall precipitation, and invasive annual grass dominance can annually fluctuate quite wildly in some areas. Ground disturbance from bison through pawing and wallowing provides areas for winter annuals to establish. Similarly, bison grazing reduces plant litter and creates more bare areas on the soil surface, which are conducive to seed germination. Additionally, these animals help disperse seeds that become attached to their fur. Bison grazing also stimulates nitrogen turnover, which creates conditions that benefit fast-growing plants like winter annuals. As a result, bison indirectly create conditions that can accelerate winter annual invasions.

Winter annuals and other nonnative species replaced native sagebrush and grass communities in portions of the Gardiner Basin near the northern park boundary. This area is the most arid climate within the park, has relatively poor soils on active mudflows, and sustained heavy historical use by livestock and native ungulates (Whittlesey 1995; Rush 1932). This area has had relatively sparse vegetation since the Langford-Washburn-Doane Expedition of 1870 (Whittlsey 1995; USDOI, NPS 2006b). Congress added a 7,600-acre (243-hectare) portion of the basin to YNP in 1941, primarily to provide lower-elevation habitat for elk, pronghorn, and other animals during winter (Whittlesey 1995). Previously, settlers homesteaded, tilled and irrigated, ranched, or hunted for wild animals, primarily ungulates, on most of this area (Whittlesey 1995). This area was overgrazed with nonnative grasses, such as cheatgrass, and the topsoil was eroded by the 1920s due to heavy use by cattle and horses prior to 1905 (Rush 1932). The NPS aerially seeded crested wheatgrass in some of these areas to improve conditions after lands were included in the park. The also NPS initiated native restoration efforts on about 100 acres of winter annual monocultures near the park boundary starting in 2008, and efforts to continue systematic conversion to competitive native species are continuing.

Wetland Habitats—Wetland habitats, including natural springs, face similar invasion of timothy, creeping clover, dandelion, smooth brome, and Canada thistle. Bison graze the periphery of wetlands during the growing season and increase use during winter. Disturbance from bison would likely continue to exacerbate invasions, particularly near bison summering areas in the Lamar watershed and Hayden

Valley. As part of the permit requirements set by the US Army Corps of Engineers, the NPS manages invasive species in wetlands impacted by federal highways projects to maintain their functionality. This control primarily involves spraying clover and Canada thistle, followed by revegetation using willow and other native plants.

Stephens Creek Administrative Area—Today, invasive nonnative plants infest much of the Stephens Creek Administrative Area, where the bison capture facility is located. Native vegetation is sparse because of historical uses and, more recently, from the horse corrals, bison capture and quarantine facilities, equipment storage, barn and associated buildings, and nursery operations. Planted vegetation includes cottonwoods, chokecherries, and a few conifers. Nonnative plants include crested wheatgrass, desert madwort, kochia, Russian thistle, cheatgrass, and annual wheatgrass. The surrounding area consists of foothills with widespread nonnative plants and a mixture of native vegetation, including sagebrush, rabbitbrush, greasewood, juniper, cottonwoods, willow, Douglas fir, and a variety of forbs and grasses. There are also terraces near the Yellowstone River and Reese and Stephens Creeks that ranchers cultivated before being included in YNP. Nonnative plants including crested wheatgrass and desert madwort dominate the vegetation in these areas. Botanists found no rare plants during a survey in the Stephens Creek Administrative Area (USDOI, NPS 2006b).

Facilities or activities that disturb areas of potential bison habitat only affect approximately 90 acres, a small portion of the total 500,000 acres of the project area. NPS staff apply herbicide treatments to reduce noxious weeds, and confine and feed horses and mules within the Stephens Creek Administrative Area. Current management does not have meaningful effects on vegetation in the bison capture facility or quarantine pastures in and near the Stephens Creek Administrative Area because these areas are already denuded. Past expansion of quarantine pastures involved construction of new fences near the Stephens Creek Administrative Area with limited loss of native vegetation. This disturbance was not significant because native plants were sparse in the area and previous land uses had already resulted in widespread disturbance. Quarantine pastures are being actively seeded with native plants, sterile annual plants, or nonnative plants that already occur in the area.

Additional Trends and Planned Actions—Numbers of bison using northern YNP would likely remain between 3,000 and 4,000 animals during summer with slightly higher numbers during winter under the current management framework. Animals using central YNP would likely continue a slow decline toward 1,000 or fewer animals. Bison would continue long-distance migrations from the Hayden Valley to either West Yellowstone or northern YNP or from the upper to lower northern region (Geremia et al. 2015a). The northern migrations may extend with more animals pioneering across the Mirror Plateau into the Pelican and Hayden Valleys over time. Northern migrations may result in animals moving farther upstream along Soda Butte Creek and Slough Creek earlier in the growing season, resulting in higher grazing intensities. Bison effects on vegetation would continue and would be most pronounced in high grazing areas along the northern migration.

Cool-season invasives would continue to invade and become more common in wet grassland habitats throughout the park. Taller growing, bunchgrass invaders, such as timothy, would continue to spread in areas throughout the park with less grazing disturbance. Sod-forming vegetative plants like creeping clover, Kentucky bluegrass, and smooth brome would increase in areas of higher bison grazing. Grazing lawns in floodplain areas of the Lamar Valley would continue their complete conversion to the "grazing-lawn-invasive" state. Based on grazing intensity and moisture regimes, monocultures of dandelion, creeping clover, Kentucky bluegrass, smooth brome, and Canada thistle would likely occur regionally within lawns. Grazing lawns in the Lamar Valley may increase in size and geographic extent to include Slough Creek and Soda Butte Creek. In the absence of persistent drought, grazing lawns are expected to maintain current levels of ecosystem services.

Some riparian areas would be maintained in a woody-dominated state, while others would continue to be maintained in a grassland-dominated state. Bison would continue to reduce growth and recruitment of

woody species such as willow, aspen, and cottonwood. These areas would display an increase in bank disturbance and grazing-tolerant plants. Bison effects on woody-dominated riparian areas would likely be localized to areas of intense bison use, focused on the Lamar Valley, and may spread to Slough Creek and Soda Butte Creek. However, other factors such as altered hydrological processes and changing climatic conditions would also contribute to maintaining some riparian areas in a grassland-dominated state. These factors would interact in maintaining grassland-dominated riparian areas and possibly transitioning some woody-dominated riparian areas to a grassland-dominated state.

The climate of northern YNP has warmed and dried significantly since the 1980s, and this trend is forecast to continue (Tercek et al. 2015; Thoma et al. 2015; Hostetler et al. 2021). Warmer nighttime temperatures could result in increased soil and root respiration and loss of soil carbon. Increased atmospheric carbon dioxide may increase plant requirements for nitrogen, which could reduce soil nitrogen over time, but the interaction of the warmer temperatures and elevated carbon dioxide may produce a neutral outcome depending on soil moisture. Warmer and wetter conditions would likely result in earlier growing seasons and fall reemergence of plants. These conditions would promote winter annual invasions.

Winter annual invasions of desert madwort presently occur on some grazing lawns, with broader occurrence in areas with high densities of bison wallows and areas that were cultivated in the early 1900s. The severity of winter annual invasions in the sagebrush steppe is likely to increase depending on the extent of climate warming and drying, and bison may accelerate this process both directly and indirectly. Current bison populations may heighten the vulnerability to winter annual invasions due to increased bare ground, lower stubble heights, higher nitrogen turnover, and greater ground disturbance. These invasions can, in turn, elevate the risk of fires and lead to further invasions of winter annuals. However, grazing might sufficiently reduce fuel levels, thereby potentially lowering fire risks and indirectly suppressing further invasions to some extent. The NPS currently implements control actions for winter annuals, primarily in the form of targeted preemergent herbicide and native broadcast seeding treatments of nascent patches along roads and trail systems throughout the Lamar Valley. NPS staff would continue to assess, strategize, and implement these management interventions to restrict range expansion of winter annuals.

Changing climatic conditions, such as increasing temperatures and drought intensity, would negatively affect riparian areas. Riparian areas are expected to experience altered hydrology by lowering base stream flows, which may increase heat and water stress of riparian plants. Increasing temperatures may also alter riparian plant phenology, and potentially decouple plant seedling establishment from peak stream flows, thus reducing recruitment. Climate change and subsequent changes in streamflow would likely transition some woody-dominated riparian areas to grassland-dominated states, which are more adapted to warmer and drier conditions (Perry et al. 2012; Peterson et al. 2020; Kauffman et al. 2023).

Wet grasslands habitats are subject to flooding from rapid snowmelt, which may become more common with climate change. The long-term effects of the record-breaking flooding events of June 2022 across northern Yellowstone almost certainly changed the hydrology and vegetation along many riparian areas. This flooding event was considered a 1-in-500-year event. Northern parts of the park received 2 to 4 inches of rain in a 24-hour period, together with at least 5.5 inches of snowmelt. This flood event caused extensive erosion along river corridors, realigned waterways in many places, and deposited extensive sediment (sand, silt) in many previously vegetated areas along river banks and on floodplains. Deposited sediment may provide a source of nutrients and minerals to vegetation and substrate to riparian plant species that require bare substrate for seedling establishment. In wet grassland areas, there is also the potential for further invasion of winter annuals that can pioneer disturbed areas.

Present and reasonably foreseeable actions include multiple repairs and replacements to park roads and bridges (see appendix D). As noted previously, three of six of these repair and replacement projects are a result of the June 2022 catastrophic flooding, which caused severe damage and loss of several sections of

road and access. Because these projects are repair and replacement of previous infrastructure, most would occur in previously disturbed areas. Mitigation measures and best management practices would be implemented to reduce erosion and soil damage, revegetate, and prevent the spread of nonnative plants.

Impacts of Alternative 1 (No Action)

Under Alternative 1, current management would continue. As a result, impacts to vegetation would be like those described above in the "Affected Environment" section that describes the current and expected future conditions of vegetation.

Impacts of Alternative 2

Under Alternative 2, numbers of bison could range up to about 6,000 after calving, and numbers of bison using northern YNP will likely be higher than current conditions and approach about 4,000 to 5,000 animals at times. Impacts would be similar to those discussed in the "Affected Environment" section but may increase slightly with more bison on the landscape. However, since 2012, total numbers of bison have ranged between about 4,000 and 5,900, with between about 2,500 and 4,500 in the northern breeding herd. Northern migrations would lengthen to include the Pelican and possibly Hayden Valleys, via the Mirror Plateau. Some wet grassland habitats in the Slough Creek, Soda Butte Creek, Upper Lamar, Mirror Plateau, and Pelican Valley would likely convert to grazing lawns. Plant communities in grazing lawns would change as described in the "Affected Environment" section. More sagebrush steppe would be impacted by a bison population using a larger migratory landscape, linking northern YNP with central YNP. Specifically, more areas of sagebrush steppe from Slough Creek to Lamar Valley to Pelican Valley would be used during summer as passthroughs as bison move between grazing lawns. Horning, digging, wallowing, seed dispersal and grazing would increase in these areas, which would increase winter annual invasions. Plant diversity would likely be positively impacted across a broad extent of YNP used by bison at light to moderate intensities. Some riparian areas would be maintained in a woody-dominated state, while others would continue to be maintained in a grassland-dominated state, particularly in the Lamar watershed. Aspen-dominated areas may transition to grassland-dominated areas as a result of bison trampling and horning behavior. Plant communities would likely continue to provide ecosystem services well within the range of variations known for such wildland systems elsewhere in the world. However, persistent drought may diminish plant community resiliency and their capacity to sustain ecosystem services. There would be no additional impacts from disturbance in the Stephens Creek Administrative Area where most operations occur because this area is already denuded of native vegetation.

Impacts of Alternative 3

Under this alternative, bison abundance could increase to 7,000 bison after calving. Impacts would be similar to those discussed in the "Affected Environment" section but may slightly increase with more bison on the landscape. Impacts to vegetation would be highest compared to other alternatives with increased likelihood of measurable change in vegetation conditions. Numbers of bison in the northern region of YNP would likely exceed forage capacity at times, likely causing bison to move into new areas. This alternative could result in bison intensively grazing portions of the Lamar, Hayden and other valleys during summer, and the Gardiner and Hebgen Basins during winter and spring. Numbers in the Hayden Valley may increase toward 3,000 bison; bison would be forced to move to new areas, and migrations would likely link the Lamar and Hayden Valleys via the Mirror Plateau. Concerns about overgrazing may increase in some areas if much higher numbers of bison remain in the park. If management areas in Montana remain the same and the bison population increases to the upper end of the population range as defined by food availability, the risk of overgrazing wet grassland habitats in some parts of Lamar and Hayden Valleys and impacts to riparian habitats, wetland habitats, and sagebrush-steppe habitats would be the highest compared to other alternatives with increased likelihood of measurable change in plant production, soil productivity, nonnative invasions, and erosion. The impacts to each of these habitat types would be similar to those described for Alternative 2, but with a greater degree of intensity and geographic extent if bison move into new areas. Declines in soil organic matter, soil nutrients, and

primary production could occur in the Lamar Valley if animals do not move to other areas when numbers exceed forage capacity. There would be no additional impacts from disturbance in the Stephens Creek Administrative Area where most operations occur because this area is already denuded of native vegetation.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable planned actions are included above in the "Affected Environment" section. Present and reasonably foreseeable actions include repairs and replacements to park roads and bridges, most of which would occur in previously disturbed areas. The long-term effects of the recent sediment deposition on vegetation will take many years to investigate; therefore, impacts to vegetation are unknown at this time.

Under Alternative 1, current management would continue, and there would be no new direct or indirect impacts beyond those described in the "Affected Environment" section. Overall, impacts including those from past, present, and reasonably foreseeable actions would result in conditions that are the same or similar to those described in the "Affected Environment" section.

Under Alternative 2, the number of bison on the landscape would increase, and the NPS would continue to monitor the effects of grazing on the landscape. Vegetation in the Stephens Creek Administrative Area has already been denuded and nonnative plants have infested the area, with no additional impacts associated with Alternative 2. When combined with the impacts from past, present, and reasonably foreseeable planned actions, vegetation would remain in the same or similar condition as described in the "Affected Environment" section.

Alternative 3 would have similar impacts on vegetation as Alternative 2 but to a slightly greater degree because there would be more bison on the landscape. Like Alternative 2, there would be no impact on vegetation at the Stephens Creek Administrative Area because this area has already been denuded and nonnative plants infest this area. When combined with the impacts of past, present, and reasonably foreseeable actions, vegetation would remain in the same or similar condition as what is described in the "Affected Environment" section.

Chapter 4: Consultation and Coordination

Public Involvement – Public Scoping

Scoping is an essential component of the NEPA planning process. The formal scoping process for the plan/EIS consisted of public scoping and consultation with federal and state agencies and tribal governments. The formal NEPA process and 30-day public scoping period was initiated on January 28, 2022, with the publication of an NOI in the *Federal Register* (87:4653). In addition, preliminary information regarding the plan/EIS was provided to the public and other interested parties through a press release and public scoping newsletter. During the public scoping period, the NPS hosted two virtual public meetings on February 9 and 10, 2022.

The NPS received approximately 2,540 public comments during the scoping period. The NPS received additional comments from federal, state, tribal, and local governments, and organizations, as well as several NGOs. Public comments included suggestions for changes to the proposed alternatives presented in the NOI and new alternatives and alternative elements for consideration. Those suggestions ranged from expanding bison tolerance areas in Montana, protecting bison migration routes, modifying hazing operations within and outside YNP, changing hunting rules, updating brucellosis management, changing the BCTP, modifying bison slaughter and hunter harvest, and combining elements of Alternatives 2 and 3. Comments included information for review such as references to specific reports and data on topics such as hydrology, brucellosis and disease management, bison population dynamics and genetics, socioeconomics, and human health and safety.

Public Involvement – Public Review of the Draft Plan/EIS

The Notice of Availability for the draft plan/EIS was published in the *Federal Register* (88:54613) on August 10, 2023. The public comment period was open for 60 days, from August 10, 2023, to October 10, 2023. During this time, the NPS hosted two virtual public meetings on August 28 and August 29, 2023.

The NPS received approximately 27,150 public comments on the draft plan/EIS. Comments were received from federal, state, tribal, and local governments and organizations, as well as several NGOs and the public. In addition to those suggestions submitted during scoping, listed above, commenters requested that NPS:

- Further address the effects of hunting outside the park, create different upper and lower range limits for the bison population, and address disease management.
- Cease management of bison and treat bison similar to other wildlife.
- Better articulate its management tools and detail when tools may be used, while others requested that the NPS cease shipment to slaughter (also referred to as transfer for processing) as a tool.
- Evaluate management actions outside the park; allow for hunting within the park; vaccinate cattle, elk, and bison against brucellosis; and build overpasses within the park to aid bison migration.
- Stop participating in the IBMP, stop hunting outside the park, change hunting regulations outside the park, and transfer live bison to non-tribal entities.

Commenters also requested additional information be provided on bison genetics, the BCTP, impacts to other wildlife species, climate change, cumulative actions, and riparian plant communities.

Commenters submitted additional reference documents for the NPS to consider related to ungulate impacts on vegetative communities, ecosystem dynamics, greenhouse gas (GHG) emissions, beaver, elk, birds, grizzly bears, brucellosis in the GYA, quarantine procedures, bison genetics, and more. For a

complete summary of substantive comments received during the comment period and NPS's responses to comments, please see appendix G.

Agency Consultation

Agency consultation is the early involvement of federal, state, and tribal governments that may be affected by the federal action. Like the public scoping process, this process allows affected agencies and tribal governments to comment and contribute early to the decision-making process and helps the NPS identify key issues or requirements to be considered in the NEPA process. During development of the draft and final plan/EIS, NPS conducted agency consultation with the regulatory and consulting agencies described below regarding their recommendations on bison management related to the actions being considered in this plan/EIS.

Section 106 of the NHPA requires that federal agencies consider their effects to historic properties. This process requires agencies to determine whether they have an undertaking that has the potential to cause effects to a historic property. The alternatives were reviewed for their potential to affect historic properties. The implementing regulations for section 106, 36 CFR 800, define an undertaking as, ". . . a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval" (36 CFR 800.16(y)). The management of bison is an undertaking according to this definition. The no-action alternative would result in the park continuing to manage bison in the same manner as they are currently managed. Both action alternatives consist of using existing facilities and are based on the number and frequency of bison that are trapped or permitted to pass by the capture facility to be hunted by American Indian Tribes and the state outside the boundary of the park. No new construction or other activities that would have the potential to cause effects to historic properties are part of this plan. Bison do not meet the definition of a historic property at 36 CFR 800.16(l)(1). The alternatives in this plan/EIS do not have the potential to cause effects to historic properties per 36 CFR 800.3(a)(1); therefore, no further section 106 review is needed. The NPS will continue to consult with American Indian Tribes per other laws, policies, and regulations, given the significance of bison to American Indian Tribes. On February 15, 2022, the NPS held a virtual consultation meeting, which was attended by representatives of the Comanche, Nez Perce, and Shoshone-Bannock Tribes of the Fort Hall Reservation Tribes. On November 10, 2023, the NPS held a virtual consultation meeting that was attended by the Blackfeet Tribe, Coeur d'Alene Tribe, Kiowa Tribe, Confederated Salish and Kootenai Tribes, Chippewa Cree Tribe, Shoshone-Bannock Tribes, and the Assiniboine and Sioux Tribes. Ongoing consultation has also occurred with the harvesting Tribes through the IBMP meetings throughout the development of this plan/EIS.

Specific comments were received from some cooperating agencies. The Chairman of the Nez Perce Tribal Executive Committee submitted comments to the Superintendent of YNP on March 9, 2022, indicating recognition of treaty rights should be an action common to all alternatives. The Tribe supported adaptive management and requested inclusion in the development of adaptive components. The Tribe tentatively supported Alternative 3 and asked the NPS to identify actions that would facilitate migration and dispersal of bison from the park and predict short- and long-term migrant numbers. The Tribe requested more information about the carrying capacity models and bison habitat and asked the park to consider climate change and its impacts.

On September 21, 2023, the Chairman of the Nez Perce Tribal Executive Committee submitted comments on the draft plan/EIS to the Superintendent of YNP. The Tribe expressed support of Alternative 3, provided that the NPS revises Alternative 3 to re-incorporate key provisions presented in the NOI. These key provisions include managing bison at or near the park's carrying capacity (i.e., up to 10,000) to support the Tribe's treaty-reserved rights and trust responsibilities outside the park. The Tribe stated that managing the population near or at capacity will improve its treaty hunting right to access and harvest bison on adjacent National Forest System lands and greatly enhance hunting opportunities for other

American Indian Tribes outside the park. Opportunities could also be presented for live bison transfer to American Indian Tribes under the BCTP, assuming it does not conflict with, or take priority over, the Tribe's exercise of treaty hunting rights. The Tribe requested an explanation of the scientific basis for the estimated upper limit for bison and the NPS's decision to decrease the limit in Alternative 3. The NPS responded to these concerns in appendix G.

The Confederated Salish and Kootenai Tribes of the Flathead Reservation submitted comments on the draft plan/EIS to the Superintendent of YNP on January 4, 2024, and stated that actions should not be based on arbitrary population counts, rather, hunting should be the primary population control method, and reduction of bison-human conflict should guide management actions. The Confederated Salish and Kootenai Tribes of the Flathead Reservation do not support the no-action alternative or any alternative that "prioritizes maintaining a negligible risk of brucellosis transmission from bison to cattle." The Confederated Salish and Kootenai Tribes of the Flathead Reservation also stated support for both the action alternatives, although reiterated that population counts are arbitrary and irrelevant. The Tribes also offered support for any management actions that increase bison access and use of the expanded tolerance zones, which in turn would increases hunter harvest success and safety. The Tribes stated that bison should be managed like other wildlife in the GYA and encouraged YNP to select an alternative that ensures a healthy and sustainable population. The NPS responded to these concerns in appendix G.

The Confederated Tribes of Umatilla Indian Reservation submitted comments on the draft plan/EIS to the Superintendent of YNP on October 10, 2023. The Confederated Tribes of Umatilla Indian Reservation support a combination of Alternatives 2 and 3. Under Alternative 3, the Tribes also support a target population of 3,500–7,000 bison. The Confederated Tribes of Umatilla Indian Reservation encourage the movement of bison across the full tolerance zone in Montana to maximize the winter forage available to the herd and maximize the number of bison available for hunting, stating that co-stewardship can be enhanced through increased hunting opportunities and expanding the capacity of the BCTP. The Tribes also support the immediate cessation of bison capture for transfer for processing under Alternative 3 and requested clarification of the criteria the NPS will use to determine if reinstating capture and transfer for processing is necessary. The Tribes indicated that consultation is necessary prior to the NPS decision to reinstitute shipments for processing. The NPS responded to these concerns in appendix G.

The Chairman of the Fort Hall Business Council for the Shoshone-Bannock Tribes of the Fort Hall Reservation sent a letter dated March 22, 2022, to the Superintendent requesting a meeting to discuss working together to protect and preserve the Tribe's interests and treaty rights. Specific interests included identifying areas of importance for spiritual and cultural activities, creating an inventory of cultural and natural resources used by American Indian Tribes, managing resources for treaty rights, gathering of cultural resources, transferring surplus lands to American Indian Tribes, preserving bison moving from YNP to Aboriginal lands of American Indian Tribes, and business and employment opportunities in YNP.

The President of the ITBC provided comments to the NPS on February 28, 2022, requesting an expansion of and adjustments to the BCTP, tribal right of first refusal for all bison transferred from the park, limitations on APHIS' involvement in the BCTP to its statutory role, an exemption for bison in YNP or on tribal lands from state laws, the NPS develop its own protocols for quarantine with changes to (or elimination of) various phases of the testing program, construction of another quarantine facility on the west side of YNP, an end or substantially decrease of shipments of bison for processing, the IBMP tribes operate temporary capture facilities within the northern tolerance area in Montana to ensure hunting is not disturbed, the NPS release bison testing positive for brucellosis exposure for tribal harvest opportunities, and the NPS not haze bison within YNP.

The State of Montana a provided comments to the NPS on February 28, 2022, requesting the NPS withdraw the NOI and engage in consultation to identify mutually acceptable alternatives, clarify how the NPS's new NEPA efforts will fit with the 2000 NEPA effort (IBMP), and examine and commit to specific population management or disease suppression measures. The Governor indicated Montana's

tolerance for bison dispersal in areas around YNP is limited, food-limited carrying capacity was not an acceptable foundation for bison population targets, and a true no-action alternative would reflect the modified preferred alternative described in the 2000 IBMP ROD.

The State of Montana provided comments on the draft plan/EIS to the Superintendent of YNP on October 10, 2023. The State indicated that the NPS failed to uphold its cooperating agency responsibilities because the NPS did not allow enough time for the State to sufficiently comment on the draft plan/EIS and did not make it clear how the input provided by the State was included or considered in the draft plan/EIS. The State noted that the draft plan/EIS fails to adequately address studies critical of existing bison population numbers, mischaracterizes the 2020 National Academy of Sciences, Engineering, and Medicine's publication, and makes broad assumptions without scientific support, such as the assertion that bison should be treated no more aggressively than elk. In addition, the State noted that the 2000 IBMP ROD established an overall population objective of 3,000 bison, which should serve as the baseline for the no-action alternative in this plan/EIS. The State further noted that any increase in the population objective since the 2000 ROD was an operating procedure used by the IBMP partners and not an adaptive management adjustment that changed the provisions in the IBMP, as adjusted. Because of a lack of meaningful engagement and failure to identify a clear course of action, the State felt that its status as a cooperating agency does not equate to endorsement of the draft plan/EIS or its alternatives. The NPS responded to these concerns in appendix G.

Upon publication of the Notice of Availability of the final plan/EIS in the *Federal Register*, electronic notification will be provided to the media, federal departments/agencies, state and local governments, elected officials, tribal governments, organizations, businesses, and interested individuals. An electronic copy of the final plan/EIS will be distributed to US Environmental Protection Agency Region 8.

List of Preparers

Name	Title	Qualifications
National Park Service		
Cameron Sholly	YNP, Superintendent	BA, Management MS, Environmental Management
Jennifer Carpenter	YNP, Chief, Center for Resources	BA, Ecology and Evolutionary Biology MS, Applied Ecology and Environmental Resources
P. J. White	YNP, Natural Resources Program Manager	PhD, Wildlife Ecology
Chris Geremia	YNP, Leader of the Bison Program	PhD, Ecology
Tim Reid	YNP, Bison Program Coordinator	BS, Wildlife Biology MS, Strategic Leadership
Tobin Roop	YNP, Chief, Branch of Cultural Resources	BS, Anthropology
Ray McPadden	YNP, Compliance Branch	MS, Community and Regional Planning
Robin Park	YNP, Compliance Branch	BA, Anthropology MA, Archaeology
Gretchen Pinkham	Washington Support Office, Environmental Quality Division, Former Project Manager	BS, Environmental Studies
Jennifer Rebenack	Natural Resource Specialist, Denver Service Center	BS, Environmental Science (terrestrial ecology focus) MS, Natural Resources (fisheries biology focus)

Name	Title	Qualifications
Kelly Daigle	Washington Support Office, Environmental Quality Division, Project Manager	BS, Journalism MS, Environmental Policy (Natural Resource Management)
Dave Jacob	Washington Support Office, Environmental Quality Division, Branch Manager	BA, History JD, Law
Dan Niosi	Intermountain Regional Office, Regional Planning and Environmental Quality Division Manager	BA, Environmental Studies
WSP		
Lori Fox	Senior Vice President, Federal Environmental Planning and Compliance	BS, Environmental Policy MCP, Land Use and Environmental Planning
Marlis M. Muschal	Consultant Archaeologist	BA, History and Anthropology MA, Anthropology with a focus in Archaeology Registered Professional Archaeologist (34344474))
Richard Morris	Economist	BS, Economics MS, Economics
Deborah Mandell	Technical Editor	BA, Government MBA, Finance and Marketing

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Appendix A: Roles and Responsibilities of Agencies Involved with Bison Management

Under the Interagency Bison Management Plan (IBMP), the National Park Service (NPS) has lead responsibility for implementing bison management actions inside Yellowstone National Park (YNP). The NPS is charged with preserving park resources unimpaired and in their natural condition for the benefit and enjoyment of people (16 United States Code [USC] 21, 54 USC 100101 et seq.). Bison and other wildlife generally move freely and unpursued within the interior of the park (16 USC 26, USDOI, NPS 2006a). *An Act to Protect the Birds and Animals in Yellowstone National Park, and to Punish Crimes in said Park, and for Other Purposes* passed by Congress in 1894 prohibits hunting and the harassment, possession, or removal of birds and animals from YNP (16 USC 26). However, the Superintendent, through the Secretary of the Interior and Director of the NPS, has the discretion to transfer or dispose of 'surplus' animals (16 USC 36; 54 USC 100101, 100752).

In Montana, the Fish, Wildlife and Parks Commission (MFWP) typically sets policies for the protection, management, and public use of wildlife (Montana Code Annotated [MCA] 87-1-201). However, in 1994 the Montana Legislature assigned the management of Yellowstone bison to the Department of Livestock due to the population's chronic exposure to brucellosis (State of Montana 2000). The Department can remove Yellowstone bison moving into Montana if they jeopardize programs to control livestock diseases (MCA 81-2-120, Montana Attorney General 2016). Pursuant to a plan approved by the Governor, the Department contains bison in areas near YNP and keeps them separate from livestock (Bullock 2015, Legislative Audit Division 2017). MFWP cooperates in this management paradigm, focusing on public hunting and preventing damage to property (MCA 87-1-216, MCA 87-2-730, Montana Attorney General 2016).

The US Forest Service (USFS) manages national forests pursuant to a multiple-use mandate, whereby renewable resources are used to best meet the needs of the American people (16 USC 528, 1604). Forest Supervisors have an obligation to conserve and maintain wildlife on national forests and cooperate with states in planning and implementing management actions, including harvests that conform with state laws (36 Code of Federal Regulations [CFR] § 241). Comprehensive forest plans are prepared to sustain wildlife populations and their habitats, with the management of wildlife often primarily conducted by the respective states (16 USC §§ 528, 1604). If necessary, the USFS can preempt or supersede state laws and policy to meet its statutory and trust responsibilities regarding issues such as public safety and natural resource protection after consultation with the states (43 USC § 1732). In 2022, the Custer Gallatin National Forest adopted a new land management plan. The selected alternative includes components supporting habitat improvement projects to create or connect suitable bison habitat with enough bison present and distributed year-round to provide a self-sustaining population on the national forest in conjunction with bison herds in YNP (USDA, USFS 2022a).

The mission of the Animal and Plant Health Inspection Service (APHIS) is to protect the health, quality, and productivity of American agricultural resources. The Secretary of Agriculture establishes regulations to prevent the interstate or international spread of livestock diseases, including the quarantine of animals. Under the Animal Health Protection Act (7 USC § 8301 et seq.), the Veterinary Services section of APHIS administers the National Brucellosis Eradication Program in cooperation with the states. The *Uniform Methods and Rules for Brucellosis Eradication* (USDA, APHIS 2003) describes standards for surveillance, testing, and interstate transport of livestock and domestic bison and contains a protocol for the quarantine of bison from YNP to determine whether animals are brucellosis-free.

American Indian Tribes retain Aboriginal rights over lands within their Aboriginal territories and exercise rights reserved by treaties with the US government. Each tribe exists as a sovereign nation with self-governing authority with an emphasis on preservation of cultures and traditional ways of life. Tribal sovereignty is recognized in the US Constitution and protected by US Supreme Court decisions.

The Confederated Salish and Kootenai Tribes of the Flathead Nation have treaty-reserved hunting and fishing rights both on and off the Flathead Reservation pursuant to the Treaty with the Flathead, etc., 12 Statute 975 (Hellgate Treaty of 1855). The Aboriginal territory of the Salish and Kootenai Tribes includes the Yellowstone area, where the Tribal Council has reestablished a wild bison hunt for member hunters. The treaty bison hunt is conducted pursuant to the laws, regulations, and conditions set by the Tribal Council, with enforcement by tribal game wardens and any applicable federal authorities.

The Nez Perce Tribe has treaty-reserved hunting and fishing rights both on and off their Reservation in north-central Idaho pursuant to the Waiilatpu (Walla Walla) Treaty Council of 1855. The Aboriginal territory of the Nez Perce Tribe includes the Yellowstone area, where the Tribal Executive Committee and General Council have reestablished a wild bison hunt for member hunters. The treaty bison hunt is conducted pursuant to the laws, regulations, and conditions set by the Tribal Executive Committee, with enforcement by tribal game wardens and any applicable federal authorities.

The InterTribal Buffalo Council, a federally chartered Indian organization pursuant to the Indian Reorganization Act, comprises approximately 82 member American Indian Tribes from 20 states. The Council has transferred bison of Yellowstone-origin to at least 26 American Indian Tribes in at least 12 states to reestablish bison on Indian lands.

Appendix B: Changed Circumstances and New Information

Changed Circumstances

- 2003: The Animal and Plant Health Inspection Service (APHIS) issued the *Uniform Methods and Rules for Brucellosis Eradication* that describes standards for surveillance, testing, and interstate transport of livestock and domestic bison and contains a protocol for the quarantine of bison from Yellowstone National Park (YNP) to determine whether animals are brucellosis-free and can be relocated elsewhere.
- 2004: Montana Fish, Wildlife and Parks (MFWP) prepared a *Final Bison Hunting Environmental Assessment* and *Decision Notice* with concurrence from the Montana Department of Livestock (MDOL; MFWP 2004; MFWP and MDOL 2004).
- 2005: The Interagency Bison Management Plan (IBMP) agencies completed a five-year status review that led to adaptive management adjustments allowing more bison on winter ranges outside YNP to provide opportunities for Montana-licensed hunters (Clarke et al. 2005; Linfield 2005).
- 2005: MFWP established a 90-day public bison hunt between November 15 and February 15 each year on lands adjacent to YNP. These hunts have continued to present.
- 2005: The National Park Service (NPS), US Forest Service (USFS), and Center for Invasive Plant Management convened a group of restoration specialists to develop recommendations for restoring native plant associations to about 1,200 acres (485 hectares) of former agricultural fields in YNP and nearby areas of the Custer Gallatin National Forest. The USFS implemented weed treatments, barley planting, prescribed burning, and native grass seeding in the Beattie Gulch and Cutler Meadow areas.
- 2006: The IBMP members clarified "a population of 3,000 bison is defined as a population indicator to guide implementation of risk management activities and is not a target for deliberate population adjustment" (IBMP Partner Agencies 2006:1).
- 2006: The IBMP members adjusted the operations plan to increase tolerance for bull bison in Montana because there is negligible risk of them transmitting brucellosis to cattle (Clarke et al. 2005).
- 2006: American Indian Tribes asserted their treaty rights to harvest bison migrating from YNP onto unoccupied national forest lands in Montana. These hunts have continued to present.
- 2008: MFWP signed a 30-year livestock grazing restriction and bison access agreement with the owners of the Royal Teton Ranch north of YNP. The NPS provided the federal government's $1.5 million share of the total $3 million cost (MFWP 2008a,b). As a result, there are fewer cattle adjacent to YNP.
- 2008: The NPS initiated native vegetation restoration projects on about 48 acres (19 hectares) between Landslide and Reese Creeks in northern YNP, divided into four fenced plots to exclude ungulates. The NPS removed fencing around 26 acres (10 hectares) during 2019–2021 after successful restoration. Additional restoration projects on more than 75 unfenced acres (30 hectares) are ongoing.
- 2009: IBMP members began trying to reduce shipments of bison to meat processing plants by using alternate tools such as hazing, hunting, and increased tolerance in Montana (IBMP Agencies 2011).
- 2009: Livestock disease regulators implemented calf-hood vaccination of cattle with high compliance in the brucellosis surveillance area in Montana. This vaccination program has continued to present.
- 2009: Two American Indian Tribes and a tribal organization became involved with the management of Yellowstone bison, including developing an annual operating plan, conducting

hunts, relocating brucellosis-free bison to tribal lands, and distributing meat and other bison resources from culled animals to their members.

- 2010: APHIS changed regulations to deal with brucellosis outbreaks in cattle on a herd-by-herd basis without imposing unnecessary corrective actions and associated economic costs on the rest of the producers in the state (USDA, APHIS 2010). If outbreaks are investigated and contained by removing all cattle testing positive for brucellosis, the entire state or area is not reclassified or subject to corrective actions.
- 2010: The State of Montana established a designated surveillance area (DSA) for brucellosis defined by occurrence of the disease in elk (MDOL 2011). To prevent brucellosis-infected livestock from being moved into other states, all calves within this area are vaccinated for brucellosis, all cattle are uniquely marked so relocations or sales can be traced, and all reproductive cattle are tested for brucellosis exposure prior to movement elsewhere.
- 2011: A Citizens Working Group on Yellowstone Bison provided recommendations that the IBMP partners largely adopted, including allowing bison more access to habitat and increasing the use of hunting as a management tool.
- 2011: IBMP members adjusted the operations plan to substantially increase spatial and temporal tolerance for bison migrating north and west of YNP during winter (IBMP Agencies 2011, 2012).
- 2011: Actions such as the strategic hazing of bison from conflict areas to suitable habitat and financial aid for fencing from nongovernmental organizations began being implemented to reduce conflicts with landowners and livestock operators.
- 2012: The NPS consulted with the US Fish and Wildlife Service (FWS) on the hazing of Yellowstone bison and its potential effects on threatened grizzly bears. The agencies concluded the infrequent occurrence of people walking or in vehicles, on horseback, or in a helicopter causing a few grizzly bears to run short distances during hazing operations was not likely to adversely affect grizzly bears.
- 2012: The NPS began implementing agreements with a tribal organization and several American Indian Tribes to provide them with captured bison for shipment directly to meat processing facilities and subsequent distribution of meat, hides, and horns to their members.
- 2013: The Custer Gallatin National Forest issued a permanent shooting closure for a portion of Beattie Gulch between the Yellowstone River to the east, Old Yellowstone Trail South (county road) to the west, YNP to the south, and residential houses to the north.
- 2015: MFWP began requiring successful bison hunters to place unused parts of carcasses at least 200 yards (183 meters) from roads, trails, and homes, and spread stomach contents on the ground to reduce attraction to scavengers.
- 2015: Montana increased tolerance for more bison across a larger management area in the state, including year-round in some areas, especially for bull bison because of their lower risk of brucellosis transmission. The Governor of Montana concluded this decision would not increase transmission risk to cattle or result in trade sanctions by other states or nations (Bullock 2015).
- 2016: The Custer Gallatin National Forest issued an official shooting closure, renewed annually, for a 150-yard (137-meter) buffer extending west from Old Yellowstone Trail South Road in Beattie Gulch where there would be no shooting.
- 2017: The Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes and Bands of the Yakama Nation, Nez Perce Tribe, and Confederated Salish and Kootenai Tribes of the Flathead Nation signed a memorandum of agreement to maintain regular, predictable, safe, and respectful bison hunts in Beattie Gulch, with common hunt protocols, safety regulations, and enforcement to ensure the safety of hunters, wardens, and the surrounding community.
- 2017: The NPS, APHIS, and MDOL agreed to implement a quarantine program (Bison Conservation Transfer Program; BCTP) to identify brucellosis-free Yellowstone bison and transfer them to the Fort Peck Indian Reservation in northeastern Montana.

- 2018: The Intermountain Regional Director, NPS, issued a decision to conduct quarantine with Yellowstone bison near the Stephens Creek Administrative Area in the northern portion of YNP and on the Fort Peck Indian Reservation. APHIS agreed to continue quarantine operations with Yellowstone bison on leased pastures in Corwin Springs, Montana, north of YNP.
- 2019: A local organization, the Bear Creek Council, worked with the IBMP agencies on recommendations for a safer hunt with fewer impacts to residents in and near Gardiner, Montana. The IBMP agencies discussed concerns with local citizens, reviewed current shooting closures and hunting regulations, and agreed to address these concerns while respecting treaty rights.
- 2019: The Fort Peck Tribes agreed to transfer 70% of Yellowstone bison that complete the BCTP to the InterTribal Buffalo Council (ITBC) for restoration on Indian lands elsewhere. The Tribes also have an agreement to provide Montana with brucellosis-free Yellowstone bison for restoration on public lands.
- 2019–2024: The NPS and APHIS sent 414 brucellosis-free Yellowstone bison to the Assiniboine and Sioux Tribes at Fort Peck for one year of assurance testing and eventual release.
- 2020–2024: The ITBC transferred more than 300 bison of Yellowstone-origin from the Fort Peck Indian Reservation to 26 American Indian Tribes across 12 states.
- 2020-2021: The Custer Gallatin National Forest implemented a one-year emergency closure followed by a permanent firearm discharge closures on about 23 acres (9 hectares) near Beattie Gulch and the McConnell area north of YNP for safety.
- 2021–2022: The NPS partnered with Yellowstone Forever and the Greater Yellowstone Coalition to double the capacity of the BCTP, increase the number of live brucellosis-free bison transferred to American Indian Tribes, and lower the number of animals testing negative for brucellosis exposure sent for processing.
- 2022: The Custer Gallatin National Forest issued a decision on a new land management plan. The selected alternative includes components supporting habitat improvement projects to create or connect suitable bison habitat with enough bison present and distributed year-round to provide a self-sustaining population on the national forest in conjunction with bison herds in YNP (USDA, USFS 2022a).

Improved Knowledge

- 2002: A review of grazing and grasslands by the National Academy of Sciences concluded northern YNP was not overgrazed, and the NPS could continue to allow numbers of ungulates to fluctuate in response to predators, resource limitations, weather, and hunting outside the park (National Research Council 2002a).
- 2005: An evaluation of the food-limited carrying capacity for Yellowstone bison and elk predicted there could be more than 8,000 bison with about 5,000 elk, and about 6,200 bison with 20,000 elk (Coughenour 2005). Currently, there are about 7,000 northern Yellowstone elk, 80% of which spend winter outside YNP.
- 2005–2018: The number of bison in the central portion of YNP decreased substantially while the number of bison in northern YNP increased exponentially due, in part, to dispersal of bison from central to northern YNP. The exact causes are unknown but potential contributing factors include: (1) high bison densities, intense grazing in some areas, and severe winters (1997, 2006, 2008) in central YNP that limited forage availability; (2) intense hunting during the 1980s and hazing of bison during the 1990s and 2000s along the western boundary to keep them in the park; (3) roads groomed (packed snow) for over-snow vehicles that facilitated rapid travel by bison to the north during winter; (4) higher wolf densities and selection of bison in central YNP during the early 2000s; and (5) a 50% decrease in numbers of elk spending winter in northern YNP by 2006 and a 75% decrease by 2013.

- 2007–2015: Biologists reported significant changes in bison movement patterns and distribution, with more bison migrating and dispersing to the northern portion of YNP (Fuller et al. 2007a; Bruggeman et al. 2009; Geremia et al. 2011, 2014, 2015a).
- 2007: Research indicated females with brucellosis had lower pregnancy rates across all ages than unexposed bison. Exposure to brucellosis lowered survival because the NPS and Montana culled these bison when they attempted to leave YNP due to concerns about transmission to cattle (Fuller et al. 2007b; Geremia et al. 2009).
- 2007: Geneticists found Yellowstone bison retained high levels of diversity despite a severe reduction in numbers (bottleneck) in the late 1800s when colonists almost extirpated bison. Yellowstone is the only wild population with an effective size high enough to avoid inbreeding depression and to maintain genetic variation (Halbert and Derr 2007, 2008; Hedrick 2009).
- 2009: An evaluation by NPS biologists suggested maintaining a bison population that varies on a decadal scale between 2,500 and 4,500 animals should satisfy collective long-term interests as a balance between the park's forage base, conservation of the genetic integrity of the bison population, protection of their migratory tendencies, brucellosis risk management, and other societal constraints (Plumb et al. 2009).
- 2009: Evidence emerged that elk play a predominant role in the transmission of brucellosis to cattle, and the risk of transmission from bison to cattle is minute in comparison (Bienen and Tabor 2006; Beja-Pereira et al. 2009; Kilpatrick et al. 2009; Schumaker et al. 2010, 2013; Higgins et al. 2012; Rhyan et al. 2013b; Kamath et al. 2016; Brennan et al. 2017).
- 2010: Evidence accumulated that brucellosis is maintained independently in elk, increasing in prevalence, and spreading through the Greater Yellowstone Area (GYA; Cross et al. 2010; Kamath et al. 2016; O'Brien et al. 2017).
- 2010: Biologists estimated the timing and location of bison parturition events that may shed tissues infected by *Brucella abortus* and concluded the risk of brucellosis transmission to cattle in Montana should not increase due to separation (Jones et al. 2010). *Brucella* bacteria placed on fetal tissues, soil, and vegetation persisted for 21 to 81 days depending on ambient temperatures and exposure to sunlight (Aune et al. 2012).
- 2010: Biologists analyzed conditions facilitating contact between bison and elk on a shared winter range in YNP and found levels of elk exposure to *Brucella abortus* (2% to 4%) similar to those in other elk populations that did not commingle with bison (Proffitt et al. 2010).
- 2010: A five-year quarantine feasibility study successfully concluded, with the surviving bison and their offspring being declared brucellosis-free (Clarke et al. 2014). Montana relocated 87 bison completing quarantine to the Green Ranch in Montana in 2010 and sent another 61 bison to the Fort Peck Indian Reservation in 2012, for five years of assurance testing (MFWP 2011). In 2014, Montana sent the original quarantined bison plus 25% of the offspring (139 total) at the Green Ranch to the Fort Peck Tribes (MFWP 2014).
- 2010: Researchers used individual-based epidemiological models to assess the relative efficacies of various vaccination strategies, sterilization, and test-and-removal for reducing brucellosis prevalence in Yellowstone bison (Treanor et al. 2010; Ebinger et al. 2011).
- 2011: Studies indicated many older bison testing positive for brucellosis exposure may be resistant to the disease if re-exposed and not infectious (Treanor et al. 2011).
- 2011: A technical committee for the IBMP completed an assessment of suitable bison habitat in the Gardiner and Hebgen Basins and explored new areas where there could be increased tolerance for bison to accommodate additional hunting opportunities.
- 2011: Analyses indicated shipments of large numbers of bison for processing could affect demographic (reproduction, survival) rates and genetic diversity if removals result in large variations in numbers, skewed sex ratios, or different influences on bison in the central or northern breeding herds (White et al. 2011; Halbert et al. 2012).

- 2012: Monitoring of radio collars detected substantial movements and breeding (gene flow) between bison originating from central and northern portions of YNP in recent decades, making Yellowstone bison a single intermixing population (White and Wallen 2012; Wallen and White 2015; Forgacs et al. 2016).
- 2012: A population viability analysis indicated Yellowstone bison should retain existing genetic diversity for centuries with total abundance averaging at least 3,000 to 3,500 bison (Pérez-Figueroa et al. 2012).
- 2012: APHIS began a six-year study of the effectiveness of the vaccine GonaCon™ at preventing gonadotropin-releasing hormone from initiating follicle growth and ovulation in Yellowstone bison—thereby resulting in infertility and preventing the shedding of brucellosis bacteria in infected bison.
- 2013: A technical committee for the IBMP evaluated ways to distribute bison migrating north of YNP to prevent conflicts with private property owners, increase opportunities for bison to occupy portions of the Gardiner Basin, and provide additional hunting opportunities.
- 2013: The NPS discussed the applicability and feasibility of using fertility control as an ungulate management tool. A review of pertinent scientific information with presentations by experts in fertility control technologies, wildlife population modeling, and moral and ethical considerations preceded the discussion (Powers and Moresco 2015).
- 2013: Experimental studies suggested bull bison likely are not brucellosis transmission vectors (Frey et al. 2013; Uhrig et al. 2013).
- 2013: Geneticists investigated natural resistance to brucellosis in Yellowstone bison by attempting to identify resistant and susceptible genotypes using the prion protein gene but failed to find a significant association with bison testing positive for *Brucella* exposure (Herman 2013).
- 2013: Brucellosis experts from around the world contributed articles to *Brucellosis: Recent Developments Towards 'One Health*' by the World Organization for Animal Health to support finding practical and effective solutions for addressing brucellosis at local, regional, and global levels (Plumb 2013).
- 2013: Several evaluations concluded that the substantial suppression of brucellosis through vaccination would be extremely difficult with existing vaccines and delivery technologies (USDOI, NPS and MFWP 2013; White et al. 2013b; USDOI, NPS 2014b).
- 2014: Geneticists found quarantined bison had genetic diversity similar to the overall population, resulting in low risk of genetic loss in relatively small populations (50 to 100 animals) started from bison completing the BCTP (Herman et al. 2014).
- 2015: Researchers assessed the effects of brucellosis on the Yellowstone bison population and used five-year forecasting to evaluate the ability of different actions, such as test-and-slaughter and vaccination, to meet management goals relative to taking no action (Hobbs et al. 2015).
- 2015: Social scientists conducted interviews with residents from the Gardiner and West Yellowstone, Montana, communities to understand their attitudes toward migratory wildlife, including bison, and their experiences living near migratory wildlife (Metcalf et al. 2016).
- 2015: NPS biologists and colleagues published a book entitled *Yellowstone Bison—Conserving an American Icon in Modern Society* with chapters summarizing existing information about brucellosis, seasonal distributions, reproduction and survival, nutritional ecology, ecological role, adaptive capabilities and genetics, cultural importance, and management (White et al. 2015c).
- 2016: Genetic data indicated elk infected cattle herds with brucellosis in the GYA, not bison. Elk exposed to brucellosis inhabited an area encompassing about 17 million acres (6.9 million hectares), whereas bison inhabited 1.5 million acres (607,000 hectares) near the core. Control measures in bison would not affect the dynamics of unrelated strains in elk elsewhere (Kamath et al. 2016).
- 2016: Genetic analyses indicated Yellowstone bison consist of two independent lineages in about equal proportions, representing the native bison remaining in central Yellowstone by 1900 and

the bison introduced into northern and central portions of YNP from the Pablo-Allard herd in the early 1900s (Forgacs et al. 2016).

- 2017 and 2020: The National Academies of Sciences, Engineering, and Medicine concluded infected elk had transmitted brucellosis to livestock in the GYA at least 27 times since 1998 with no transmissions attributed to bison. The Committee recommended prioritizing efforts on preventing brucellosis transmission by elk, while maintaining separation between bison and cattle. The Committee recommended not using aggressive control measures on bison until tools became available for an eradication program in elk.
- 2018: The NPS and APHIS completed assessments of the risk of transferring bison completing quarantine to the Fort Peck Indian Reservation for one additional year of assurance testing and subsequent release.
- 2018: Historians evaluated thousands of first-hand accounts of animals in the Yellowstone area during the 1800s, including before settlement by colonists. Some accounts described plentiful and widespread bison making long-distance seasonal movements from high-elevation summer ranges to lower-elevation winter ranges (Whittlesey et al. 2018; Whittlesey and Bone 2020).
- 2022: Geneticists at Texas A&M University published findings indicating all North American bison have some level of cattle introgression, including Yellowstone bison (Stroupe et al. 2022).
- 2022: The NPS and APHIS assessed existing data from quarantine and assurance testing to see if the testing timelines could be shortened while still maintaining negligible risk of not detecting an infected bison (USDA, APHIS 2022; Springer Browne et al. 2023).
- 2023: Biologists have monitored the effects of bison grazing on grasslands in YNP since 2012. Bison created grazing lawns of dense, short-statured plants in some areas through intense and repeated grazing. This grazing strategy sustained highly nutritious food through summer by prolonging new plant growth and stimulating nutrient cycling and water-holding potential. The deposition of feces and urine into the soil released plants from nitrogen limitation, and precipitation became the primary factor influencing plant growth (Geremia and Hamilton 2019, 2022; Geremia et al. 2019).
- 2023: A time-to-event model developed by the NPS and APHIS based on data from quarantine predicted 99.9% of bison with brucellosis would seroconvert (test positive) by 294 days. Only 1 in 1,000 bison with brucellosis bacteria would not be detected by 300 days, and fewer than 4 in 10,000 bison would not be detected by 330 days. The results were similar for males and females and suggest regulators could reduce testing timelines to allow animals to complete quarantine within one year with negligible risk of brucellosis transmission (Springer Browne et al. 2023).

The IBMP agencies addressed these changed circumstances and new information through adaptive management adjustments and environmental compliance evaluations described at http://ibmp.info/adaptivemgmt.php and in other sections of this document.

Appendix C: Issues and Impact Topics Not Carried Forward for Detailed Analysis

Introduction

The National Park Service (NPS) did not analyze the following topics in this plan/environmental impact statement (plan/EIS) due to a lack of potential significant impacts to resources and values (Council of Environmental Quality [CEQ], 40 Code of Federal Regulations [CFR] Parts 1500-1508; NPS Director's Order 12).

Environmental Justice

Executive Order 12898, *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to identify and address disproportionately high and adverse health or environmental effects of their programs and policies on minorities and low-income communities. Federal agencies must also follow rules set under the Environmental Justice Guidance released by the Environmental Protection Agency in 1998. The bison management alternatives in this environmental impact statement may impact American Indian Tribes. Detailed information and an impact analysis are included in the "American Indian Tribes and Ethnographic Resources" and "Human Health and Safety" sections of chapter 3 of the plan/EIS. None of the alternatives proposed in this document would have negative health or environmental effects on other minority or low-income communities.

Archeological Resources

The 1998 *Cultural Resource Management Guidelines* for the NPS define archeological resources as the remains of past human activity and records documenting the scientific analysis of these remains. None of the alternatives proposed for the management of Yellowstone bison would affect archeological resources. Personnel with the NPS have inventoried areas where bison capture, processing, and quarantine facilities are located and avoided archeological resources.

Historic Structures

The 1998 *Cultural Resource Management Guidelines* for the NPS define historic structures as "material assemblies extending the limits of human capability." There are hundreds of historic structures within Yellowstone National Park (YNP), but none of the proposed management alternatives would affect them. The NPS has used a small cabin (Historic Structure-0101) in the Stephens Creek Administrative Area of YNP for storing equipment and testing blood samples from bison, but this structure is not eligible for the National Register of Historic Places. In 2008, the University of Montana inventoried cultural resources in the area impacted by the bison capture, processing, and quarantine facilities in and near the Stephens Creek Administrative Area. They did not find any historic properties impacted by operations. In addition, NPS staff did not find any potential negative effects to historic properties from bison behavior such as rubbing on buildings or modifications to the bison capture and processing facilities in 2015.

Cultural Landscapes

The 1998 *Cultural Resource Management Guidelines* for the NPS define cultural landscapes as settings people have created in the natural world. During the 1920s and 1930s, a private corporation called the Game Preservation Company bought land west and north of Gardiner, Montana, and operated the Game Ranch. Staff irrigated agricultural fields near the Stephens Creek Administrative Area using water from springs and creeks to grow hay to feed elk and pronghorn. Congress included the Game Ranch in YNP in 1932 and, afterward, the NPS used lands in and near the Stephens Creek Administrative Area for a nursery, horse corral operations, equipment storage, log building, a firing range, bison capture and quarantine facilities, and native plant restoration efforts. In 2006, the NPS completed a cultural landscape inventory and identified the Game Ranch Cultural Landscape. This area is a functioning ranch and is

eligible for listing in the National Register of Historic Places as a historic district. The bison capture, processing, and quarantine facilities are outside the Game Ranch Cultural Landscape. Based on previous consultations for the construction of bison quarantine facilities, the NPS and Montana State Historic Preservation Office consider these activities and facilities a historically compatible land use because they convey the area's association with ranching and the conservation of wildlife.

Trust Resources

Trust resources include land, water, minerals, timber, or other natural resources held in trust by the US government for the benefit of an American Indian Tribe or individual tribal member. Some American Indian Tribes have asserted bison in YNP are a trust resource that the federal government must manage for their benefit. These American Indian Tribes contend the federal government must consult with American Indian Tribes with recognized treaty rights for hunting bison before removing them to processing, research, or quarantine facilities. Such removals affect the numbers of bison moving outside YNP where tribal harvests could remove them. In the 2000 final EIS for the Interagency Bison Management Plan (IBMP) and the Record of Decision, the NPS indicated bison are important to many American Indian Tribes but not defined as a trust resource in a formal, legal, property-based manner that would trigger a federal responsibility (USDOI and USDA 2000a; USDOI and USDA 2000b). The NPS has not managed Yellowstone bison as a trust resource for one or more specific American Indian Tribes. Instead, it has collaborated with numerous American Indian Tribes through agreements and other avenues to benefit their interests as described in the following paragraphs (USDOI, NPS 2016c).

The NPS has a unique relationship with American Indian Tribes, which is founded in law and strengthened by a shared commitment to stewardship of the land and resources. The NPS will honor its legal responsibilities to these American Indian Tribes as required by the US Constitution, treaties, statutes, and court decisions. The formal legal rationale for the relationship between the NPS and American Indian Tribes is augmented by the historical, cultural, and spiritual relationships that American Indian Tribes have with park lands and resources. The NPS *Management Policies 2006*, section 1.11, indicate "[a]s the ancestral homelands of many tribes, parks protect resources, sites, and vistas that are highly significant for the tribes. Therefore, the Service will pursue an open, collaborative relationship with tribes to help tribes maintain their cultural and spiritual practices and enhance the Park Service's understanding of the history and significance of sites and resources in the parks. Within the constraints of legal authority and its duty to protect park resources, the Service will work with tribal governments to provide access to park resources and places that are essential for the continuation of traditional American Indian cultural or religious practices."

Under the IBMP, as adjusted, the NPS and other federal and state members have taken the following actions to benefit American Indian Tribes:

- Recognized tribal rights to conduct hunts of bison migrating from YNP onto national forest lands in Montana pursuant to treaties with the federal government;
- Involved American Indian Tribes as partners in the management of Yellowstone bison, including the development of adaptive management and annual operating plans;
- Adjusted the IBMP to substantially increase spatial and temporal tolerance for bison migrating north and west of YNP, in part, to facilitate tribal harvests and access a traditional resource;
- Provided American Indian Tribes with captured bison for transfer to meat processing facilities and subsequent distribution of meat, hides, and other resources to their members;
- Coordinated with American Indian Tribes that hunt bison on National Forest System lands adjacent to the park to reduce the effects of capture operations on hunting opportunities;
- Implemented and expanded a Bison Conservation Transfer Program (BCTP; quarantine) to identify brucellosis-free bison and transfer them to American Indian Tribes for restoration on Indian lands; and

- Implemented lower-stress handling techniques to reduce trauma to captured bison.

The NPS will continue to integrate consideration of tribal treaty and reserved rights early into decision-making and regulatory processes to ensure agency actions are consistent with constitutional, treaty, reserved, and statutory rights (Advisory Council on Historic Preservation et al. 2021). In addition, the NPS will implement the *Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters* to ensure all decisions relating to federal stewardship of lands, waters, and wildlife under its jurisdiction include consideration of how to safeguard the interests of any American Indian Tribes such decisions may affect (USDOI and USDA 2021). NPS officials will work directly with appropriate tribal government officials whenever plans or activities may directly or indirectly affect tribal interests, practices, and/or traditional use areas such as sacred sites. The NPS would ensure tribal governments play an integral role in decision-making related to the management of federal lands and waters by engaging them in meaningful consultation at the earliest phases of planning, considering their expertise and Indigenous Knowledge, and giving due consideration to tribal recommendations on the management of public lands.

Geology and Topography

Congress established YNP, in part, to protect natural wonders such as its geologic formations. Bison management actions would have negligible effects on the surface topography or underlying geology of YNP.

Natural Soundscapes

The NPS must protect, maintain, or restore natural sounds in areas affected by inappropriate or excessive noise sources (Director's Order 47). Soundscapes are inherent components of the scenery and natural historic objects protected by the NPS Organic Act. Occasional use of aircraft, such as helicopters and planes, and vehicles, such as trucks, is necessary for bison management both in and outside the park. Any vehicle use would be limited to front-country areas, where visitor automobile traffic on park roadways is the predominant source of human-caused sounds. Therefore, bison management in YNP would have no measurable effect on soundscapes in the park and would therefore have no related effects on other wildlife and threatened and endangered species. However, the sound of gunfire may be audible to visitors traveling on Old Yellowstone Trail South Road and Highway 89. This impact is analyzed in the "Visitor Use and Experience" section of chapter 3 of the plan/EIS.

Paleontological Resources

Bison management activities in YNP would not disturb any known paleontological resources and would involve minimal ground disturbance. Thus, impacts to paleontological resources from these activities would be negligible.

Floodplains and Wetlands

Executive Orders 11988, *Floodplain Management*, and 11990, *Protection of Wetlands*, require federal agencies to examine the potential effects of critical actions on floodplains and wetlands. Few bison management activities occur within or adjacent to floodplains or wetlands, and there is minimal disturbance where they occur. The alternatives in this plan/EIS do not propose construction of bison management facilities in or adjacent to wetlands. As a result, these impacts would not constitute critical actions as defined in the NPS floodplain management guides. Some riparian communities in the northern portion of YNP changed to grasslands during the 1900s due, in large part, to intense browsing by more than 19,000 elk (Hobbs and Cooper 2013). Elk counts have decreased by about 70% since 1994, and riparian communities are recovering in several areas; though browsing by abundant bison is suppressing recruitment in some areas (Painter and Ripple 2012; Painter et al. 2015). Wetland habitats, including natural springs, face invasions of timothy, creeping clover, dandelion, smooth brome, and Canada thistle. Bison graze the periphery of wetlands during the growing season and increase use during winter.

Disturbance from bison would likely continue to exacerbate invasions, particularly near bison summering areas in the Lamar watershed and Hayden Valley. As part of the permit requirements set by the US Army Corps of Engineers, the NPS manages invasive species in wetlands affected by federal highways projects to maintain their functionality. This control primarily involves spraying clover and Canada thistle, followed by revegetation using willow and other native plants. These effects are evaluated under "Vegetation" in chapter 3 of the plan/EIS.

Aquatic Resources

Most management activities with bison in YNP take place in and near the Stephens Creek Administrative Area in the Gardiner Basin, where the bison capture facility and quarantine pastures. The Yellowstone River flows through the Gardiner Basin about 0.8 miles (1.3 kilometers) northeast of the bison capture facility and quarantine pastures. At this point, the river is about 200 feet (61 meters) lower in elevation than the facilities. The primary native fish in this river are mountain whitefish and Yellowstone cutthroat trout, as well as nonnative brown trout and rainbow trout. Stephens Creek is a tributary of the Yellowstone River and flows by the bison capture facility about 0.4 miles (0.6 kilometer) to the southeast. Historically, this creek provided water for a residence (Rife House) and irrigation ditches in and near the Stephens Creek Administrative Area. This practice ceased sometime between 1984 and 1996, and the irrigation ditches are no longer functional. There are no fish in the creek.

Reese Creek is a tributary of the Yellowstone River that constitutes a portion of the boundary of YNP about 1.5 miles (2.4 kilometers) northwest of the bison capture facility in the Stephens Creek Administrative Area. Historically, managers diverted some water from this creek into irrigation ditches in and near the Stephens Creek Administrative Area, but these ditches are no longer functional. Fish from the Yellowstone River move into the lower reaches of this creek. Existing water rights claims historically made Reese Creek an over-appropriated stream, where demand at times exceeded available water due to private irrigation demands adjacent to YNP. In 2018, an agreement for the lease of water rights from Reese Creek between Trout Unlimited, Inc. and a landowner near the park was reached to maintain instream flows through the year while supporting irrigation through a new diversion intake structure and pipeline (Trout Unlimited 2018).

Water for people, livestock (horses, mules), captured or quarantined bison, nursery operations, and landscaping in and near the Stephens Creek Administrative Area comes from Wilson Springs, which is located approximately 0.3-miles (0.5-kilometers) west in the Sepulcher Mountain foothills. There are no plans to make irrigation ditches operational or divert water from the Yellowstone River or Reese or Stephens Creeks for bison management.

An increase in bison abundance has the potential to increase stream sedimentation; however, this increase is unlikely to affect native fish species in the park in a meaningful way. *Tubifex tubifex* is the obligate host for *Myxobolus cerebralis*, the exotic parasite that causes whirling disease in cutthroat trout at Yellowstone Lake and some connected streams. *T. tubifex* densities are highest in fine nutrient-rich sediments, the type found in lower Pelican Creek and some tributaries to the Yellowstone River in Hayden Valley. These streams are low gradient and unconfined, capable of meandering into the floodplain when flooding occurs, so they naturally have these fine sediments—the fine sediments are not a result of stream bank disturbance by wildlife. A majority of other tributaries to Yellowstone Lake and rivers and streams elsewhere across the park are, by comparison, relatively high gradient and confined, so flushing flows in these streams, especially during spring snowmelt runoff, preclude accumulation of fine sediments.

Along with fine sediments and the presence of *T. tubifex*, many other factors, both biological (e.g., *T. tubifex* genetics) and environmental (e.g., water chemical characteristics and flow velocity) influence the prevalence and severity of whirling disease in cutthroat trout. Studies conducted by Koel et al. (2006, 2007) suggest that the most important of these other factors is stream temperature and its timing with the emergence of cutthroat trout fry from redds. Despite the presence of fine sediments and Tubificids, infection risk to cutthroat trout is low when fry emerge either earlier or later than peak

production of triactinomyxons, which is the free-floating form of *M. cerebralis* produced by *T. tubifex*. The emergence of fry earlier or later in the season and the environmental setting of some streams may be somewhat incompatible with successful *M. cerebralis* life cycle establishment.

M. cerebralis was discovered in Yellowstone Lake cutthroat trout 25 years ago (1998). Although the parasite persists, it has not spread further, and impacts on the cutthroat trout population appear to be low. The geomorphology of streams and other environmental characteristics may limit future outbreaks of whirling disease in cutthroat trout, regardless of wildlife disturbance and stream bank conditions.

Thus, the alternatives in this document would have negligible impacts on aquatic resources.

Prime and Unique Farmlands

In 1980, the CEQ directed federal agencies to assess the effects of their actions on farmland soils classified by the US Department of Agriculture's Natural Resources Conservation Service as prime or unique. Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops. Unique farmland is land other than prime farmland used for production of specific high-value food and fiber crops. Lands affected by the proposed alternatives for bison management activities do not meet these criteria.

Energy Requirements and Conservation Potential

Implementing the proposed bison management alternatives would involve using some machinery and motorized vehicles but not a substantial use of national energy resources.

Natural or Depletable Resource Requirements and Conservation Potential

None of the bison management alternatives would deplete natural resources. Bison in YNP have hundreds of calves each spring that can replenish numbers removed during captures, harvests, and natural mortality—including the removal of more than 1,000 bison during several winters and more than 13,000 bison since 1985. Large aggregations of bison repeatedly and intensively graze vegetation at some sites through the summer, which tends to create lawns of dense, short-statured plants. This grazing strategy sustains highly nutritious food by prolonging and intensifying new plant growth but reduces the amount of plant material available at the end of the growing season. Repeated grazing by large groups of bison generally has positive effects on plant growth by increasing the availability of nutrients such as nitrogen and improving water-holding potential, which supports higher grass growth through summer (Geremia and Hamilton 2019, 2022; Geremia et al. 2019). These effects are evaluated under "Yellowstone Bison" in chapter 3 of the plan/EIS.

Possible Conflicts with Land Use Plans, Policies, or Controls

Facilities for bison capture, processing, and quarantine already exist in YNP and nearby areas of Montana, and they do not restrict the movements of other animals. The capture and confinement of bison conflicts with the NPS's biological principle of minimizing disturbances by people (USDOI, NPS 2006a), but the NPS sometimes reduces bison numbers because of limited tolerance for them in surrounding states. On adjacent US Forest Service (USFS) lands in Montana, the Custer Gallatin National Forest Land Management Plan (2022) is the overarching plan that provides broad goals for land use, management areas, and wildlife habitat management, including bison habitat. For lands under the jurisdiction of Montana, the 2015 *Year-Round Habitat for Yellowstone Bison Environmental Assessment* is the overarching land use and management document related to bison. This plan defines the geographic extent of bison tolerance in the Gardiner and Hebgen Basins, which are located within the designated surveillance area (DSA) for brucellosis. Environmental consequences and the comparative analysis between alternatives are based on the existing management areas and land use as defined in the USFS and Montana plans. The NPS would continue to sustain a viable population of wild, wide-ranging Yellowstone bison. The potential impacts of bison on cattle and people through brucellosis transmission, injuries, or property damage are discussed in chapter 3 of the plan/EIS.

Air Quality

The 2006 *Management Policies* and 2010 *Climate Change Response Strategy* for the NPS encourage park managers to engage partners and use the best available science to inform planning and the implementation of cooperative solutions. However, the NPS is not responsible for adverse impacts such as emissions from sources outside YNP over which it has no control. Bison management requires the occasional use of machinery, aircraft, and vehicles, such as staff driving vehicles to the Stephens Creek Administrative Area, operating facilities, and pens; truck use for transporting bison; and fixed-wing flights for bison surveys. Because these activities are limited in number, and a tiny fraction of machinery and vehicle use in the park, they would have no measurable effect on emissions in the park.

Further analysis addressing greenhouse gas (GHG) emissions and the social cost of carbon from bison on the landscape was dismissed because the NPS is not aware of available information or data to complete a full quantification of GHG emissions for native wildlife species with native ecosystems and therefore cannot complete a social cost of carbon analysis. Secretarial Order 3399, *Department-Wide Approach to the Climate Crisis and Restoring Transparency and Integrity to the Decision-Making Process*, states that "when considering the impact of GHG emissions from a proposed action, Bureaus/Offices should use appropriate tools, methodologies, and resources available to quantify GHG emissions and compare GHG quantities across alternatives. When quantifying GHG emissions is not possible because tools, methodologies, or data inputs are not reasonably available, Bureaus/Offices will provide a qualitative analysis and the rationale for determining that a quantitative analysis is not warranted." Additionally, CEQ gives agencies the latitude to discuss GHG emissions and impacts in a qualitative rather than quantitative analysis when agencies lack the tools necessary to fully quantify these emissions (see "Climate Considerations" below for additional detail). The NPS is proposing only minor increases in bison numbers compared to no action; an increase of 1,000 bison compared to the no-action alternative under Alternative 2 and a potential increase of 2,000 bison under Alternative 3. It is unlikely that any quantification of GHGs resulting from the action alternatives would demonstrate a meaningful impact to air quality.

Wilderness

The Wilderness Act of 1964 established the National Wilderness Preservation System, which defines wilderness as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain … an area of undeveloped Federal Land retaining its primeval character and influence … which is protected and managed so as to preserve its natural conditions" (16 US Code [USC] 1131, et seq.). In 1972, the Secretary of the Interior recommended to the president of the United States that 91% of YNP (2 million acres; 809,370 hectares) be designated as wilderness. This proposal was submitted to Congress for approval in 1978, but Congress has yet to act on this recommendation. Per NPS Management Policies, recommended wilderness is managed as wilderness to protect wilderness resources and values. As a result, the area proposed for wilderness designation in YNP is managed "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness" (16 USC 1131 section 2[a]). The Stephens Creek Administrative Area, where management activities with bison currently occur, is not inside the park's recommended wilderness. Road corridors and adjacent lands in the Hayden and Lamar Valleys are not included in wilderness. Some counts and classifications of bison may be conducted in wilderness and have ephemeral, insignificant effects on wilderness character. Under the adaptive management strategy proposed for Alternative 2, the NPS may capture bison in the interior of the park in limited circumstances and with additional site-specific NEPA analysis, including a minimum requirements analysis. This action would impact the untrammeled, natural, and undeveloped qualities of wilderness character. Impacts to the untrammeled quality of wilderness would result from the intentional manipulation of the bison population through removal of bison. The natural quality is preserved when native plant species and animal populations and native biophysical processes predominate in relative balance. Large concentrations of bison in some areas resulting from climate warming or other factors could degrade the natural quality and

capturing some bison in the interior could reduce the population resulting in reduced impacts on vegetation which would benefit the natural quality of wilderness. The presence of structures and installations, the use of motor vehicles or motorized equipment would degrade the undeveloped quality of wilderness during capture operations.

Other Wildlife

Impacts to bison, elk, pronghorns, bighorn sheep, mule deer, bears, cougars, grey wolves, and threatened animals are included in chapter 3 of the plan/EIS.

Wet Grassland Habitat Species

Impacts to wet grassland habitats are discussed in chapter 3 of the plan/EIS. Changes in bison abundance in wet grassland habitats could indirectly affect songbirds, insects, and reptiles.

Songbirds and woodpeckers, or passerine and near passerine species, make up the majority of bird species in the park. They are monitored through counts in willow (*Salix* spp.) stands, recently burned forests, old growth forests, and grasslands/sagebrush steppe; the North American Breeding Bird Survey; fall migration surveys; and summer and early fall banding stations. Grasslands are a threatened habitat type across the continent, and grassland songbirds are the most imperiled songbird guild in North America. In the park, invasive plants, changing intensities of ungulate browse, and climate change all affect grasslands. In 2021, bird program staff and volunteers conducted songbird surveys in sagebrush steppe and grasslands across the northern range in areas that vary in bison grazing intensity as well as native and invasive plant species composition. Staff observed 13 species of songbird in grasslands and sagebrush steppe in 2021. In areas with high grazing intensity and abundant nonnative vegetation, the most abundant species were horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), and western meadowlark (*Sturnella neglecta*). At other sites, species diversity varied significantly, although Brewer's sparrow (*Spizella breweri*), vesper sparrow, and savannah sparrow (*Passerculus sandwichensis*) were all common.

Common insects in the park include butterflies and moths (Lepidoptera), beetles (Coleoptera), flies (Diptera), and bees and ants (Hymenoptera). Insects far outnumber vertebrates in YNP and globally. Insects aid in the crucial process of nutrient cycling by moving soil, consuming carrion, and decomposing organic matter. Insect activity physically modifies the soil profile, improving the habitat for plant growth. Ants and other burrowing insects redistribute soil, bringing mineral-rich components from below and mixing it with organic matter, creating a fertile environment ideal for plant growth. In an area such as the Greater Yellowstone Ecosystem with large populations of large mammals, carrion decomposition is an important issue. Carrion beetles (Silphidae) are especially important in decomposition. Sikes (1994) found more than 50 species of carrion beetle present in the northern range of the Greater Yellowstone Ecosystem that are heavily dependent on ungulate carcasses. Exotic species, especially exotic plants, may have large, yet undetected effects on terrestrial insects in the Greater Yellowstone Ecosystem. These species have indirect effects on the insect community by changing the amount and relative abundance of plants and soil nutrients available to insects (Ehrenfeld 2003). These changes may increase populations of some insect species by providing additional nectar, food, or host plants; other insect populations may decrease because their preferred nectar, food, or host plant species are outcompeted by exotics (Levine et al. 2003).

Reptiles are not well studied in YNP. There are six confirmed species of reptiles in YNP: bullsnake (*Pituophis catenifer sayi*), prairie rattlesnake (*Crotalis viridis*), rubber boa (*Charina bottae*), sagebrush lizard (*Sceloporus graciosus*), common garter snake (*Thamnophis sirtalis*), and the terrestrial garter snake (*Thamnophis elegans*). Many reptiles congregate to breed or overwinter, and they can be adversely affected by disturbance or loss of key sites.

As discussed in chapter 3, consistent with current trends, cool-season invasives are expected to continue to invade and become more common in wet grassland habitats throughout the park. Taller growing

bunchgrass invaders, such as timothy (*Phleum pratense*), would continue to spread in areas throughout the park with less grazing disturbance. Sod-forming, vegetative plants like creeping clover (*Trifolium repens*) and smooth brome are expected to increase in areas of higher bison grazing. Grazing lawns in floodplain areas of the Lamar Valley are expected to continue complete conversion to the "grazing-lawn-invasive" state. Based on grazing intensity and moisture regimes, monocultures of dandelion (*Taraxacum officinale*), creeping clover, Kentucky bluegrass (*Poa pratensis*), smooth brome, and Canada thistle (*Cirsium arvense*) would likely occur regionally within lawns. Grazing lawns in the Lamar Valley may increase in size and geographic extent to include Slough Creek and Soda Butte Creek.

Under Alternatives 2 and 3, bison abundance could increase, resulting in bison migrations into new areas. These new areas could be converted from wet grassland habitat to grazing lawns. This conversion could change predator/prey dynamics and availability or suitability of breeding and foraging habitat for songbirds, insects, and reptiles in these specific areas.

Under Alternative 3, it is possible that bison could overgraze wet grassland habitats of the Lamar Valley, resulting in measurable changes in plant regrowth, soil productivity, and erosion. These changes would indirectly affect available habitat for wet grassland species. Additionally, species present across the northern region of YNP where bison congregate could be affected by bison trampling and wallowing if bison abundance increases.

Riparian Habitat Species

Impacts to riparian habitats are discussed in chapter 3 of the final plan/EIS. Changes in bison abundance in riparian habitats could indirectly impact songbirds and small mammals such as beavers, invertebrates, and amphibians.

Several YNP bird species, including Wilson's warbler (*Cardellina pusilla*), willow flycatcher (*Empidonax traillii*), and gray catbird (*Dumetella carolinensis*), only breed in willow communities. From the early 1900s, growth of willows and other woody vegetation on Yellowstone's northern range was stunted (suppressed) by elk browsing, reduced beaver populations, consumption by fire, and/or climate change. Correlated with the recovery of several large predator species in the park, some willow stands in the northern range have grown taller and thicker since the mid-1990s, creating a range of growth conditions in current willow stands.

Monitoring of willow–songbird communities in YNP began in 2005. Scientists compare the presence and abundance of breeding songbirds across different willow stand conditions. In 2021, park staff recorded 39 songbird species in willows. Species richness (diversity) was higher in taller willows than in suppressed willows. Recovered willow stands provide shrubby cover for ground and low-nesting species such as song sparrows (*Melospiza melodia*). Suppressed willows appear to provide habitat for generalist and grassland/sagebrush species. Willow stands are slowly changing, and biologists plan to regularly reassess the vegetation characteristics as bird communities continue to be monitored.

Beaver (*Castor canadensis*) is a keystone species that affects habitat structure and dynamics by damming and diverting streams and felling trees and other woody vegetation in YNP. The resulting ponds and flooding help create an environment favorable to willow and aspen, which are the beavers' preferred winter foods and are also used in building their lodges. The territoriality of beavers probably deters two colonies from locating within 165 feet (50 meters) of each other, and most streams in the park lack either suitable vegetation or a sufficiently low gradient to provide suitable habitat for beavers.

Willow dominated many riparian areas at the time of the park's establishment (Houston 1982; Wolf et al. 2007); however, increased elk herbivory during the 20th century transitioned many of these areas to grassland-dominated states (Houston 1982; Singer et al. 1994). As willow-dominated riparian areas declined, beaver populations also declined because they depend on willows for food and habitat (Baker and Hill 2003). The loss of beavers created fundamental shifts in the hydrologic processes of riparian areas that ultimately caused channel incision, loss of fine sediments, and lowered water tables that have

inhibited the transition back to willow-dominated states even with reduced ungulate herbivory (Bilyeu et al. 2008; Marshall et al. 2013). Willow and beavers are likely intertangled in a mutual feedback loop (obligate symbiotic relationship) where willows cannot reestablish without beavers, and beavers cannot reestablish without willows (Wolf et al. 2007).

Five amphibian species occur in the park: boreal chorus frog (*Pseudacris maculate*), Columbia spotted frog (*Rana luteiventris*), plains spadefoot toad (*Spea bombifrons*), western tiger salamander (*Ambystoma mavortium*), and western toad (*Anaxyrus boreas*). Boreal chorus frogs are common throughout the park, living in moist meadows and forests near wetlands and breeding in shallow pools or ponds during late spring. Columbia spotted frogs are widespread along or in rivers, streams, lakes, wetlands, and ponds. Western tiger salamanders are widespread in a variety of habitats and breed in ponds and lakes with emergent vegetation used for egg attachment. These salamanders are abundant in the northern portion of the park. Western toads are abundant in some areas and can range far from wetlands by absorbing water from puddles or moist areas. They lay eggs in warm water along lake edges, slow streams, ponds, and river backwaters (USDOI, NPS 2019). In 2014, a breeding population of plains spadefoot toads was discovered in five thermally warmed pools in the Lower Geyser Basin at an elevation of about 7,220 feet (Schneider et al. 2015). These toads emerge from overwinter burrows near the pools to breed in May, and most tadpoles complete metamorphosis in the pools by mid-July. Adults can disperse up to 1.5 miles, but most remain within 400 yards of the pools. No plains spadefoot toads are known to occur in the Lamar River watershed.

Aquatic macroinvertebrates in the park include aquatic insects, gastropods (snails), bivalves (mussels and clams), hydracarina (water mites), annelids (segmented worms and leeches), amphipods (scuds), isopods (pillbugs), decapods (crayfish), hydroids (hydra), turbellaria (flatworms), poriferans (freshwater sponges), and nematodes (unsegmented worms). Macroinvertebrates are an important food source for fish, amphibians, and some birds and mammals.

Larger numbers of bison under Alternatives 2 and 3 could induce movements into new areas of the park. Expansion of bison into new areas of the park could enhance the cycling of energy, nutrients, and water; grassland health; and biodiversity benefiting other species. There could also be more intense grazing in these new areas, which would affect available habitat for some species such as songbirds and beavers. Bison abundance in new areas of the park degrade riparian habitats by increasing exotic species dominance, and reducing species richness, native species diversity, willow cover, and wetland species dominance (Kauffman et al. 2023). In addition, bison may trample amphibian and reptile species that bask along the edge of riparian areas for thermoregulation, resulting in impacts on amphibian and reptile populations in the park.

Raptors

The park supports 19 breeding avian raptor species, with additional species present during migration. The park monitors bald eagles (*Haliaeetus leucocephalus*), golden eagles (*Aquila chrysaetos*), ospreys (*Pandion haliaetus*), and peregrine falcons (*Falco peregrinus*). Bald eagles and peregrine falcons were previously listed as endangered and threatened species, and the park has continued monitoring since their delisting. The osprey is monitored because of the decline of one of their primary food sources, the cutthroat trout in Yellowstone Lake. The park monitors golden eagles because they are affected by expanding energy development and increasing human activity across the United States. Other raptor species that occur in the park, such as American kestrels (*Falco sparverius*) and Swainson's hawks (*Buteo swainsoni*), are of growing conservation concern throughout their ranges in the United States.

YNP raptors nest on various substrates, including trees (e.g., *Bute*o spp., *Accipter* spp.), cliff faces (e.g., golden eagles, peregrine falcons), cavities (e.g., American kestrel, several owl species), and the ground (e.g., northern harrier [*Circus hudsonius*]). Bald eagles and ospreys often nest in trees adjacent to riparian areas (e.g., cottonwood [*Populus deltoides*]). Grasses dominate the Hayden and Lamar Valleys where bison tend to gather in large herds of several hundred animals or more during summer. Suitable

ground-nesting habitat may be found in both valleys, though it is unlikely that raptors would establish nests where herds of bison are roaming. Suitable raptor nesting trees are scarce at lower elevations in both valleys. The riparian zone along the Lamar River in Lamar Valley contains sparse stands of cottonwood trees that may provide suitable nesting habitat for fish-eating raptors such as bald eagles and osprey.

Larger numbers of bison under Alternatives 2 and 3 would not likely impact cliff- and cavity-nesting raptors or raptor species that nest in forested areas. Expansion of bison into new areas of the park could impact raptor species that nest near riparian areas by suppressing the recruitment of young cottonwood trees as a result of browsing on riparian vegetation. However, as part of habitat restoration projects in response to natural disturbance processes such as fire, flooding, landslides, native insect outbreaks, and windthrow, the NPS would continue to remove weeds, and plant native grasses, shrubs, and riparian trees to restore desired conditions under all alternatives (Yellowstone Center for Resources 2021).

Raptors prey on small mammals, reptiles, fish, and smaller birds. Increased numbers of bison in new areas of the park under Alternatives 2 and 3 could affect available terrestrial prey densities in YNP as a result of grazing and trampling of burrows and dens where prey species live. There are no plans to make irrigation ditches operational or divert water from the Yellowstone River or Reese or Stephens Creeks for bison management. Thus, the alternatives in this document would have negligible impacts on fish prey availability.

Overall, under Alternatives 2 and 3, more bison on the landscape could increase grazing pressure in some areas of the park. More bison would likely graze portions of the Lamar and Hayden Valleys during the summer, as well as the Gardiner and Hebgen Basins during the winter and spring. The grazed areas would make up a small portion of the available habitat for other wildlife species in YNP. Most summer ranges and all winter ranges generally experience low to moderate grazing during the summer growing period (Geremia and Hamilton 2019, 2022). Thus, it is unlikely that continued or increased grazing by bison would affect available habitat, predator/prey dynamics, or breeding and foraging habitat for other wildlife species in a meaningful way. For these reasons, the NPS did not carry forward these species for detailed analysis.

Climate Considerations

The NPS addresses climate change and its impacts to the resource topics carried forward in chapter 3 of the final plan/EIS. The NPS dismissed climate change as an issue carried forward for detailed analysis because the action alternatives would likely have minimal net impact on biogenic carbon cycling throughout the system and GHGs. As such, a detailed analysis of the impacts on the carbon footprint would be inconsistent with National Environmental Policy (NEPA) regulations and policy that state data and analysis should be commensurate with the importance of the impact. Within the context of this plan/EIS, impacts to climate change from NPS management actions would be minor and would primarily consist of indirect effects of a slightly larger bison population on the landscape potentially resulting in enteric fermentation and changes to vegetation that could affect carbon sources and sinks. The NPS addresses the current and expected future condition of vegetation and the resulting impacts from the range of alternatives in chapter 3 of the final plan/EIS.

Both Secretarial Order 3399 (USDOI 2021) and CEQ guidance on considerations of GHG emissions and climate change (CEQ 2023) suggest agencies use GHG emissions and the subsequent social cost of carbon to disclose how an agency's actions would affect climate change. Both guidance documents state that when quantifying GHG emissions is not possible because tools, methodologies, or data inputs are not reasonably available, agencies will provide a qualitative analysis and the rationale for determining that a quantitative analysis is not warranted (USDOI 2021, CEQ 2023).

The NPS is not aware of available information or data to complete a full quantification of GHG emissions associated with bison impacts on natural carbon cycling in native ecosystems. This analysis would be complex and would involve numerous ecosystem processes and feedback loops. The NPS reviewed all

available literature and tools, including literature submitted by commenters (see Concern Statement 81 in appendix G.) and determined that a qualitative discussion is more appropriate in this case, consistent with USDOI and CEQ guidance.

Using available tools for enteric fermentation from bison managed as livestock and available tools to convert enteric fermentation estimates to global warming potential estimates, it is possible that enteric fermentation emissions from bison could average 82.2 kg (USEPA 2018) of methane per head per year. Using the International Panel on Climate Change (IPCC) global warming potential values for non-fossil methane provided in Table 7.15 of the IPCC Climate Change 2021-The Physical Science Basis Document, livestock bison would emit 6.6 metric tons of carbon dioxide equivalent (CO2e) per head per year on a 20-year time frame, and 2.2 metric tons of CO2e per head per year on a 100-year time frame. However, enteric fermentation estimates are meant for livestock populations only and not wildlife populations. This is not a complete picture and does not account for native bison in a native environment and the many carbon feedback loops present.

The action alternatives would reduce NPS's anthropogenic manipulation of native bison populations in YNP. Management tools proposed under Alternative 2 would be the same as the no-action alternative; however, the NPS would reduce shipments for processing. Under Alternative 3, the NPS would prioritize treating bison more like other ungulates such as elk, thereby reducing and ceasing some management tools such as transfer for processing under most situations. A reduction in the use of some management tools under Alternatives 2 and 3 would reduce NPS's contribution to GHG emissions compared to current management. Additional information on air quality is included as part of the air quality dismissal.

Under the action alternatives, the NPS is proposing only minor increases in bison numbers compared to the no-action alternative; an increase of 1,000 bison compared to the no-action alternative under Alternative 2 and a potential increase of 2,000 bison under Alternative 3. Changes to vegetation because of more bison on the landscape could affect carbon sources and sinks, which could affect climate change. As discussed in chapter 3 of the final plan/EIS, some studies suggest that current levels of bison may be exacerbating climate change effects by shifting the composition of riparian plant assemblages toward those adapted to warmer and drier conditions and inducing warmer microclimates and lower soil water-holding capacities by removing riparian cover (Kauffman et al. 2023) but other studies confirmed in grassland and sagebrush steppe that soil carbon sequestration is being maintained by elk and bison. However, the climate of northern YNP has warmed and dried significantly since the 1980s, and this trend is forecast to continue (Tercek et al. 2015; Thoma et al. 2015; Hostetler et al. 2021). Before bison replaced elk as the dominant grazer in northern YNP, this warming had already changed the composition and distribution of vegetation. It is not clear that Yellowstone bison are responsible for ecosystem changes and/or declines in YNP today, as observed declines or ecosystem changes may also be attributed to other stressors, including (but not limited to) climate change. Additional information on changes to carbon sinks (i.e., soils, wet grassland areas, riparian areas, sagebrush-steppe areas, wetlands) from the range of alternatives is included in chapter 3 of the final plan/EIS.

On a regional and national scale, North American bison populations are significantly reduced from their historic ranges (pre-European contact), and Yellowstone bison are remnants of this keystone species. Secretarial Order 3410, *Restoration of American Bison and the Prairie Grassland* (USDOI 2023), stresses the importance of restoring bison as native North American wildlife and notes that, "warming temperatures exacerbate the pressures on grasslands, with historic droughts, wildfires, and invasive species threatening the grassland ecosystems and the communities they support. The best science shows that returning bison to grasslands can enhance soil development, restore native plants and wildlife, and promote carbon sequestration." The proposed increase in Yellowstone bison under Alternatives 2 and 3 are well below historical population estimates on a regional and national scale. This is an important consideration when discussing the natural carbon cycle, as climate change is a global rather than a localized phenomenon. Based on the NPS's mission and mandates, the NPS manages parks for overall ecosystem functions and processes, not carbon productivity (USDOI, NPS 2006a). Yellowstone bison are

a keystone species and an important component of natural ecosystems, contributing to climate resiliency through the promotion of carbon sequestration in grasslands in YNP.

Because a detailed analysis of the environmental impacts related to climate change is not necessary to make a reasoned choice between alternatives, and the action alternatives are unlikely to contribute to climate change in a meaningful way, the NPS did not carry forward this issue for detailed analysis.

Appendix D: Ongoing and Reasonably Foreseeable Actions

Proposed Yellowstone Park Road Reconstruction and Maintenance in Park and Teton Counties, Wyoming (2008-2028)—This plan describes the process of reconstructing, repairing, and maintaining paved and gravel roads and bridges to promote human safety and visitor enjoyment in Yellowstone National Park (YNP). Park roads were not designed to handle the weight, size, number of vehicles, and the longer seasonal periods of use that began in the latter part of the twentieth century. The poor quality sub-base materials drain poorly and retain moisture, resulting in severely rutted, cracked, and pot-holed roads. Moisture contributed to accelerated erosion, pavement failure, and heaving during the spring thaw. Erosive, high-water events have affected road stability along some segments. The project is reconstructing, overlaying, and repairing primary and secondary park roads and bridges and maintaining and repairing gravel and unimproved park roads. Primary roads include the Grand Loop and the entrance roads; secondary roads are all other paved roads.

Yellowstone River Bridge Replacement (2020)—This project would replace the Yellowstone River Bridge located on the Northeast Entrance Road in YNP. The selected alternative will replace the existing Yellowstone River Bridge (605 feet long) with a new bridge (1,175 feet long) on a new alignment approximately 500 feet south of the existing bridge. Just over 1 mile of the Northeast Entrance Road will be shifted several hundred feet south of its existing alignment on either side of the bridge to line up with the new bridge. Traffic will be carried on the existing bridge while the new bridge and road is under construction. Once construction is complete, the existing Yellowstone River Bridge, and approximately 1.5 miles of the existing Northeast Entrance Road will be removed. Temporary work bridges will be constructed adjacent to the alignment of the new and existing bridges to facilitate their construction and deconstruction. These work bridges will be removed prior to completion of the project. Construction is anticipated to last three years with most construction occurring during the months of April-November (starting as early as 2023), though no restrictions on winter work will occur if weather allows. In addition to replacing the bridge, the project would reconfigure and expand the Yellowstone River picnic area, improve turnouts for vehicles along the road, and reduce traffic hazards to visitors when feasible to do so.

Emergency Activities for Improvements to the Old Gardiner Road Project (2022)—Following the June 2022 flooding, this project initially consisted of widening the 5.26-mile Old Gardiner Road to two lanes and paving the road to accommodate year-round access. Additional improvements to the Old Gardiner Road (now called the Temporary North Entrance Road) were proposed and executed in autumn 2022. These additional improvements included flattening of dangerous curves and a slight realignment of approximately 1 mile of the southernmost end of the road (as it approaches Mammoth Hot Springs). The paved surface was intended to provide a durable, plowable, all-season driving surface for the duration of the use of the road as temporary access. The curve widening/flattening and realignment near Mammoth allows for safer vehicle travel during winter months and use by oversized vehicles (or vehicles pulling trailers) year-round. The lifespan of the Old Gardiner Road as temporary access is anticipated to be 5 to 10 years, while the permanent North Entrance Road is reconstructed. The road was surfaced with crushed aggregate and paved to ensure durability and increase ease/safety of plowing for daily/regular use by passenger vehicles and some oversized service vehicles during all months of the year. There will continue to be certain vehicle size restrictions for the road, and traffic volume will be less than what was normally present on the North Entrance Road due to the width and slope of the Old Gardiner Road, even after improvements.

Emergency Activities for Improvements to the Northeast Entrance Road (2022)—Following the June 2022 flooding, this project consisted of emergency activities to temporarily repair damaged sections of the Northeast Entrance Road to reestablish vehicular access between Silver Gate and Cooke City, Montana, and Mammoth Hot Springs, Wyoming, resulting from the 2022 flooding. Work will be done in two phases, autumn of 2022 and summer of 2023. The proposed repairs will provide vehicular access along this route for the next 5 to 10 years and will be in use until the entirety of the Northeast Entrance Road is

permanently reconstructed. The first phase of repairs were completed in autumn 2022 to provide a plowable, all-season road for essential services, and reestablished resident, employee, and visitor access.

Permanent North Entrance Road Reconstruction (TBD)—The North Entrance Road requires reconstruction after catastrophic flooding in June 2022 caused severe damage and loss of several sections of the road. This project is in the early planning stages, but construction/reconstruction work on a permanent road connecting the North Entrance (Gardiner, Montana) and Mammoth Hot Springs, Wyoming, is anticipated to begin as early as 2025. The Temporary North Entrance Road (see above) was constructed to reestablish vehicular access between these locations for a period of approximately 5 to 10 years and was not intended to serve as a long-term access route. A permanent road will need to be established and completed before the end of the life cycle of the temporary road to ensure safe year-round access for employees, visitors, and residents of the area. The permanent North Entrance Road alignment will be designed to minimize or avoid impacts to natural and cultural resources, and design will incorporate climate resiliency measures to protect the infrastructure from future extreme weather events (such as floods, wildfire, earthquakes). As the project is in the early stages of planning, proposed alignment and design alternatives are in the process of being developed. Potential alignments may use and improve portions of the existing road infrastructure.

Custer Gallatin National Forest Land Management Plan (LMP) (2022)—In 2022, the Custer Gallatin National Forest adopted a new LMP. The selected alternative includes desired conditions supporting habitat improvement projects to create or connect suitable bison habitat with enough bison present and distributed year-round to provide a self-sustaining population on the national forest in conjunction with bison herds in YNP (USDA, USFS 2022a). This long-term plan allows for expanded tolerance of bison on the national forest, including a desired condition to have a self-sustaining population of bison on the forest year-round. It also includes an objective to complete three habitat improvement projects every three years to create or connect suitable habitat for bison on the forest, while continuing to work with partners to reduce conflicts with livestock and private property. In addition, the plan allows the national forest to address potential barriers to bison on the landscape in areas under consideration for expanded tolerance by Montana. The NPS would continue to collaborate with the Custer Gallatin National Forest on implementation of the LMP.

Hunting Outside the Park (ongoing)—Bison would continue to migrate outside the park where state agencies and the national forest have jurisdiction and work with private landowners to determine levels of tolerance, hazing, and captures, and with American Indian Tribes with tribal harvesting rights to coordinate the location and extent of hunting outside the park. Public hunting and tribal harvests began in the winter of 2005–2006 with American Indian Tribes asserting their treaty rights to hunt outside the northern boundary of the park. During these early years, two American Indian Tribes exercised their right to hunt. Over time, more American Indian Tribes have exercised their right to hunt, and hunting intensity, particularly in Beattie Gulch, increased. Public hunts and tribal harvests removed about 2,930 bison during winters from 2001 through 2023 (table 2), and around 1,175 bison in the winter of 2022–2023 outside the park. The NPS expects a similar range of harvests would continue under current management. Hunting bison, either administered by the State of Montana or harvests conducted by American Indian Tribes exercising their treaty rights generally occurs from September 1 to April 1, with most hunting happening in February and March. The majority of bison harvest and hunting adjacent to the park occurs in Beattie Gulch on the Custer Gallatin National Forest between Yellowstone National Park and Gardiner, Montana.

In addition to the current bison hunting season generally running from December to April, hunting may occur year-round in the Gardiner Basin. A plethora of big-game species, including elk, mule deer, and bighorn sheep, make the Gardiner Basin home throughout the year. American Indian Tribes assert that their treaty rights acknowledge the ability to hunt year-round. The State of Montana has various big-game hunting seasons (elk, deer, bighorn sheep, pronghorn antelope, black bear) running from August through May each year, with year-round hunting for certain predators. American Indian Tribe hunting, combined

with hunters licensed by the State of Montana during various hunting seasons mean that Beattie Gulch may be congested with hunters throughout the year. A public target practice area, used daily by the public, exists within a 1-mile line of sight from Beattie Gulch.

Secretarial Order 3410, Restoration of American Bison and the Prairie Grassland—In March 2023, the Secretary of the Interior issued Secretarial Order 3410 to enhance the Department of the Interior's (USDOI) work to restore wild and healthy populations of American bison and the prairie grassland ecosystem through collaboration among the USDOI Bureaus and partners such as other federal agencies, states, American Indian Tribes, and landowners using the best available science and Indigenous Knowledge. Section 5(d) orders the NPS to initiate discussions with American Indian Tribes and other conservation partners on developing a plan to increase quarantine capacity for bison from YNP to undergo disease testing to further increase both shared stewardship and the number of live bison transferred to American Indian Tribes.

Updated Testing Procedures under APHIS Guidance (TBD)—Operations of the BCTP would be influenced by current updates to APHIS guidance including Veterinary Services (VS) Guidance 6605.1- "Testing Procedures for Approved Bison Quarantine Facilities to Classify Bison as Brucellosis Free" that updates testing procedures of Yellowstone bison. This guidance reduces the overall time that male bison are quarantined, facilitating more rapid throughput of male bison to assurance testing and to conservation herds. The NPS also consulted with APHIS on proposed rulemaking and program standards for brucellosis eradication. Presently, APHIS is in the process of publishing a draft rule to amend 9 Code of Federal Regulations (CFR) Part 78, Brucellosis, as well as new program standards (formerly Uniform Methods and Rules [UM&R]) for the National Brucellosis Eradication Program. This proposed rule would update the standards for the brucellosis program. The proposed rule would update bison quarantine procedures and establish new minimums for qualifying as brucellosis-free, following the VS Guidance 6605.1. The proposed rule would also update brucellosis management area guidance for the three Greater Yellowstone Area (GYA) states and requirements for cattle surveillance and vaccination, which would continue to inform managers of the status of brucellosis spread in the GYA.

Updated testing procedures for approved bison quarantine facilities to classify bison as brucellosis-free could result in cumulative beneficial impacts as these updated procedures would increase the number of brucellosis-free bison available annually from the GYA and decrease the number of required days for bison in quarantine. VS Guidance 6605.1 established the UM&R describing rigorous testing over several years to establish disease freedom, as APHIS regulations do not permit infected bison to move other than to slaughter; VS recently evaluated data collected from bison that have cleared quarantine since 2005 and suggested reducing the testing burden. VS Guidance 6605.1 post-quarantine requirements include testing the animal 12 months after release to verify that it remains test negative. Animals will be kept separate from all other animals until the 12-month test has been completed and classified.

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Appendix E: Revisiting Brucellosis in the Greater Yellowstone Area, National Academies of Sciences, Engineering, and Medicine Recommendations

The following recommendation are excerpted from the 2020 *Revisiting Brucellosis in the Greater Yellowstone Area* publication from the National Academies of Sciences, Engineering and Medicine, pages 2–9, found at https://nap.nationalacademies.org/catalog/24750/revisiting-brucellosis-in-the-greater-yellowstone-area.

Recommendation 1: To address brucellosis in the GYA, federal and state agencies should prioritize efforts on preventing B. abortus transmission by elk. Modeling should be used to characterize and quantify the risk of disease transmission and spread from and among elk, which requires an understanding of the spatial and temporal processes involved in the epidemiology of the disease and economic impacts across the GYA. Models should include modern, statistically rigorous estimates of uncertainty.

Recommendation 2: In making timely and data-based decisions for reducing the risk of B. abortus transmission from elk, federal and state agencies should use an active adaptive management approach that would include iterative hypothesis testing and mandated periodic scientific assessments. Management actions should include multiple, complementary strategies over a long period of time and should set goals demonstrating incremental progress toward reducing the risk of transmission from and among elk.

Recommendation 3: Use of supplemental feedgrounds should be gradually reduced. A strategic, stepwise, and science-based approach should be undertaken by state and federal land managers to ensure that robust experimental and control data are generated to analyze and evaluate the impacts of feedground reductions and incremental closure on elk health and populations, risk of transmission to cattle, and brucellosis prevalence.

Recommendation 4: Agencies involved in implementing the IBMP, as adjusted, should continue to maintain a separation of bison from cattle when bison are outside YNP boundaries.

> Removal of bison for population management purposes could target B. abortus-infected individuals if further reducing the prevalence of brucellosis is a goal; however, until tools become available that would simultaneously allow for an eradication program in elk, additional aggressive control measures in bison seem unwarranted.

Recommendation 5: In response to an increased risk of brucellosis transmission and spread beyond the GYA, USDA-APHIS should take the following measures:

> 5A: Work with appropriate wildlife agencies to establish an elk wildlife surveillance program that uses a modeling framework to optimize sampling effort and incorporates multiple sources of uncertainty in observation and biological processes.
>
> 5B: Establish uniform, risk-based standards for expanding the DSA boundaries in response to finding seropositive wildlife. The use of multiple concentric DSA zones with, for example, different surveillance, herd management, biosecurity, testing, and/or movement requirements should be considered based on differing levels of risk, similar to current disease outbreak response approaches.
>
> 5C: Revise the national brucellosis surveillance plan to include and focus on slaughter and market surveillance streams for cattle in and around the GYA.

Recommendation 6: All federal, state, and tribal agencies with jurisdiction in wildlife management and in cattle and domestic bison disease control should work in a coordinated, transparent manner to address brucellosis in multiple areas and across multiple jurisdictions. Effectiveness is dependent on political will, a respected leader who can guide the process with goals, timelines, measured outcomes, and a sufficient budget for quantifiable success. Therefore, participation of leadership at the highest federal (Secretary)

and state (Governor) levels—for initiating and coordinating agency and stakeholder discussions and actions and in sharing information—is critical.

Recommendation 7: The research community should address the knowledge and data gaps that impede progress in managing or reducing risk of *B. abortus* transmission to cattle and domestic bison from wildlife.

7A: Top priority should be placed on research to better understand brucellosis disease ecology and epidemiology in elk and bison, as such information would be vital in informing management decisions.

7B: To inform elk management decisions, high priority should be given to studies that would provide a better understanding of economic risks and benefits.

7C: Studies and assessments should be conducted to better understand the drivers of land use change and their effects on B. abortus transmission risk.

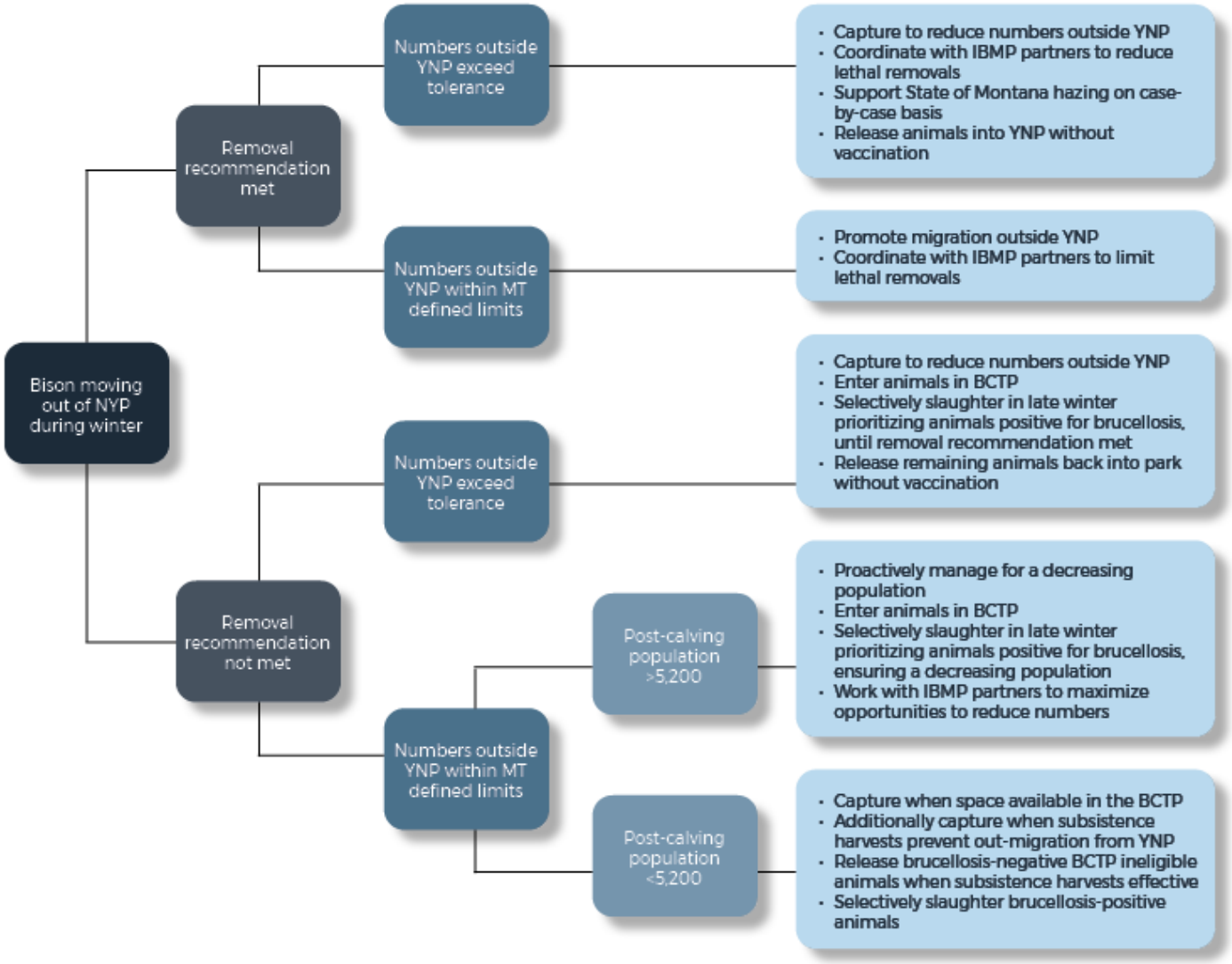
7D: Priority should be given to developing assays for more accurate detection of B. abortus-infected elk, optimally in a format capable of being performed pen-side to provide reliable rapid results in the field.

7E: Research should be conducted to better understand the infection biology of B. abortus.

7F: To aid in the development of an efficacious vaccine for elk, studies should be conducted to understand elk functional genomics regulating immunity to B. abortus.

7G: The research community should (1) develop an improved brucellosis vaccine for cattle and bison to protect against infection as well as abortion, and (2) develop a vaccine and vaccine delivery system for elk.

Appendix F: Example BCTP Decision Tree



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Appendix G: Public Comment Summary and Responses

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Yellowstone National Park

Bison Management Plan
Environmental Impact Statement

APPENDIX G: COMMENT RESPONSE REPORT

CONCERN RESPONSE REPORT

This report summarizes the substantive public comments received during review of the draft EIS and provides the responses to substantive comments, which are grouped together by area of concern.

Alternative 1 – No-Action Alternative

CONCERN STATEMENT 1: One commenter expressed concern that Alternative 1 does not meet the primary goal of the Interagency Bison Management Plan (IBMP) of maintaining a wild, free-ranging bison population as management actions will keep bison in Yellowstone National Park (YNP or the park) and continue reliance on bison slaughter. Furthermore, the commenter stated that this alternative does not meet the purpose and need of the plan/environmental impact statement (plan/EIS) in part because it does not adequately support tribal treaty rights and access to bison. Commenters expressed varying opinions on the target population numbers specifically related to Alternative 1. One commenter stated that 5,000 bison after calving is too high because it would not provide adequate forage for other grazing animals such as elk, deer, moose, and antelope. Other commenters stated the population range in the no-action alternative should range from 3,000 to 3,500 bison because at this population range, there is better gene flow, sex ratio, and age structure. Commenters stated that a "true" no-action alternative would mirror the low-intervention management model practiced for wild elk. Commenters stated that the no-action alternative should reflect the "Modified Preferred Alternative" from the 2000 IBMP EIS and include a population range not to exceed 3,000 bison. Lastly, commenters stated that the no-action alternative is a substantial deviation from the 2000 IBMP Record of Decision (ROD), the National Park Service (NPS) does not have the discretion to dismiss the "Modified Preferred Alternative from the 2000 EIS," and the current no-action alternative is not an accurate baseline because it is not the "Modified Preferred Alternative" from the 2000 EIS.

RESPONSE: Title 40 Section 1502.14(c) of the Code of Federal Regulations (CFR) requires the alternatives analysis in the EIS to "include the no-action alternative." In the case of this plan/EIS, "no action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all, such as ceasing all management of bison, would be unnecessary according to the Council on Environmental Quality (CEQ) (CEQ 40 questions). Therefore, the no-action alternative may be thought of in terms of continuing with the present course of action until that action is changed. Because it is required to be included by the CEQ regulations, the no-action alternative does not need to be reasonable to be carried forward for detailed analysis, and it does not need to meet the purpose and need for action.

As stated in the plan/EIS under the no-action alternative, bison numbers are expected to range between about 3,500 and 5,000 after calving, consistent with the consensus agreement among IBMP members on annual operating plans and therefore consistent with the goals of the IBMP. Alternative 1 is loosely based on management experiences during 2001 to 2011, prior to the IBMP members making adaptive adjustments to emphasize tribal harvest outside the park, when bison summer counts averaged about 3,900 and ranged between 3,000 and 5,000. A late-winter/spring population of 3,000 bison would roughly equate to about 3,500 or more bison after calving depending on the composition and growth rate of the population. Maintaining fewer bison would require aggressive removals of bison migrating to the boundary of YNP, as well as in the interior of the park. These actions could decrease genetic diversity and skew the age and sex composition of the population (White et al. 2011; Halbert et al. 2012; Pérez-Figueroa et al. 2012). Low numbers of bison also could reduce the long-term viability of the population and raise concerns related to their consideration for listing under the Endangered Species Act (ESA). Low numbers could diminish the ecological role of bison at engineering habitats, redistributing nutrients, altering plant growth patterns, improving biodiversity, and providing meat for predators, scavengers, and decomposers. Low numbers of bison would eliminate most hunting opportunities in nearby areas of Montana due to a lack of migration outside the park. Such actions are not necessary given 20 years of

experience managing bison at higher numbers with no brucellosis transmission from bison to cattle and fewer property and safety conflicts.

The management of 5,000 bison has not proven to reduce forage for other grazing animals such as elk, deer, moose, and antelope. The amount of aboveground herbaceous plant material produced annually within YNP averages 425 million pounds (Geremia and Hamilton 2019). A bison population of 5,000 animals would likely consume about 15% of total herbaceous plant material, leaving the rest available for other grazing animals. Such use is less than levels considered as benchmarks for sustainable livestock grazing on federal lands that leave sufficient forage for native herbivores and conserve long-term health and ecological integrity.

The NPS discusses the 2000 IBMP Modified Preferred Alternative in the plan/EIS as an alternative considered but dismissed. As noted in the plan/EIS, the IBMP was never completely implemented and therefore is not an accurate representation of current management nor the baseline.

Alternative 2

CONCERN STATEMENT 2: Commenters expressed conflicting opinions on what the target population numbers should be for Alternative 2. While some commenters expressed support for the proposed range, others stated that the target population should be higher at around 7,000 to 8,000, with some requesting bison be managed with an upper population range around 100,000. Commenters stated that Alternatives 2 and 3 should be combined. In contrast, commenters stated their preference for a lower maximum population to prevent overgrazing of the landscape and a more dynamic population control program, while other commenters stated that the lower population target requested by the State of Montana (Montana or the state) (3,000 bison) does not consider the long-term social and political implications of managing so few bison on the landscape compared to the current population numbers.

RESPONSE: The NPS added language to the final plan/EIS in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section of chapter 2 regarding managing more than 7,000 bison after calving in YNP. As indicated in the Notice of Intent (NOI) to prepare the draft plan/EIS, the NPS did consider alternatives with as many as 10,000 bison. Biologists estimated the carrying capacity for bison in YNP at about 10,000 bison during summer and 6,500 during winter (Coughenour 2005; Plumb et al. 2009; Geremia and Hamilton 2019). As indicated in chapter 2, in the "Actions Common to All Alternatives" section, the upper population estimates provided for each alternative are intended to guide the implementation of risk management activities, not as targets necessitating immediate population adjustment. Bison abundance may exceed the upper estimate in each range at times due to a series of mild winters that limit migration and removals or because new research or successful management based on the demographic, genetic, ecological, and social objectives indicate bison can be sustained at a higher population level and the impacts disclosed in the plan/EIS are substantially the same.

With 4,400 to 5,900 bison in the population since 2013, numbers of animals moving north of Mammoth Hot Springs in the park averaged 1,389 animals per winter, with up to 1,000 animals outside the park at one time. Montana defines tolerance limits for bison outside the park and have informally indicated that several hundred animals could be tolerated outside the northern boundary in the state's 2015 decision to expand tolerance areas. An alternative including more than 7,000 bison after calving is infeasible because numbers of animals outside the park during some winters would far exceed tolerance limits defined by the state. Lastly, there is not sufficient forage for 100,000 bison in YNP and nearby areas of Montana.

Alternatives are distinguished based on differences to their approach to resolving the purpose and need for action and the environmental impacts of implementing the alternative. Alternatives 2 and 3 present different approaches for the management of bison within YNP, including differences in environmental impacts resulting from the actions. For this reason, the NPS did not consider combining these two

alternatives. When selecting an action for implementation in the ROD, the decision-maker may select one alternative, or elements from the range of alternatives for implementation.

The plan/EIS includes a discussion on managing for a target of 3,000 bison or fewer in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section of chapter 2.

CONCERN STATEMENT 3: Commenters stated that the NPS singles out Alternative 2 as the option that would "prioritize" the NPS's trust responsibilities to the American Indian Tribes, and instead requested all alternatives prioritize trust and treaty responsibilities as required by treaty, federal statute, regulations, executive orders, and agency policy.

RESPONSE: The NPS revised the plan/EIS to indicate that all alternatives will continue to honor and support American Indian rights reserved through treaties and establish collaborative partnerships with American Indian Tribes for bison management, as described in the "Actions Common to All Alternatives" section in chapter 2. The "Trust Resources" section in appendix C similarly indicates "[t]he NPS will honor its legal responsibilities to these American Indian Tribes as required by the US Constitution, treaties, statutes, and court decisions."

Alternative 3

CONCERN STATEMENT 4: Commenters had varying views on what a population limit should be under Alternative 3. Commenters requested that an upper population limit for bison be eliminated from the range of alternatives. Some stated that the upper range of the population should be increased as studies have shown the park is able to support up to 10,000 bison in the summer and 6,500 bison in the winter. Others recommended carrying capacity should be based on the range available to bison, as adjusted, and no fixed numerical targets set for the population. Commenters stated that the Alternative 3 presented in the NOI is different from the Alternative 3 presented in the draft plan/EIS. The commenter specifically requested the NPS explain why the upper range of bison under Alternative 3 was reduced from 8,000 bison to 7,000. This commenter stated that managing for 8,000 or more bison would increase tribal treating hunting opportunities outside the park and allow the NPS to transfer more live bison through the Bison Conservation Transfer Program (BCTP). Commenters requested the NPS explain the scientific rationale for the upper ranges presented in the plan/EIS. One commenter requested a population target of 4,000 to at least 7,000 animals after calving.

RESPONSE: Managing bison like elk, with no upper range is discussed in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section of chapter 2. As indicated in the plan/EIS, bison need similar access to habitat that other wildlife species, such as elk, are given in the YNP area, including year-round access to national forests and other public lands. When bison leave the park, their management becomes the jurisdiction of the state. The State defines tolerance limits for bison outside the park and has informally indicated that several hundred animals could be tolerated in more than 400,000 acres outside the park boundary in its 2015 decision to expand tolerance areas. In that decision, the State defined abundance limits of several hundred bison in areas adjacent to the western boundary of YNP. Since then, the State informally clarified that several hundred animals could be tolerated outside the northern boundary of YNP. Such constraints make managing bison without an upper limit infeasible.

See the response to Concern Statement 3 for further discussion on the various ranges over 7,000 bison considered, as well as what occurred in the park with 4,400 to 5,900 bison. A late-winter/spring population of 3,000 bison would roughly equate to about 3,500 or more bison after calving depending on the composition and growth rate of the population. The population range for each alternative in the plan/EIS includes a lower bound of 3,500 bison after calving. Allelic diversity, or the number of different genes, is important to protect adaptive potential of a species. Yellowstone bison should retain about 95% of existing allelic diversity for neutral nuclear microsatellites for the next 200 years with a population size

greater than 3,250 animals and removal of mainly or only juveniles (Pérez-Figueroa et al. 2012). Greater genetic loss could occur if intermixing and gene flow ceases between the two primary breeding herds, but current analysis supports significant gene flow presently (Stroupe et al. submitted). The NPS decided on a minimum population size for each alternative consistent with numbers needed to maintain existing genetic diversity and allow some migration to park boundaries to support the NPS's trust responsibilities to American Indian Tribes by using the BCTP and treaty hunting outside the park.

CONCERN STATEMENT 5: Commenters stated that allowing population sizes to range up to 7,000 would put pressure on the park's natural resources and increase the threat to cattle, public safety, and private property outside the park. A commenter stated that forage availability, weather, and environmental conditions force bison out of the park, leading to a greater likelihood of lethal bison removal and herd pressure that would push bison farther into tolerance zones. Commenters stated that the NPS is treating tolerance zones as additional forage zones for bison, which is not accurate. Commenters stated that tolerance zones are animal health boundary zone and building these zones into a management plan as forage access jeopardizes the efficacy of the IBMP and years of collaboration brought to the table by IBMP members.

RESPONSE: Numbers of bison migrating from the park during winter increase with bison population abundance and winter severity, as indicated in the plan/EIS. However, a direct relationship does not exist among bison population abundance and conflicts outside the park. During the last decade (2014–2023), YNP and IBMP partners successfully managed bison moving outside the park with a population averaging around 4,800, after calving, and varying from about 4,600 to 5,900 animals. Property damage and private-land complaints remained low despite higher numbers of bison. Also, YNP and IBMP partners prevented all transmission of brucellosis from bison to livestock outside the park. Higher numbers of bison supported increased hunting opportunity outside YNP.

The Montana 2015 Year-Round Tolerance Decision identifies "allowing presence of bison year-round in Montana on the perimeter of YNP. This modification is appropriate because of several changes in the science and factual circumstances underlying the original IBMP decision that was finalized in the year 2000" including: cattle no longer occur on Horse Butte, several US Forest Service (USFS) grazing allotments were closed, federal rules governing responses to brucellosis infection in cattle changed, new research indicated negligible risk of brucellosis transmission from bull bison to cattle, new research on brucellosis persistence relative to cattle turnout dates indicated reduced risk, and recognition that elk play a substantial role in brucellosis infection of livestock. The State decision was intended to "provide the potential for greater hunting opportunities and the use of hunting as a tool for bison population management" and "maintain a wild, free-ranging population by providing year-round habitat north and west of YNP" among other objectives. The State decision indicated "an approach that includes hazing, seasonal tolerance zones, and when necessary lethal removal, blended with treaty tribal and state-regulated hunting to limit numbers and address social conflicts."

Regarding commenter concerns that tolerance zones are used as additional forage for Yellowstone bison, forage-based estimates of carrying capacity for bison within the park range from 6,500 in winter to 10,000 in summer (Coughenour 2005; Plumb et al. 2009; Geremia and Hamilton 2019). Estimates do not account for additional forage provided by areas outside the park and the NPS did not use these tolerance zones as "forage access" zones in the plan/EIS.

CONCERN STATEMENT 6: A commenter stated that the immediate end of shipment to slaughter under Alternative 3 is not realistic and needs to remain as a tool for managing population objectives because natural selection only accounts for 8% to 10% loss each year. A commenter stated that the plan/EIS should include a clear explanation of the criteria the NPS will use to determine whether reinstituting shipment to slaughter is necessary. Further, one commenter stated that prior to reinstituting shipment to slaughter, the NPS must first consult with American Indian Tribes with treaty-reserved rights to hunt bison near YNP. One commenter requested that the NPS explain what "threaten the efficacy of

management efforts to keep them within existing management areas" means in the plan/EIS. Other commenters requested that the NPS end shipment to slaughter under all circumstances. Lastly, commenters requested that any transfer of bison be done in the summer to prevent injury to bison.

RESPONSE: Under all alternatives, the NPS would prioritize sending brucellosis-positive bison to American Indian Tribes and tribal organizations for lethal processing. Once processed, bison meat, hides and other resources would be distributed to tribal members. This would aid in reducing the prevalence of brucellosis in Yellowstone bison and honor and support American Indian Tribes. The NPS revised chapter 2 of the final plan/EIS to better articulate the use of this tool.

Under Alternatives 2 and 3, the NPS considered the reduction of this tool. However, the NPS would retain full flexibility of transfer for processing as a removal method. Impacts from this tool are analyzed in chapter 3 of the plan/EIS. Regarding the desire to have the NPS consult with American Indian Tribes, chapter 2 of the plan/EIS contains the statement, "the Secretary of the Interior and responsible NPS managers will continue to collaborate with American Indian Tribes and tribal organizations but must retain final reviewing and decision-making authorities about bison management and the transfer of "surplus" Yellowstone bison."

Regarding criteria for reinstating transfer for processing, as indicated in the plan/EIS, the risk of brucellosis spreading from bison to cattle might increase as more bison migrate outside the park and potentially mingle with cattle if they surpass the ability of staff and management efforts to keep them in the existing management areas designated by the state. The movements of thousands of bison into Montana could require more and intense hazing to maintain separation between bison and cattle and protect people and property, which would stress the bison and could surpass the capabilities (staffing) and resources of managers to prevent mingling. More bison management activities, such as moving bison off private property or preventing bison from coming in direct contact with cattle, may occur and the number of calls for assistance may surpass the abilities of federal and state staff to respond promptly. The NPS may reinstitute shipments for processing in these instances.

The NPS revised chapter 2 of the final plan/EIS to address ending the transfer of bison for processing under all circumstances in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section. The draft plan/EIS did not specify the timing of transferring animals to processing. The following text was added to chapter 2 of the final plan/EIS: "The NPS aims to complete shipments for processing by the end of March to prevent sending females late in gestation for processing. Non-pregnant bison could be held later into spring based on processing facility availability. Transfer for processing is stressful to wild animals regardless of the time of year. NPS personnel are trained in low-stress-bison-handling to use best practices to humanely move wild bison into livestock handling facilities and onto trailers. The NPS encourages American Indian Tribes to use processing facilities proximal to the park to reduce transport times. The NPS also only works with American Indian Tribes to transport small numbers of animals to processing facilities such that all animals are killed on the day of shipment."

CONCERN STATEMENT 7: One commenter requested the NPS explain why 1,000 bison or more may need to be removed each winter from YNP. This commenter requested the NPS explain how suppressing the population when it reaches the upper range is considered "minimal intervention."

RESPONSE: Bison are prolific, with high survival of calves compared to other ungulates in YNP and lower rates of predation due to their large body size and group defensive tactics. As a result, bison numbers can increase quickly when conditions are favorable. The bison population is expected to grow at a rate of 10% to 15% annually under all alternatives considered.

Each alternative specifies an upper limit (5,000 for Alternative 1, 6,000 for Alternative 2, and 7,000 for Alternative 3). As indicated in chapter 2 under "Actions Common to All Alternatives," the upper population estimates provided for each alternative are intended to guide the implementation of risk management activities; not as targets necessitating immediate population adjustment. When the

population approaches or exceeds these guidelines, it is likely that 1,000 animals or more would have to be removed to return the population to lower numbers given the 10% to 15% annual growth.

While removal as discussed in the plan/EIS is a possibility, the "Actions Common to All Alternatives" section of chapter 2 indicates "[t]o the extent feasible, the NPS would manage bison with minimal intervention in the interior of YNP, so bison continue to provide a key food source for species ranging from wolves to magpies to beetles and bacteria in the soil that redistribute nutrients across the landscape (emphasis added)." The "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section of the plan/EIS states, "the 2000 ROD for the IBMP allowed the capture of bison attempting to leave the northern portion of YNP in the Stephens Creek Administrative Area for brucellosis testing and vaccination. However, the NPS concluded the repeated herding of bison into corrals in the interior of YNP for testing and transfer for processing would detract from the wild free-ranging qualities of the bison population and could have a major adverse impact on the distribution of bison (USDOI and USDA 2000a)." Under all alternatives, it may be necessary for the NPS to implement tools that contribute to a reduction in bison numbers to align with population goals presented in this plan/EIS, potential bison conflicts in Montana, and potential resource degradation in the park.

CONCERN STATEMENT 8: Commenters raised questions as to if there are sufficient hunters and meat processors to handle a bison harvest larger than what is currently occurring and noted having these commitments would be necessary for management under any alternative.

RESPONSE: Based on evidence supported by the last 20 years of bison management under the IBMP, the NPS believes it is reasonably foreseeable to assume that there will be a sufficient number of both public and tribal treaty hunters and a sufficient number of available meat processors to implement the alternatives.

CONCERN STATEMENT 9: One commenter stated that a reliance on tribal treaty hunting outside the park to regulate bison population numbers may not be feasible under Alternative 3. This commenter stated that climate change may result in less harsh winters resulting in less predictable migrations of bison from the park, which would result in fewer opportunities for tribal treaty hunting to regulate bison population numbers.

RESPONSE: The commenter is correct that climate change may cause less predictability of bison migration out of the park. The stated desire to maximize the use of harvest and hunting outside the park as a population management tool in Alternative 3 does not preclude the use of capture and transfer for processing, and scenarios are discussed in the plan/EIS. The NPS retains the tool of capture and transfer for processing in all alternatives to regulate bison numbers and would collaborate with American Indian Tribes and partners on actions that are appropriate for the particular winter season, migration level, and level of hunter presence and harvest success. All alternatives encompass population ranges that data demonstrate are conducive to some level of migration.

Actions Common to All Alternatives, Other New Alternatives, or Alternative Elements

CONCERN STATEMENT 10: One commenter stated that the range of alternatives in the draft plan/EIS assumes that tolerance zones outside the park would remain unchanged and noted the state has indicated that tolerance zones outside the park could decrease.

RESPONSE: The plan/EIS presents three alternatives for managing bison within the park. Each alternative necessarily considers external actions that could affect management efforts inside the park, while acknowledging the NPS does not have jurisdiction or control over actions beyond the park boundary. The plan/EIS indicates "descriptions of external actions are not an endorsement or commitment from partners." To analyze impacts from each alternative, the NPS used the existing condition and no-action alternative, whereby bison are allowed to migrate from YNP during winter and spring into management (tolerance) areas in Montana adjacent to the northern and western boundaries of YNP. The

plan/EIS acknowledges that "given existing political and social constraints, however, it is unlikely these management areas will be increased substantially if bison numbers continue to increase." The NPS revised the final plan/EIS to include a statement that, "there remains a possibility that management areas may decrease which may necessitate additional management measures taken by the NPS."

The state can re-examine its tolerance for bison. In a January 11, 2016, letter to the IBMP agencies, Governor Bullock indicated his decision to allow more tolerance for bison in parts of the Hebgen and Gardiner Basins was based on several fundamental changes in circumstances. Cattle were no longer on Horse Butte and there were no active cattle allotments on public lands in portions of the Hebgen Basin currently used by bison. In addition, modifications of federal rules reduced the economic consequences to livestock producers of a brucellosis infection. Research indicated a negligible risk of brucellosis transmission from bull bison to cattle and decreased risk of brucellosis persistence related to cattle turnout dates. Moreover, elk were now recognized as the primary transmission route of brucellosis infection to livestock. The Governor indicated "we've been successful at managing Yellowstone Bison and preventing brucellosis from being transmitted by bison to cows. The risk of brucellosis transmission from bison to cattle can be successfully mitigated through focused management. Accordingly, we're adjusting how we manage bison." In the associated 2015 Decision Notice, the state indicated "[t]he ability to maintain temporal and spatial separation between bison and cattle operations remains a key conditional element and has already been successfully demonstrated to protect cattle operations." All these circumstances remain similar, with no transmission of brucellosis to cattle attributed to bison. For these reasons, the NPS did not address impacts resulting from a decrease in tolerance zones outside the park as this is not reasonably foreseeable, as defined by the National Environmental Policy Act (NEPA).

CONCERN STATEMENT 11: One commenter stated that the draft plan/EIS fails to analyze a reasonable range of alternatives because it failed to analyze one alternative in which it stops participating in the IBMP. Commenters further stated that the IBMP is no longer a relevant document as it is focused on the separation of bison and cattle due to brucellosis. The commenters asked for the NPS to clarify if the IBMP or this plan/EIS will be the controlling management plan for bison in the park. Commenters further expressed concern with the IBMP in that it delegates power to outside parties, which risks blurring "lines of accountability" and risks "undermining an important democratic check on government decision-making." Additionally, commenters stated that the IBMP partnership agreements predetermine an outcome for NPS actions and that operating plans must be accompanied by a decision document.

RESPONSE: The federal and state ROD in December 2000 for the IBMP signed by the Secretaries of Agriculture and Interior, and the Governor of Montana were the result of extensive deliberation and legal proceedings that yielded an unprecedented agreement among federal and state agencies for the management of bison. Since 2000, the NPS has successfully participated as an IBMP partner to cooperatively manage bison in and around the park. Various IBMP members conduct bison management activities. However, each agency, American Indian Tribe, or tribal organization does not provide support for every management operation. The level of participation and support by personnel in bison management actions as set forth in the IBMP remains subject to each IBMP member's supervision, jurisdiction, specific authority, and administrative oversight. The NPS will continue to exercise sole decision-making authority over actions within YNP and has not delegated this authority to any other entity. Working collaboratively with other agencies does not increase or decrease the NPS' responsibilities or authorities. Additionally, ceasing participation in the IBMP would not meet the purpose of the plan/EIS, as it would not allow the NPS to "continue to work with partners" to address the management of bison in and around YNP.

The NPS initiated a new plan/EIS process to prepare a bison management plan to address NPS management actions within the park boundary that will incorporate new information and changed circumstances since the 2000 IBMP plan was approved. Once a ROD is signed selecting a set of actions for implementation, the NPS will manage bison inside the park under this new framework. The new ROD will determine and update NPS actions only. The NPS will continue to coordinate with IBMP partners

within the IBMP framework to collectively and adaptively manage bison. The new ROD will not direct actions of other IBMP partners. NPS actions outlined in IBMP annual operating plans will be consistent with the selected action in the ROD and will not require a new NEPA decision document.

CONCERN STATEMENT 12: Commenters stated that there is no cost data provided in the plan/EIS despite a number of management approaches being rejected due to their cost. Commenters stated that without a discussion of current costs of bison management, it is not possible to determine whether such actions are affordable. Commenters requested that the planning process disclose the cost to taxpayers and cost effectiveness in the analysis.

RESPONSE: Implementation of any of the alternatives carried forward for detailed analysis would not require any new facilities as part of the implementation. Therefore, costs associated with implementation of all the alternatives would be limited to the ongoing management of the Stephens Creek Administrative Area, staffing, research, monitoring, and the use of transfer for processing. Existing funding and staffing resources from the NPS would be used with all the alternatives to accomplish the required actions necessary for the continued management of bison at YNP. Therefore, the difference in costs of alternatives would be negligible. In addition, there is no requirement in law, regulation, or policy for the NPS to disclose costs of alternatives in an EIS.

CONCERN STATEMENT 13: Commenters shared varying perspectives on management of target population numbers and genetic viability of the herds, with some suggestions focused on the central herd. Commenters asserted the existence of two genetically distinct subpopulations of bison in the park and highlighted the risk of unknowingly, disproportionately culling bison of one subpopulation. Commenters emphasized the importance of protecting the genetic viability and diversity of Yellowstone bison and suggested providing for a minimum of 2,000 to 3,000 bison per herd. One commenter questioned the consideration of the Yellowstone bison as their own distinct population segment.

RESPONSE: During the population bottleneck of the late 19th century, the Yellowstone bison population narrowly avoided extinction, with an estimated 23 individuals remaining in 1902. To preserve this population, additional bison were brought in from private ranches. Eighteen females from the Pablo-Allard herd in Montana, three males from the Goodnight herd in Texas, and four calves from the indigenous herd were used to establish a secondary "introduced" population. The introduced herd was moved to the Lamar Valley in 1907 and closely day herded or corralled through at least 1915. Meanwhile the indigenous herd was isolated, wintering in the Pelican Valley and summering in the high-elevation grasslands of the Upper Lamar River. It is likely the bison formed a single "northern herd" by the 1930s summering together and separating into two wintering units called the "Lamar" and "Pelican" bison (Meagher 1973). In 1936, managers relocated 71 bison from the Lamar bison to the Firehole and Hayden Valleys. The animals formed the "Mary Mountain Bison" or "central herd." Population reductions and subsequent recovery likely kept the northern and central herds separated through the 1970s. Movements between the herds were believed to increase through the 1980s when northern herd animals wintering in the Pelican Valley began moving to the Hayden Valley and integrating into the central herd (Meagher 1993, 1998). By the 1990s, animals from the central herd began moving to wintering areas of the northern herd (Meagher, 1989, 1993, 1998). Today, all Yellowstone bison roam relatively freely within YNP.

Nuclear microsatellite-based population level assessment revealed two genetically distinct bison subpopulations during 1997–2003 (Halbert et al. 2012). After this study, there was evidence of females switching between breeding areas in northern and central YNP, suggesting the population structure may be breaking down (White and Wallen 2012). In 2016, an analysis of mitochondrial haplotypes showed the two founding maternal lineages were distributed throughout the park (Forgacs et al. 2016). Finally, during 2019-2021, nuclear microsatellite-based reassessment and initial Single Nucleotide Polymorphism (Stroupe and Derr, submitted) level assessment revealed that Yellowstone bison no longer exhibited population substructure (Stroupe et al. submitted). Instead, Yellowstone bison is best described as one interbreeding population with two primary breeding herds. Differences in allelic frequencies between

northern and central herd bison were not detected, although not all alleles were found in each herd. Samples collected from park boundaries did not support that management actions removed bison disproportionately to their occurrence based on genetic markers measured (Stroupe et al. submitted).

Allelic diversity, or the number of different genes is important to protect adaptive potential of a species. Yellowstone bison should retain about 95% of existing allelic diversity for neutral nuclear microsatellites for the next 200 years with a population size greater than 3,250 animals and removal of mainly or only juveniles (Pérez-Figueroa et al. 2012). Greater genetic loss could occur if intermixing and gene flow ceases between the two primary breeding herds, but current analysis supports significant gene flow presently (Stroupe et al., submitted). Chapter 2 of the plan/EIS was updated to add further information regarding the current status of genetic diversity between the Yellowstone herds.

The NPS does not have the authority to consider Yellowstone bison as a distinct population segment. That authority is held by the US Fish and Wildlife Service (FWS). More information on that process is provided under Concern Statement 54.

CONCERN STATEMENT 14: A commenter requested the NPS analyze an alternative of building a Yellowstone bison overpass over Highway 191 and 89 to help bison migrate and decrease the number of bison killed on highways.

RESPONSE: Bison mortality from vehicular accidents does occur. However, few bison are killed by vehicles each year in YNP. The park estimates 10 to 12 bison mortalities annually resulting from vehicles. This does not noticeably affect population level numbers. Roadways in the park do not generally impact bison's ability to migrate, and in the winter, bison use roadways as travel corridors because some park roads are groomed. Building overpasses over park roads would not increase bison migration, nor would it decrease bison mortality from vehicular accidents in a meaningful way. Additionally, building overpasses would likely result in other environmental impacts such as impacts to vegetation, the viewshed, visitor use and experience, and other wildlife. This alternative element would cause additional environmental impacts without contributing meaningfully to the purpose of the plan to promote actions that preserve an ecologically sustainable population of wild, migratory bison. Due to lack of jurisdiction to build overpasses outside the park, and lack of need to address potential impacts of bison-vehicle collisions, as discussed above, building overpasses on Highway 191 in the northwest portion of the park, or on any park road for the purposes of increasing bison migration and decreasing the number of bison killed on highways was not carried forward as an alternative or alternative element for detailed analysis.

CONCERN STATEMENT 15: Commenters suggested alternatives to current culling practices, such as transferring bison to other public lands, zoos, museums, and sanctuaries. Commenters also suggested introducing a wolf population to the park to reduce bison population numbers.

RESPONSE: The draft plan/EIS states "all bison completing quarantine in YNP would continue to be sent to the Fort Peck Tribes until other tribal facilities become available." The following text was updated in the final plan/EIS: "All bison released from quarantine or assurance testing in YNP would continue to be given to American Indian Tribes. This would be in support of Secretarial Order 3410, *Restoration of American Bison and the Prairie Grassland*, which directs the NPS to increase the number of live bison transferred from YNP to American Indian Tribes. Currently, American Indian Tribes have capacity for receiving all bison entered in the quarantine program. Managers of other private, state, and federal lands could coordinate with American Indian Tribes to receive some bison completing assurance testing."

As stated in the plan/EIS, in 2018 the NPS completed a NEPA process for the use of quarantine to identify brucellosis-free Yellowstone bison for relocation elsewhere, also referred to as the BCTP (2018 Quarantine Environmental Assessment) (USDOI, NPS 2018). This plan/EIS proposes no changes to the selected action in the 2018 Quarantine EA. The NPS would continue the quarantine program for Yellowstone bison using facilities in and adjacent to the Stephens Creek Administrative Area in YNP, north of the park in Corwin Springs, Montana (leased by the US Department of Agriculture [USDA]

Animal and Plant Health Inspection Service [APHIS]), and at the Fort Peck Indian Reservation (USDOI, NPS 2018). The plan/EIS states that the NPS could collaborate with interested partners to establish additional quarantine facilities outside the park and transfer bison to them each year as the capacity of these facilities and bison migrations allow. This could allow additional capacity for the live transfer of bison to other entities. The IBMP members would need to evaluate the design, cost, and potential locations for quarantine facilities outside the park within the designated surveillance area (DSA) for brucellosis. This evaluation would include the development of a management plan for transplanting Yellowstone bison onto suitable private or public lands (section 5 of §87-1-216 MCA), environmental compliance assessments, a cost-sharing agreement for building and maintaining the facilities, and an agreement for operating the facilities and conducting quarantine testing and terminal pasture operations. This information is included in the "Actions Common to All Alternatives" section of chapter 2.

As noted in the plan/EIS, wolves were reintroduced to YNP between 1995 and 1997, and numbers increased to 174 wolves in as many as 16 packs over the next decade but have since stabilized between 80 and 123 wolves in 7 to 10 packs (Smith et al. 2020). There were 108 wolves in 10 packs in the park during December 2022, including 7 breeding pairs. Several packs used portions of the bison management area in and outside northern YNP during 2022 and 2023, especially during winter and spring when many hundreds of ungulates spent winter in the Gardiner Basin and surrounding foothills. Wolves typically hunt in packs during winter and travel long distances through relatively flat grasslands close to rivers and streams. Wolves kill more bison (primarily calves) during spring (10%) but scavenge on bison carcasses frequently through the winter (Metz et al. 2020a,b; Stahler et al. 2020). Wolves exist in YNP and do reduce the bison population to a small degree. For this reason, the NPS did not revise the final plan/EIS to include introducing a wolf population to the park as an alternative element.

CONCERN STATEMENT 16: Commenters requested information be added to the plan/EIS on the methods of monitoring bison and other animal populations. The commenter requested additional information on flights used for monitoring, including how often and where. The commenter requested the NPS disclose the level of accuracy for monitoring bison.

RESPONSE: As requested, additional information has been added to the final plan/EIS regarding methods and accuracy of monitoring. Chapter 2 of the plan/EIS was updated under "Actions Common to All Alternatives, Population Abundance" to reflect these changes.

CONCERN STATEMENT 17: Commenters requested the NPS provide annual status reviews of bison management to the public.

RESPONSE: The NPS addresses operations plans under the "Actions Common to All Alternatives" section in chapter 2. The NPS revised the final plan/EIS in this section to indicate such reports would be made publicly available.

Alternatives Considered but Dismissed

CONCERN STATEMENT 18: One commenter stated that the draft plan/EIS fails to consider all brucellosis testing mechanisms and available vaccines for bison and cattle. For testing, the commenter noted that the NPS failed to consider the use of loop-mediated isothermal amplification and real-time polymerase chain reaction testing to identify brucellosis. The commenter also noted that the draft plan/EIS fails to analyze remote vaccines, like the use of B. Abortus 519 vaccine, although earlier NPS analysis had referenced it, nor does it consider the new DNA vaccines or multivalent fusion DNA vaccines. The commenter requested the NPS consider engineered live-attenuated vaccines based on deletions in virulence genes, viral or bacterial vector-based Brucella vaccines, subunit vaccines, DNA vaccines, Nanoparticle-based vaccines, and research into mRNA vaccines.

RESPONSE: Vaccination of bison is an alternative considered but dismissed by the NPS (see chapter 2, "Vaccination of Bison," in the plan/EIS) because it is technically infeasible as described in the document.

The NPS would provide some bison for brucellosis research (see "Actions Common to All Alternatives" in chapter 2). But any brucellosis suppression technique, including vaccination, would not be implemented within the park until "proven effective without significant adverse effects, additional NEPA compliance is conducted, and tools become available to eliminate brucellosis in elk."

CONCERN STATEMENT 19: Commenters requested the NPS analyze the effectiveness of vaccinating cattle to prevent Yellowstone bison from spreading the disease to cattle, as well as consider alternative methods for developing cattle vaccines. Additionally, the commenter requested the NPS analyze transmission rates of brucellosis from bison to cattle under each alternative. Lastly, this commenter stated that Olsen 2013 is incorrectly cited in the draft plan/EIS.

RESPONSE: In chapter 2 of the draft plan/EIS ("Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis"), the NPS briefly discusses available vaccines which could provide cattle with some protection against infection and abortion. The vaccination of cattle against brucellosis, including available vaccines, is managed by APHIS and the state in coordination with the herd owner and does not involve the NPS. The NPS did not analyze the effectiveness of vaccinating cattle against brucellosis or new vaccines for cattle as this is beyond the scope of this NEPA analysis and would not meet the purpose and need for action.

As stated in the plan/EIS, no transmissions of brucellosis to cattle have been directly attributed to bison. For this reason, an analysis of transmissions rates of brucellosis from bison to cattle across the alternatives would not produce a meaningful analysis and is not necessary to make a reasoned choice between alternatives.

The NPS revised chapter 2 of the final plan/EIS to remove the following citation:

Olsen S. C. 2013. Recent developments in livestock and wildlife brucellosis vaccination. *Revue Scientifique et Technique Office International des Epizooties* 32:207-217.

The NPS revised chapter 2 of the final plan/EIS to include the following citations:

Olsen, S. C., S. M. Boyle, G. G. Schurig, and N. N. Sriranganathan. 2009. Immune responses and protection against experimental challenge after vaccination of bison with Brucella abortus strain RB51 or RB51 overexpressing superoxide dismutase and glycosyltransferase genes. *Clinical and Vaccine Immunology* 16(4), pp.535-540.

Olsen, S. C. and C. S. Johnson. 2012. Efficacy of dart or booster vaccination with strain RB51 in protecting bison against experimental Brucella abortus challenge. *Clinical and Vaccine Immunology* 19(6), pp.886-890.

Olsen, S. C., J. L. McGill, R. E. Sacco, and S. G. Hennager. 2015. Immune responses of bison and efficacy after booster vaccination with Brucella abortus strain RB51. *Clinical and Vaccine Immunology* 22(4), pp.440-447.

CONCERN STATEMENT 20: One commenter suggested managing bison more like livestock by supplementing bison diets with hay and controlling herd numbers using pastures to avoid large herd sizes and bison migration outside of the park. One commenter suggested a separate, pastured bison population can be developed within the park to provide bison meat to tribal organizations. Commenters stated that bison are managed like livestock, rather than being managed like elk. They further stated that the draft plan/EIS fails to fully consider managing wild buffalo like wild elk.

RESPONSE: The NPS considered and dismissed an alternative that would erect physical barriers and another that would supply food to keep bison within YNP. The NPS considered and dismissed an alternative that would capture bison in the interior of the park, and alternative elements that would allow administrative shooting and hunting within YNP. Lastly, the NPS considered and dismissed an alternative that would manage wild bison like wild elk. This information is included in the "Alternatives and

Alternative Elements Considered but Dismissed from Detailed Analysis" section in chapter 2 of the plan/EIS.

CONCERN STATEMENT 21: One commenter stated that the dismissal of restoring bison to the Great Plains was not detailed enough. The commenter suggested that returning bison to the Great Plains would be the ecologically most rational way for the NPS to immediately reduce bison numbers and ensure the long-term genetic diversity of the existing herd is maintained and that this alternative should be carried forward for detailed analysis.

RESPONSE: As the commenter stated, the NPS dismissed an alternative that would restore bison to the Great Plains as this is beyond the scope of this NEPA review and is outside the agency's jurisdiction. While the large-scale restoration of plains bison in North America is beyond the scope of this NEPA review, the alternatives under consideration in this plan/EIS include providing live, brucellosis-free bison from the Yellowstone lineages for restoration efforts on tribal and public lands.

The following was added to the final plan/EIS under the dismissal of this alternative element: "This would be in support of Secretarial Order 3410 that directs the NPS to increase the number of live bison transferred from Yellowstone National Park to American Indian Tribes. Currently, American Indian Tribes have capacity for receiving all bison entered in the BCTP. Managers of other private, state, and federal lands could coordinate with American Indian Tribes to receive some bison completing assurance testing." The increased transfer of Yellowstone bison to American Indian Tribes under Alternatives 2 and 3 would aid in the restoration of bison to the Great Plains. Lastly, the commenter did not provide additional information for the NPS to consider or add to the final plan/EIS.

CONCERN STATEMENT 22: One commenter stated that the draft plan/EIS does not analyze the full range of reasonable alternatives pursuant to CEQ regulations. As an example, the commenters noted that the draft EIS dismisses the alternative, "Manage for a Target of 3,000 or Fewer Bison," despite the alternative's use on eight other national park system units and that bison existed at numbers lower historically. One commenter stated that one of the reasons for dismissing the alternative was lowered genetic diversity; however, a genetics study by Dr. Philip Hedrick found that Yellowstone bison will retain adequate genetic diversity for hundreds of years if the population number is 3,000 to 3,500 animals. The commenter requested the NPS carry forward the dismissed alternative as a full alternative because it is consistent with NPS law and policy and has proven successful in eight other NPS units that have adopted it.

RESPONSE: The NPS revised the final plan/EIS in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section in chapter 2 to address concerns related to genetics with managing for a target of 3,000 or fewer bison. The NPS did not carry forward this alternative element for the reasons detailed in the plan/EIS. Bison management in each NPS unit is based on differing area-specific conditions, including environmental and socio-political conditions, and management goals. As a result, how the NPS manages bison in these other units is not relevant to how the NPS manages bison at YNP and were not considered in designing the alternatives.

CONCERN STATEMENT 23: One commenter noted that the draft plan/EIS dismisses "continuous fencing" and "fortified fencing" as a possible management tool; however, the draft plan/EIS does not address strategic fencing for bison management. The commenter further noted that dismissal of fencing as an alternative because it can "create a ranch or zoo-like atmosphere," "is generally inconsistent with both state and NPS wildlife management principles," and has high costs are subjective statements and are inconsistent with the reality that fencing is used as a management tool in many park systems. Additionally, the commenter noted that no defined costs are presented in the draft plan/EIS; therefore, there is no basis to dismiss fencing due to costs. Lastly, one commenter suggested the NPS evaluate the use of bison-proof exclosures within the park for vegetation restoration.

RESPONSE: In chapter 2 of the plan/EIS in the section "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis," the NPS dismisses erecting physical barriers because it would not meet the purpose and need, would have too great of an environmental impact on bison, and would conflict with general wildlife and NPS *Management Policies*. It does not dismiss this alternative element solely on cost. See Concern Response #12 for information on cost evaluation in the plan/EIS. The NPS has used strategic fencing in the park to reduce impacts to some resources for projects like construction. Additionally, the NPS has used fencing for research purposes. Nothing in the plan/EIS precludes the NPS from using fencing for these purposes. The commenter is requesting the NPS use fencing to exclude bison from some areas, such as riparian zones, where the commenter perceives damage to be occurring as a result from bison. The commenter believes that fencing would restore certain hydrologic functions in the Lamar Valley. The NPS revised the "Vegetation" section in chapter 3 to address impacts to riparian zones, with information specific to the Lamar Valley. Additionally, the NPS considered and dismissed an alternative element in chapter 2 that would manage bison to recover hydrologic function in the Lamar Valley. The NPS is not considering bison-proof exclosures in this NEPA process as this element would not meet the purpose and need of preserving an ecologically sustainable population of wild, migratory bison as this type of exclosure could reduce available grazing habitat and restrict migration of Yellowstone bison.

CONCERN STATEMENT 24: One commenter stated that the draft plan/EIS statement, "federal and state regulations prohibit movement of bison from an area where brucellosis occurs unless the animals have gone through quarantine," has no support in fact or law. Furthermore, the commenter stated that the two Montana statutes cited in the draft plan/EIS (MCA 81-2-120, 87-1-216) do not bind the NPS as they assign duties to the Secretary of Agriculture and therefore do not support the conclusions in the draft plan/EIS related to transport of bison.

RESPONSE: To address this concern, the NPS added the following language to the final plan/EIS in the section "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" in chapter 2: "The NPS would continue to complete quarantine within the park in coordination with APHIS and the state. The entities outline quarantine procedures using a General Agreement." The current agreement states, "all parties will follow the cattle and bison regulations of the National Brucellosis Eradication Program, including Veterinary Services (VS) Memos, VS Notices, VS Guidance Documents, pertinent parts of the CFR, and the UM&R." APHIS, under the Animal Protection Act, retains authority to control brucellosis and ultimately is responsible for adjusting quarantine procedures. VS refers to APHIS Veterinary Services, which is the branch of APHIS concerned with control of diseases that affect livestock. Policies set forth in 43 CFR Part 24 direct agencies to consult with the states and comply with state permit requirements regarding the planned removal of surplus or harmful populations of wildlife and the disposition of these wildlife except in instances where the Secretary of the Interior determines that such compliance would prevent them from carrying out their statutory responsibilities (e.g., 43 CFR. 24.4(i)(5)). Though state laws are not applicable in areas of exclusive federal jurisdiction such as YNP, the NPS routinely consults with the state to coordinate the management of Yellowstone bison and minimize confusion from regulations related to the removal and disposition of culled animals. Additionally, a state Executive Order (16-2011) prohibiting transport of live fish and wildlife in Montana to or from any Department of Interior-managed lands or facilities without prior approval, remains in effect.

CONCERN STATEMENT 25: Commenters suggested the NPS consider several different alternatives for managing bison in the park, including:

- Administrative shooting/sharpshooting
- Creating additional quarantine facilities
- Keeping the bison in the park
- Mass testing and slaughter/release
- Creating a new national park for bison

- Removing cattle from the park
- Removal of bison in areas other than Stephens Creek Administrative Area

RESPONSE: The NPS considered each of these alternative elements, and a description for why they were not carried for detailed analysis is included in chapter 2 of the plan/EIS in the section "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis."

In the draft plan/EIS, the NPS considered and dismissed the capture of bison in the interior of the park. In the draft plan/EIS, the NPS stated that the repeated herding of bison in the interior of the park would detract from the wild, free-ranging qualities of bison, would adversely impact other wild animals, the visitor experience, and recommended wilderness, would require the plowing of roads if done in the winter, and could disturb mother-calf pairs if done in the spring and summer.

The NPS closely reviewed this action and removed this alternative element considered but dismissed. The NPS added information to Adaptive Management section of Alternative 2, stating the limited circumstances under which the NPS would consider this action. Because this action would be ad hoc, and the NPS would not repeatedly herd bison, this action would not detract from the wild, migratory qualities of the bison herd. The NPS would not capture bison in areas of the park with over-snow travel during October to March because it would require plowing roads to facilitate effective operations at various locations and allow for the transportation of bison from the park to quarantine, research, or processing facilities. The NPS developed a long-term regulation for winter recreation during 2013 that rejected plowing roads for wheeled vehicles in favor of an alternative that allows over-snow vehicles on interior park roads (USDOI, NPS 2013). The NPS is uncertain of when, where, or how specifically these capture actions would be taken, and for this reason, the NPS provided a broad analysis of impacts to bison, wildlife, visitor use and experience, and recommended wilderness in the final plan/EIS, noting that additional site-specific tiered analysis would be completed before these actions would be implemented. The NPS would reevaluate this programmatic adaptive management action and its impacts consistent with 40 CFR 1501.11(c).

CONCERN STATEMENT 26: One commenter stated that the 2014 *Final EIS for the Remote Vaccination Program to Reduce the Prevalence of Brucellosis in Yellowstone Bison* (2014 Remote Vaccination EIS) did not find that remote vaccination "would" result in injuries, changes in bison behavior, or negatively affect visitor experience. The commenter stated that the 2014 Remote Vaccination EIS states that remote vaccination alternatives were discarded because of low potential efficacy of the proposed program given the state of vaccine encapsulation and remote delivery technology, and the unknown yet potentially negative behavioral impacts to bison and, in turn, visitor experience (e.g., wildlife viewing).

RESPONSE: The NPS updated the final plan/EIS to reflect the commenter's concern in chapter 2, in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section.

CONCERN STATEMENT 26: One commenter stated that the 2000 IBMP ROD established an overall population objective of 3,000 bison, which should serve as the baseline for the no-action alternative in this plan/EIS. The commenter noted that any increase in the population objective since the 2000 ROD was an operating procedure utilized by the IBMP partners and not an adaptive management adjustment that changed the provisions in the IBMP.

RESPONSE: The State of Montana has not released a decision pursuant to the Montana Environmental Policy Act indicating a goal of maintaining a population ranging from 3,500 to 5,000 bison. However, summer counts of Yellowstone bison reached about 3,800 in 2003 and 4,900 in 2005. In 2006, the IBMP members clarified "a population of 3,000 bison is defined as a population indicator to guide implementation of risk management activities and is not a target for deliberate population adjustment" (http://ibmp.info/adaptivemgmt.php). While the Montana Department of Livestock (MDOL) has since argued this population clarification was only for one year, the NPS is not aware of any documentation

supporting this stance. Other IBMP adaptive management changes have remained in effect until they are replaced by a revision, and this was never done here. During 2008 to 2022, the state (MDOL and the Montana Department of Fish, Wildlife and Parks [MFWP]) signed annual operations plans for bison without dissent, despite knowing the population counts were higher than 3,000 bison. In 2011, the state signed an adaptive management plan that included an objective to recognize tribal treaty rights for hunting bison by allowing bison to occupy National Forest System lands and other areas determined suitable within the designated tolerance area (Zone 2) and maximize timing and geographical extents to increase tribal hunt opportunities. The plan also included objectives and actions to minimize bison processing by increasing the use of state and treaty hunts and implementing quarantine. The IBMP discussions and presentations of these issues clearly indicated larger numbers of bison would be needed to have more consistent migrations to the park boundary to support hunting and quarantine and there has been no brucellosis transmission from bison to cattle. The state has tolerated higher bison numbers for 15 years. Also, scientists recommend maintaining a bison population of over 3,000 to preserve current genetic (Pérez-Figueroa et al. 2012), with management for lower numbers potentially triggering ESA concerns. Thus, an overall population objective of 3,000 bison is inconsistent with historic and current practice. For these reasons, the NPS did not adjust its range of alternatives.

CONCERN STATEMENT 27: One commenter stated that the draft plan/EIS asserts that the techniques Montana uses to mitigate brucellosis transmission in elk (i.e., hazing, hunting) have been implemented successfully in bison, obviating any need for any management more aggressive than that presently implemented by Montana for its elk population. The commenter states that existing vaccines have a higher efficacy rate in bison than elk and are more likely to yield the desired disease management results. The commenter states that there are significant epidemiological, biological, ecological, and geopolitical differences between Yellowstone bison and Montana elk and because those differences preclude some disease measures in elk, does not mean the same for bison. One commenter stated that the 2000 IBMP committed agencies to implementing remote vaccination programs once a safe vaccine was developed and for this reason, dismissing a remote vaccination alternative was inappropriate.

RESPONSE: The 2000 ROD for the IBMP directed the NPS to evaluate whether to implement remote delivery vaccination of bison inside YNP to decrease the occurrence of brucellosis. In 2013, the NPS and MFWP convened a panel of scientists from federal, state, academic, and nongovernmental organizations who reviewed information about the vaccine-induced immune responses of bison and elk, as well as the benefits and limitations of existing tools and emerging technologies for reducing the occurrence of brucellosis in bison and elk. The panel concluded that management to maintain separation between cattle and bison was effective at preventing the spread of brucellosis between them. They also thought the vaccination of bison with available vaccines would not decrease brucellosis to a level that substantially reduced the need for the separation of bison and cattle. The panel suggested the remote delivery of vaccine to bison would be a cost-ineffective tool for preventing brucellosis spreading to cattle and could lead to shifts in the distribution of bison across the landscape that reduced the opportunity for visitors to observe bison.

In the 2014 Remote Vaccination EIS, the NPS concluded that the implementation of park-wide remote vaccination would not achieve desired results and could have unknown yet potentially negative behavioral impacts on bison, and in turn, on visitor experiences such as watching wild animals. The NPS based this conclusion on the lack of an easily distributed and highly effective vaccine and limitations of current diagnostic and vaccine delivery technologies. Bison nutrition, body condition, pregnancy, and lactation can reduce the protective immune responses from vaccination. In addition, elk that are also infected and widely distributed would re-infect bison.

In 2012, APHIS began a six-year study of the effectiveness of the vaccine GonaCon™ at preventing gonadotropin-releasing hormone from initiating follicle growth and ovulation in Yellowstone bison, thereby resulting in infertility. The objectives were to determine whether GonaCon™ vaccine could prevent the shedding of brucellosis bacteria in young, recently infected bison throughout the infection

cycle. Researchers also wanted to determine whether bacteria that remain dormant in infected animals during fertility control would increase again during pregnancies after the effects of the vaccine decreased. This study ended in 2017, but data and findings have not been provided to the NPS and independent scientists for scientific peer review. Thus, this technology is not ready for implementation on Yellowstone bison and the testing of this or another fertility control method likely will take many years to evaluate sufficiently.

The NPS is not aware of any significant improvements in existing vaccines or delivery technologies for bison since the 2014 issuance of the Remote Vaccination ROD not to implement remote vaccination. Nor is the NPS aware of studies being conducted by APHIS, MDOL, or MFWP on these issues for either elk or bison. For these reasons, the NPS did not revise the final plan/EIS.

The existing vaccine for bison is not "a proven and effective tool at mitigating the disease [brucellosis] in bison" as indicated in detail in the 2014 Remote Vaccination EIS and discussed by the National Academies of Sciences, Engineering, and Medicine in its 2017 report *Revisiting Brucellosis in the Greater Yellowstone Area*. Moreover, the purported differences in the distribution and management of bison and elk mentioned by the state are misleading. The National Academies of Sciences, Engineering, and Medicine concluded in 2017 that infected elk had transmitted brucellosis to livestock in the Greater Yellowstone Area (GYA) at least 27 times since 1998 with no transmissions attributed to bison. It also recommended prioritizing efforts on preventing brucellosis transmission by elk, while maintaining separation between bison and cattle. The National Academies of Sciences, Engineering, and Medicine also recommended not using aggressive control measures on bison until tools became available for an eradication program in elk. State biologists indicated intrusive methods of disease control, such as vaccination, culling, and test-and-process, which Montana suggests the NPS take with bison in YNP, are not likely to be effective, feasible, or politically or socially acceptable to implement on wide-ranging elk populations (Rayl et al. 2019, Journal of Wildlife Management 83:817-829). This also is true for bison in YNP. Instead, state biologists concluded the primary strategy for managing brucellosis transmission risk from more numerous elk to livestock is to prevent mingling by hazing, hunting, fencing, or removing haystacks and other attractants, or improving forage on public lands (Rayl et al. 2019). For over two decades, the IBMP partners have demonstrated these same techniques work for bison.

The prevalence of brucellosis in adult female bison has varied around 60% for many decades, suggesting it has reached a quasi-steady state (Hobbs et al. 2015). In contrast, the prevalence of brucellosis in elk outside the park is increasing rapidly and spreading throughout the GYA (Kamath et al. 2016). Elk exposed to brucellosis inhabit an area encompassing about 17 million acres, and the spread is not linked to Yellowstone bison, but rather other lineages in elk (Kamath et al. 2016). From 1985 to 2009, the prevalence of brucellosis in about 2,900 elk harvested during the Gardiner, Montana, late season hunt north of the park was 2% to 4% (Cheville et al. 1998; Lemke 2009). However, prevalence increased to about 13% to 15% in hunting district 313 and 20% to 30% farther north in hunting district 317 during 2010 to 2020 (MFWP 2018, 2020). Elk have become more concentrated in the Paradise Valley of Montana during the last several decades, in part, because of access to irrigated alfalfa fields. Many large groups, totaling thousands of elk, are spending more time in this area and mixing with cattle (Rayl et al. 2019; Tilt 2020).

CONCERN STATEMENT 28: One commenter stated that the range of alternatives does not meet YNP mandates or the goals of the IBMP. This commenter submitted the purpose of the IBMP for NPS review and stated that any alternative that does not address the risk of brucellosis transmission would not meet the goals of the IBMP.

RESPONSE: Chapter 2 of the plan/EIS, section "Actions Common to All Alternatives," includes a discussion of brucellosis research as well as managing brucellosis transmissions risk to cattle. For this reason, the NPS does believe it would continue to meet the goals of the 2000 IBMP.

CONCERN STATEMENT 29: One commenter stated that each alternative works against the purposes of the NPS Organic Act because bison overpopulation leads to a clear detriment of supporting ecosystem services and perpetuates the existence of disease within the population. The commenter stated that overpopulation and disease constitute impairment and spoliation in contradiction to YNP's mandate.

RESPONSE: The YNP Protection Act of 1872 set apart about 2.2 million acres (890,300 hectares) in the future states of Wyoming, Montana, and Idaho "as a public park or pleasuring ground for the benefit and enjoyment of the people." It requires the Secretary of the Interior to preserve "from injury or spoliation" the "timber, mineral deposits, natural curiosities and wonders" of YNP and to ensure "their retention in their natural condition" (16 USC 21 et seq., 17 Stat. 32). The NPS Organic Act of 1916 directed park managers to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations" (54 USC 100101a,b).

Contemporary management policies have remained consistent with these tenets but clarified that managers should preserve "components and processes in their natural condition," which was defined as "the condition of resources that would occur in the absence of human dominance over the landscape." Additional contemporary principles for managing biological resources include "preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur; restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them" (USDOI, NPS 2006a:36, 42).

The goals of bison conservation and management, as outlined in the "Actions Common to All Alternatives" section in chapter 2 of the plan/EIS, are in accordance with the NPS Organic Act and NPS *Management Policies* for managing biological resources and would maintain landscape integrity. These goals include (1) sustain a viable, wild population; (2) sustain the role of bison as ecosystem engineers; (3) maintain functional grasslands; and (4) sustain bison as a meaningful component of the food web influencing energy and nutrient transfer through the ecosystem.

CONCERN STATEMENT 30: One commenter stated that each alternative generally identifies management tools that could be used, without committing to when each tool will be used, or under what circumstance. This commenter notes that the draft plan/EIS's failure to identify a clear course of action under each alternative, or at each population milestone, is contrary to NEPA.

RESPONSE: The NPS revised chapter 2 of the final plan/EIS to describe scenarios under which different management tools would be used.

CONCERN STATEMENT 31: One commenter asked why an upper population range is identified if the NPS states that these estimates are intended to guide implementation of risk management activities, not targets necessitating immediate population adjustment.

RESPONSE: The population ranges outlined in each alternative serve as a guide for the NPS in its decision-making processes, rather than acting as fixed targets. For each alternative, the NPS has established criteria on how to apply various population management tools. The NPS aims to meet goals for bison abundance, hunting and harvest opportunities, the BCTP, conflict reduction, and support for migration. Under all alternatives, the NPS would focus on balancing these diverse goals rather than solely prioritizing population numbers as the decisive factor. Also, the NPS and IBMP partners have learned through more than two decades of adaptive management that migrations and population management is highly dynamic. Under all alternatives, the NPS would continue to adaptively manage the bison population through balancing the many goals outlined in this plan/EIS. The NPS would continue to encourage other agencies, such as the state, to do the same.

Bison Hunting

CONCERN STATEMENT 32: Commenters offered suggestions on the management of hunting outside the park. Some commenters requested licensed hunting via Montana Fish, Wildlife and Parks (MFWP), while others advocated for federal management. Commenters suggested that Montana residents and tribal members receive priority for hunting tags over non-residents. It was suggested that inconsistent hunting regulations can increase safety and compliance concerns. Commenters recommended a clear, universal set of regulations that are enforceable for all hunting (including tribal treaty hunting).

RESPONSE: The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101, USDOI, NPS 2006a), and the USFS has stated that hunts conducted on national forests under permits from MFWP or American Indian Tribes exercising their treaty rights do not require their authorization. The state and individual American Indian Tribes already set hunting regulations outside the park that neither the NPS nor USFS have jurisdiction to revise or enforce. Additionally, this is outside the scope of the plan/EIS.

CONCERN STATEMENT 33: Commenters expressed opposition to the hunting of bison, stating that hunting conflicts with the NPS goal of allowing wildlife to survive in the absence of human manipulation and that hunting could jeopardize the ecological goals of the plan/EIS. Commenters objected to the practice being described as hunting as there is no fair chase and stated there should only be hunting if bison are free-roaming. Some stated there should be changes to current practices and any hunting should following the North American Model of Wildlife Conservation, including free chase and fair hunt. They further noted hunting should be distributed on a large landscape and not just at the 11 acres at Beattie Gulch.

RESPONSE: The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101, USDOI, NPS 2006a).

CONCERN STATEMENT 34: Commenters expressed concern over the current bison hunting practices occurring in Beattie Gulch, citing its negative impact on surrounding neighborhoods, visitor experience, safety concerns, and restriction of bison dispersal into northern land. Commenters requested the NPS conduct a noise analysis to assess impacts to residents and visitors outside the park from hunting in Beattie Gulch. Commenters noted that discussion of bison migration into Custer Gallatin National Forest and other areas is not productive, as current management allows most, if not all, bison to be killed before they reach these lands. One commenter suggested that the shooting of bison in Beattie Gulch is in violation of Montana law, and therefore the encouragement of bison hunting in the area by the NPS is also illegal.

RESPONSE: The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101) and therefore cannot alter management actions outside the park to provide for greater bison migration across a larger landscape. The NPS does acknowledge that NPS actions could indirectly impact resources outside the park and additional information on these indirect effects was added to chapter 3 of the final plan/EIS. Chapter 3 of the plan/EIS includes information on how hunting may impact human and health and safety outside the park, including how the alternatives may impact brucellosis infection. Chapter 3 of the plan/EIS includes information on how hunting outside the park may impact the visitor experience at the park, including noise impacts from hunting outside the park. Chapter 3 of the plan/EIS includes information on how residents perceive hunting and the actions IBMP partners are taking to reduce impacts on residents, hunters, visitors and others. Chapter 1 of the plan/EIS states, “in recent years, concentrated tribal hunters on national forest lands near the park boundary have, at times, resulted in conflicts with nearby residents due to shooting near roads and houses, gut piles left on the landscape, shooting of elk and other ungulates, and occasional incidents of shooting toward other hunters, houses, and cars. The YNP Bison Management Plan/EIS will not resolve these issues.”

The commenter did not present available data for the NPS to consider when assessing the indirect effects of gunshots outside the park on visitors both traveling to the park and in the park. The NPS conducted a sound analysis and included this information in the final plan/EIS in chapter 3 of the "Visitor Use and Experience" section.

Under all alternatives, the NPS would continue to work with IBMP partners to reduce impacts outside the park and address hunting-related issues within each agency's jurisdictional authorities, as discussed in chapter 2 under "Actions Common to All Alternatives, Hunt-Capture Coordination, Adaptive Management, Operations Plans."

Regarding hunting and ecological goals, hunting outside the park does not jeopardize the ecological goals of the IBMP. During 2008 to 2022, counts of Yellowstone bison after calving increased from about 2,931 to 5,822, which is the largest number since the late 1800s and far larger than any other wild, unfenced population of plains bison. These bison move across a vast landscape where they are exposed to natural selection through competition for food and breeding opportunities, predation, and survival under challenging environmental conditions. As a result, they have adaptive capabilities that are continually honed compared to bison kept in fenced pastures with no predators and where older bulls are removed to simplify management (Wallen and White 2015). In addition, Yellowstone bison retain a high level of allelic richness and gene diversity and are sufficiently unique to contribute significantly to the overall genetic diversity of plains bison (Douglas et al. 2011; Stroupe et al. 2022). Furthermore, Yellowstone bison are the only conservation population of plains bison that exceeds the minimum size recommended for retaining more than 95% of genetic diversity for centuries without the need for introducing immigrants from other populations (Gross et al. 2006, Freese et al. 2007, Hedrick 2009, Pérez-Figueroa et al. 2010). In combination, these findings indicate hunting outside the park would not compromise ecological goals of this plan/EIS and that Yellowstone bison would continue to be a healthy, diverse population with a relatively high level of allelic richness and gene diversity that should be retained into the future under all alternatives in the plan/EIS.

Regarding the commenters' concerns that the NPS encourages hunting near the park, the NPS does not encourage the movement of bison out of the park. Bison naturally leave the park in winter to forage. Nor does the NPS determine what is legal on non-NPS land or land within the state. Neither the NPS nor USFS have the ability to enforce Montana hunting regulations. Under the 2000 IBMP ROD, hunting is analyzed as a tool for bison management outside of the park, and under the alternatives in this plan/EIS, the NPS would continue to work with its partners to honor and support American Indian rights reserved through treaties outside the park and participate in hunt-capture coordination efforts with partners outside the park.

Tribal Treaty Hunting

CONCERN STATEMENT 35: Commenters expressed conflicting interpretations regarding tribal treaty rights. Many commenters stated their belief that the NPS is relying primarily on tribal assertions of treaty rights around Gardiner Basin in Montana instead of independently validating these claims. Commenters requested empirical evidence to support claims that American Indian Tribes have treaty rights in Beattie Gulch. Additionally, commenters encouraged the NPS to revisit interpretations of overlapping statutory directions and tribal treaty obligations. Specifically, one commenter offered citations suggesting that the NPS incorrectly asserts that the American Indian Tribes are acting within their treaty rights. Lastly, a commenter requested the plan/EIS analyze the potential for more American Indian Tribes to participate in tribal treating hunting outside the park.

RESPONSE: The determination of specific tribal treaty rights is outside the scope of this plan/EIS and outside the jurisdiction of the NPS to assess. Expanding hunting opportunities to more American Indian Tribes is also outside NPS jurisdiction.

CONCERN STATEMENT 36: Commenters stated that under Alternative 3, American Indian Tribes would have to significantly expand the distribution of their harvest for it to serve as an effective population management tool. Commenters stated that hunters need to be broadly distributed throughout the Gardiner Basin in Montana for this to be an effective tool. To accomplish this, commenters requested the NPS provide a detailed framework for dispersed hunting when bison management numbers exceed the upper threshold. Commenters stated this should include annual estimates for the number of bison that can be safely and reasonably removed from the landscape by tribal treaty hunting.

RESPONSE: The NPS details hunt-capture coordination efforts in chapter 2 of the plan/EIS. The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101, USDOI, NPS 2006a). Nor does it have the ability to provide a framework for dispersed hunting when bison management exceeds the upper threshold.

CONCERN STATEMENT 37: Commenters requested the NPS consider an alternative that would allow tribal treating hunting within YNP.

RESPONSE: The NPS includes a discussion of hunting within YNP in chapter 2 of the plan/EIS, in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section. The NPS prohibits hunting in national park areas except where "specifically mandated by Federal statutory law" (36 CFR 2.2). This is re-affirmed in *Management Policies 2006* (USDOI, NPS 2006a). Congress prohibited all hunting in YNP in 1894 (16 USC 26).

Bison Conservation Transfer Program/Quarantine

CONCERN STATEMENT 38: Commenters advocated for shorter quarantine periods for the BCTP as they believe it leads to domestication of bison. Other commenters suggested that the quarantine period is entirely unnecessary as bison are not known to transmit brucellosis to cattle.

RESPONSE: APHIS, under the Animal Protection Act, retains authority to control brucellosis and ultimately is responsible for adjusting quarantine procedures, not the NPS. Additional information was added to the final plan/EIS to clarify roles and responsibilities related to quarantine procedures. Additionally, the NPS updated the final plan/EIS in chapter 2 following changes to APHIS guidance on testing procedures for approved bison quarantine facilities. The updated guidance reduces the overall time male bison are quarantined.

CONCERN STATEMENT 39: Commenters expressed support for the BCTP and advocated for increased use of the program to disperse bison to tribal lands and other public lands, rather than the shipment of bison to slaughter and/or bison harvest. Commenters suggested additional lands that bison could be sent to through the BCTP, such as the Upper Gallatin Watershed and land in Wyoming, Colorado, New Mexico, and Utah. One commenter noted that the Shoshone Tribal Buffalo Initiative could accept Yellowstone bison to augment their herd. Commenters noted that bison dispersal to new areas can contribute to genetic diversity and the resilience of the species. Commenters requested the NPS address the right of first refusal to American Indian Tribes for Yellowstone bison transfers, provide clarity on what an increase of the BCTP looks like, and provide a strong commitment to utilizing best available science, incorporating Traditional Ecological Knowledge and working with the necessary partners to expand the BCTP.

RESPONSE: As indicated in the "Establish Collaborative Partnerships with American Indian Tribes for Bison Management" section of the "Actions Common to All Alternatives" in chapter 2 of the plan/EIS, the NPS is working to increase the quarantine capacity for Yellowstone bison to further increase shared stewardship and the number of live bison transferred to American Indian Tribes per the Secretary of the Interior's Order 3410, *Restoration of American Bison and the Prairie Grasslands*, across all alternatives that were considered.

Regarding transfer of bison to other lands, the following was added to the final plan/EIS in chapter 2 in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section: "This would be in support of Secretarial Order 3410 that directs the NPS to increase the number of live bison transferred from Yellowstone National Park to American Indian Tribes. Currently, American Indian Tribes have capacity for receiving all bison entered in the BCTP. Managers of other private, state, and federal lands could coordinate with American Indian Tribes to receive some bison completing assurance testing."

The plan/EIS includes a discussion on tribal right of first refusal for bison in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section of chapter 2. Incorporating findings from research and monitoring and tribal ecological knowledge is discussed in the "Adaptive Management" and "Establish Collaborative Partnerships with American Indian Tribes for Bison Management" sections of "Actions Common to All Alternatives" in chapter 2 of the plan/EIS.

CONCERN STATEMENT 40: One commenter requested additional information regarding survival rates of bison relocated to American Indian Tribes and the sustainability of herds established on tribal lands as part of the BCTP.

RESPONSE: The NPS transfers ownership, control, and stewardship of bison completing the BCTP to the recipient American Indian Tribe. The NPS does not place any stipulations on the ownership, control, stewardship, or disposition of bison once they are transferred. Presently, the Assiniboine and Sioux of Fort Peck are the only American Indian Tribes with an approved facility to receive bison completing the BCTP for assurance testing, the final phase of brucellosis quarantine. The Fort Peck Tribes distribute nearly all bison completing assurance testing, including working with the InterTribal Buffalo Council to distribute bison widely among member American Indian Tribes.

CONCERN STATEMENT 41: One commenter requested additional information on the BCTP under Alternatives 2 and 3. The commenter requested that the NPS address the following:

- How will the NPS make the determination to hold BCTP-ineligible animals?
- How long will the NPS hold BCTP-ineligible animals before subsequent action?
- What are the impacts of holding BCTP-ineligible bison for extended time periods?
- What criteria will be used to determine shipment to slaughter or re-release?
- Will BCTP-ineligible animals be vaccinated before release?
- What is the short-term and long-term impact on disease prevalence and transference rates if ineligible bison are released?

RESPONSE: The NPS revised chapter 2 of the final plan/EIS to address concerns related to the BCTP.

Regarding holding BCTP-ineligible bison, under each alternative the NPS could hold animals for release back into the park during spring when the numbers of bison migrating out of the park threaten the efficacy of management efforts to keep them within existing management areas. Under management direction in the IBMP, such actions occurred during 2005, 2008, 2011, and 2023. In instances where bison would be held for extended durations, the NPS would segregate animals into distinct pens based on their exposure to brucellosis. The timing that animals would be held corresponds with the period of brucellosis transmission when Brucella-induced abortions tend to occur (Rhyan et al. 2008). Feeding and gathering animals in confined areas could potentially lead to situations where numerous animals are at risk of exposure to brucellosis following an abortion event.

Under Alternative 2, the NPS would place BCTP-eligible animals in the program, selectively process brucellosis-positive bison, and release brucellosis-negative bison that are ineligible for the BCTP immediately after testing, provided that the total population remains below the population assurance threshold. These actions should preferentially remove brucellosis-positive bison compared to their occurrence in the population. When the total population exceeds the population assurance threshold, additional bison would be processed to control numbers, prioritizing brucellosis-positive bison. When

possible, the NPS would hold bison until late winter before shipping them to process and reduce shipments based on the number of bison harvested outside the park. Bison released into the park would not be vaccinated, as detailed in chapter 2 of the plan/EIS.

Under Alternative 3, BCTP-eligible animals would be placed in the BCTP, but both brucellosis-positive and brucellosis-negative BCTP-ineligible bison would be released immediately after testing when the population remains below the population threshold. These actions would preferentially remove brucellosis-negative animals compared to their occurrence in the population. If the population exceeds the assurance threshold, transfer for processing would resume as described for Alternative 2. Bison released into the park would not be vaccinated, as detailed in chapter 2 of the plan/EIS.

The impacts of releasing BCTP-ineligible animals on disease prevalence are ambiguous (Hobbs et al. 2015). Males are incapable of transmitting brucellosis; therefore, removing them from the population based on seroprevalence has no impact on disease dynamics (Frey et al. 2013; Hobbs et al. 2014). Hobbs et al. (2015) developed a Bayesian model to assess the adaptive management of Yellowstone bison. Compared to management activities like those described for Alternative 1, removing 200 seronegative yearling and adult females led to an increase in seroprevalence but did not significantly alter the likelihood of disease transmission or the rate of new infections. This forecast was predicated on the assumption that managers could consistently remove 200 bison with the specified brucellosis status annually. However, the actual number of bison exiting the park and subject to removal varies greatly each year, heavily influenced by winter weather conditions (Geremia et al. 2011). When this variability is considered, the predicted seroprevalence and annual transmission probabilities show minimal difference between the management approach in Alternative 1 and scenarios focusing solely on the removal of seronegative females. Alternatives 2 and 3 that release animals back into the park could result in preferentially removing brucellosis-positive animals under Alternative 2 and brucellosis-negative animals under Alternative 3. However, given the annual uncertainty in migrations, the NPS does not expect significant impacts on seroprevalence or annual infection rates under any of the considered alternatives.

CONCERN STATEMENT 42: Commenters stated that the transfer of Yellowstone bison to the Fort Peck Tribes through the BCTP is privatization of public property and should not be allowed.

RESPONSE: The NPS disagrees that the transfer of bison through the BCTP is privatization of public property. Under 16 USC 36, "[t]he Secretary of the Interior is authorized, in his discretion and under regulations to be prescribed by him, to give surplus elk, buffalo, bear, beaver, and predatory animals inhabiting Yellowstone National Park to Federal, State, county, and municipal authorities for preserves, zoos, zoological gardens, and parks. He may sell or otherwise dispose of the surplus buffalo of the Yellowstone National Park herd, and all moneys received from the sale of any such surplus buffalo shall be deposited in the Treasury of the United States as miscellaneous receipts."

In January 2023, the Secretary of the Interior issued Secretarial Order 3410 to restore wild and healthy populations of bison through collaboration with other federal agencies, states, American Indian Tribes, and landowners. Secretarial Order 3410 directs the NPS to increase the quarantine capacity for Yellowstone bison to further increase shared stewardship and the number of live bison transferred to American Indian Tribes, which YNP would continue to do. Secretarial Order 3410 included a Bison Conservation Initiative committed to five overarching goals: (1) conserving bison as healthy wildlife; (2) restoring gene flow among conservation herds; (3) sharing stewardship with states, American Indian Tribes, and other stakeholders; (4) establishing and maintaining large wide-ranging bison herds on appropriate large landscapes; and (5) restoring cultural connections to honor and promote the unique status of bison as an American icon.

Yellowstone bison have special significance to many of these American Indian Tribes because they are direct descendants from the ancient populations of bison (Plumb and Sucec 2006). Bison were an essential component in the lives of many indigenous American Indian Tribes in western North America, and involuntarily played an important role in the colonization of the continent by European Americans

(Stark et al. 2022). Market hunting for bison hides resulted in the near extinction of bison and the decimation of the American Indian Tribes that depended on them. Thus, the NPS is committed to restoring bison to their rightful place in tribal cultures and territories so future generations can realize the bison ways culturally, materially, and spiritually.

Bison from YNP were used to augment plains bison populations in Fort Niobrara National Wildlife Refuge in Nebraska, Grand Teton National Park/National Elk Refuge in Wyoming, National Bison Range in Montana, and Wind Cave National Park in South Dakota (Plumb and Sucec 2006; Halbert and Derr 2008; Hedrick 2009; Dratch and Gogan 2010; Stroupe et al. 2022). Also, several satellite populations of bison from the Yellowstone lineages were established on the Book Cliffs and Henry Mountains in Utah, Vermejo Ranch in New Mexico, and Flying D Ranch in Montana. Under all alternatives, and consistent with existing authorities, the NPS would continue its use of the BCTP to transfer to Yellowstone bison to American Indian Tribes, and subsequently other public and private lands.

General Bison Population Concerns

CONCERN STATEMENT 43: A commenter stated that contrary to assertions in the draft plan/EIS, Pérez-Figueroa, et al. (2012) showed that the effective population size (EPS) in Yellowstone bison is expected to be at, or greater, than 1,000 under a wide variety of demographic and management scenarios, including fluctuating population sizes between 2,000 and 4,500 individuals, and harvest focused on juveniles, adults, or random harvest. The commenter stated that an EPS of 1,000, and not an overall population of 3,000 to 3,500, is the critical threshold for consideration and analysis as it is the EPS at which a population can maintain approximately the same genetic diversity as expected in an infinite population.

RESPONSE: Genetic diversity, which is the variety of different genes at each specific chromosome location, is crucial for a species' ability to adapt (Allendorf 1986). To preserve this diversity, especially at chromosome locations with a high number of genes, a larger bison population is needed. In YNP, bison gene counts range from 3 to 10 according to standard microsatellites for bison (Halbert et al. 2012). Studies using simulation models indicate that to conserve over 95% of genetic diversity at locations with more than five genes, the bison population must exceed roughly 3,250 individuals, with a focus on removing mostly or solely younger animals (Pérez-Figueroa et al. 2012).

EPS is the number of individuals in a population who contribute offspring to the next generation, essentially the breeders, whereas census size is the total count of all individuals in the population, including those that do not breed due to age, health, or social status. While census size offers a straightforward tally of a population at a given moment, EPS provides a more nuanced picture of the population's potential for genetic diversity and long-term survival, considering reproductive dynamics and other factors that influence how genes are passed on.

The census size, which refers to the count of bison in a population, is a measurable and concrete quantity that the NPS can monitor over time. The NPS has chosen the census size reported by Pérez-Figueroa et al. (2012) as one basis among many for setting a minimum population limit for each alternative. A population of 3,500 bison after the calving period roughly translates to a population just under 3,000 animals before the calving season. The upper limit of the bison population under each alternative exceeds the numbers required to maintain genetic diversity. This is because the management of bison encompasses a range of objectives, as detailed in the plan/EIS.

CONCERN STATEMENT 44: One commenter stated that the NPS did not provide peer-reviewed science supporting the need for more than 1,000 bison in each breeding herd. The commenter stated that there is genetic interchange occurring between bison in the central and northern regions of YNP and that if the population is becoming increasingly genetically homogeneous, then it is the overall population size of Yellowstone bison that would dictate the loss of rare alleles.

RESPONSE: The FEIS was revised as follows: Bison breed in northern or central geographic regions of the park with some interchange of animals between breeding areas among years (Wallen and White 2015). A nuclear microsatellite-based population level assessment revealed two genetically distinct bison subpopulations during 1997–2003 (Halbert et al. 2012). After this study, there was evidence of females switching between breeding areas in northern and central Yellowstone, suggesting the population structure may be breaking down (White and Wallen 2012). In 2016, an analysis of mitochondrial haplotypes showed the two founding maternal lineages were distributed throughout the park (Forgacs et al. 2016). Finally, between 2019 and 2021, a nuclear microsatellite-based reassessment and initial Single Nucleotide Polymorphism (Stroupe and Derr submitted) level assessment revealed that Yellowstone bison no longer exhibited population substructure (Stroupe et al. submitted). Instead, Yellowstone bison are best described as one interbreeding population with two primary breeding herds. To the extent possible, the NPS would allow ecological processes, such as natural selection, migration, and dispersal, to prevail and influence population and genetic substructure (White and Wallen 2012; Wallen and White 2015). The NPS would attempt to maintain existing allelic richness and diversity based on neutral nuclear markers.

CONCERN STATEMENT 45: One commenter stated that attempting to maintain a ratio of 50% male and 50% female bison may induce anthropogenic selection as many species do not have a natural 50/50 sex ratio. The commenter asked how YNP plans to achieve this ratio.

RESPONSE: The NPS developed an integrated population model to estimate numbers of bison in the population in age and sex categories (Hobbs et al. 2015, Geremia 2022, 2023). Vital rates such as fetal sex ratio and age- and sex-specific survival suggest that an unmanaged bison population should have a balanced sex ratio of about 50% males and 50% females. The sex ratio averaged 48% male and 52% female under the IBMP. Since 2012, the NPS proposed removal recommendations to IBMP partners that would meet conservation objectives for population abundance and composition. Under all alternatives, the NPS proposes to continue providing annual population status updates and removal recommendations to advise IBMP partners.

CONCERN STATEMENT 46: One commenter stated that existing information in the draft plan/EIS does not seem to support the statement that increasing bison populations will force bison to utilize new areas of the park. This commenter stated that a larger bison population would result in an exodus from the park. The commenter requested the NPS provide a citation for this statement in the plan/EIS.

RESPONSE: The NPS revised the final plan/EIS in chapter 3 to state that under Alternative 3 increasing bison population numbers may force bison to utilize new areas of the park and may result in more bison migrating out of the park.

CONCERN STATEMENT 47: One commenter stated that the draft plan/EIS fails to analyze how bison abundance would affect the presence, movement, and distribution of elk in the GYA and whether such changes increase disease transmission to other elk or livestock herds.

RESPONSE: Chapter 3 of the plan/EIS addresses impacts to wildlife, including elk, from the alternatives. This section includes an analysis of brucellosis prevalence in elk, stating that the spring migration and duration that elk remain on winter range north of the park affect the risk of brucellosis transmission to cattle. The plan/EIS goes on to state that brucellosis is spreading in elk through the GYA, and genetic data indicate elk have infected cattle herds with brucellosis at least 27 times since 1998. Elk exposed to brucellosis now inhabit an area encompassing about 17 million acres, and the current spread is not linked to Yellowstone bison or elk, rather to other lineages of elk (Kamath et al. 2016). Additionally, there is one lineage of brucellosis bacteria in bison and northern YNP elk that range from the park to the southern Paradise Valley. This lineage has not spread west of the park even through bison and elk mix in this area. Each alternative includes an analysis of brucellosis transmission from bison to elk. The commenter did not provide additional data or literature for the NPS to consider regarding elk distribution, and for this reason the NPS did not revise the final plan/EIS.

Bison Management Outside the Park

CONCERN STATEMENT 48: Commenters suggested that bison should be permitted to roam and be managed across a broader landscape outside of the park, including the Greater Yellowstone Ecosystem, Custer Gallatin National Forest, and other USFS lands, connective corridors to federal lands, the Charles M. Russell National Wildlife Refuge, additional calving grounds, their historic winter range, and other public lands. Commenters called for an expansion of the bison tolerance zone outside of the park, as well as a reduction of bison exclusion zones. Commenters requested the NPS make habitat improvements outside the park to support bison migration and reduce cattle in areas adjacent to YNP. Commenters requested the final plan/EIS include actions such as the local discouragement of development and taxation to discourage more intense land development resulting in habitat fragmentation. Lastly, commenters suggested various methods to reduce bison-cattle conflicts near the park, including providing ranchers an avenue to obtain a depredation permit if necessary to protect their livestock from bison.

RESPONSE: The plan/EIS presents three alternatives for managing bison within the park. In the "Actions Common to All Alternatives" section of chapter 2, habitat conservation and enhancement both inside and outside of YNP is discussed. This section also includes a discussion on encouraging more tolerance for bison in states surrounding YNP. Each alternative necessarily considers external actions that could affect management efforts inside the park, while acknowledging the NPS does not have jurisdiction or control over actions beyond the park boundary. To analyze each alternative, the NPS used the existing condition whereby bison are allowed to migrate from YNP during winter and spring into management (tolerance) areas in Montana adjacent to the northern and western boundaries of the park. These management areas were delineated by the state in 2015 and it is up to the state whether tolerance zones are modified or added (Bullock 2015).

In a January 11, 2016, letter to the IBMP agencies, Governor Bullock indicated that his decision to allow more tolerance for bison in parts of the Hebgen and Gardiner Basins of Montana was based on several fundamental changes in circumstances. Cattle were no longer on Horse Butte, and there were no active cattle allotments on public lands in portions of the Hebgen Basin currently used by bison. In addition, modifications of federal rules reduced the economic consequences to livestock producers of a brucellosis infection. Research indicated a negligible risk of brucellosis transmission from bull bison to cattle and decreased risk of brucellosis persistence related to cattle turnout dates. Moreover, elk were recognized as the primary transmission route of brucellosis infection to livestock. Governor Bullock indicated "we've been successful at managing Yellowstone Bison and preventing brucellosis from being transmitted by bison to cows. The risk of brucellosis transmission from bison to cattle can be successfully mitigated through focused management. Accordingly, we're adjusting how we manage bison." In the associated 2015 Decision Notice, the state indicated "[t]he ability to maintain temporal and spatial separation between bison and cattle operations remains a key conditional element and has already been successfully demonstrated to protect cattle operations." All these circumstances remain similar today, with no transmission of brucellosis to cattle attributed to bison. In a February 28, 2022, letter, to the NPS, however, Governor Gianforte indicated Montana's tolerance for bison dispersal in areas around YNP is limited. In an October 10, 2023, letter to the NPS, Governor Gianforte stated that if the NPS did not more fully analyze remote vaccination of bison in the plan/EIS, the state would reconsider the need for tolerance zones. Thus, the plan/EIS acknowledges that "given existing political and social constraints, however, it is unlikely these management areas will be increased substantially if bison numbers continue to increase." The NPS revised the Executive Summary and chapter 1 of the final plan/EIS to include a statement that, "there remains a possibility that management areas outside the park may decrease, which may necessitate additional management measures taken by the NPS."

The discouragement of local development or taxation is outside the scope of the plan/EIS and is outside the jurisdiction of the NPS. Lastly, the compensation of ranchers for bison impacts is included as an alternative element considered but dismissed in chapter 2 of the plan/EIS.

CONCERN STATEMENT 49: One commenter requested additional information regarding what happens to bison once they travel outside the boundaries of the park. The commenter suggested that the NPS explain where bison can and cannot go, how they can get there, what will happen while they are on their way, and how they could return to the park. One commenter stated that hunting outside the park can impact bison migration, which is a culturally learned trait. This commenter stated that loss of migration impacts the long-term wildness of bison. Lastly, commenters stated that the plan/EIS should include management tools to move bison into new areas in and outside the park to facilitate the migration of bison.

RESPONSE: Bison migrate from YNP during winter and spring into relatively small management (tolerance) areas in Montana adjacent to the northern and western boundaries of YNP. Chapter 2 of the plan/EIS provides maps of tolerance zones outside of the park and discusses management actions that encourage bison migration. The state monitors bison movement on private and public land outside of the park.

The plan/EIS presents alternatives that avoid management actions within the interior of the park to limit adverse effects to other cultural and natural resources and visitor experience (USDOI, NPS and USDA, USFS, APHIS 2000; White et al. 2011). Continuing to cull bison at the boundary of YNP would selectively remove migratory bison. However, there is no evidence that Yellowstone bison are losing their ability to migrate. Since the 2000 IBMP ROD, hundreds to more than a thousand bison have migrated outside YNP and into Montana during winter, depending on bison density, forage production and availability, snow cover, and other factors (Geremia et al. 2011, 2014, 2015b). In recent decades, Yellowstone bison have migrated farther than at any time since the massive slaughter of bison in the middle to late 1800s, with tolerance for these bison in Montana increasing since 2011 (Bullock 2015; Geremia et al. 2015b; IBMP Agencies 2016). More than 4,100 bison migrated north of Mammoth, Wyoming, in YNP during the prolonged, severe winter of 2023, which was twice the previous high of about 2,000 bison in 2008 (Geremia 2023). For these reasons, the NPS does not believe that the range of alternatives would impact Yellowstone bison's ability to migrate, nor affect the long-term wildness of bison, and the NPS did not revise the final plan/EIS.

CONCERN STATEMENT 50: Commenters requested clarification on why the NPS has an obligation to support tribal harvest outside the park when it has no jurisdiction to act on lands outside the park. One commenter asked why the migration of bison outside park boundaries and subsequent management decisions by the state are of any concern to the NPS. Commenters also stated that the NPS is misinterpreting their geographic scope of jurisdiction over bison management under the Bison Clause (16 USC 36) and bison management by the NPS does not end at the park's boundary. Due to this, commenters stated that the NPS is responsible for the disposal of surplus wild bison and must therefore analyze their ability to migrate deeper into the state, potentially in a new alternative.

RESPONSE: The plan/EIS does not state the NPS has an obligation to support tribal treaty hunting outside the park. In the "Actions Common to All Alternatives" section of chapter 2 in the plan/EIS, the NPS states it would continue to honor and support American Indian rights reserved through treaties, which includes working with partners to support the rights of American Indian Tribes to conduct hunts of bison migrating from YNP onto lands in surrounding states pursuant to their treaties. The commenter is correct that the NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP, but the NPS can support opportunities for American Indian Tribes to exercise tribal treaty hunting outside the park.

16 USC 36 states that, "The Secretary of the Interior is authorized, in his discretion and under regulations to be prescribed by him, to give surplus elk, buffalo, bear, beaver, and predatory animals *inhabiting Yellowstone National Park* to Federal, State, county, and municipal authorities for preserves, zoos, zoological gardens, and parks. He may sell or otherwise dispose of the surplus buffalo of the YNP herd, and all moneys received from the sale of any such surplus buffalo shall be deposited in the Treasury of

the United States as miscellaneous receipts" (emphasis added). Under this authority, managers captured and shipped about 800 live bison from within the park to zoos and other federal agencies, private individuals, and states to establish herds through 1951 (Skinner et al. 1942). This statute does not authorize such actions for animals outside the park, as indicated by the phrase "animals inhabiting Yellowstone National Park" and clearly does not create some sort of broader management authority for bison outside the park.

CONCERN STATEMENT 51: One commenter stated that the plan/EIS lacks information on the efforts being taken by ranchers to prevent brucellosis outbreaks in cattle. The commenter requested that the final plan/EIS recognize efforts in the Paradise Valley to keep cattle separate from elk. Lastly, this commenter stated that brucellosis was most likely introduced to the area by NPS concessionaires who were permitted to graze dairy and beef cattle inside YNP.

RESPONSE: The NPS revised the final plan/EIS in chapter 2, in the section "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis," to include the ongoing efforts in the Paradise Valley to keep cattle separate from elk, while correctly indicating that elk exposed to brucellosis still frequently mingle with cattle during the potential abortion period and brucellosis prevalence has increased substantially in the Paradise Valley during the past two decades This includes increasing prevalence in the northern portion of the valley where Yellowstone bison and elk are not present or influencing brucellosis prevalence (Tilt 2020). The NPS revised the final plan/EIS, chapter 1, to clarify that the source of initial brucellosis infection is unknown adding citations to Meagher and Meyer 1994 and Yonk et al. 2018.

Cumulative Impacts

CONCERN STATEMENT 52: A commenter stated that the NPS did not analyze other agencies' proposed actions as part of its cumulative impacts analysis and stated that the NPS failed to identify the impacts of any non-NPS projects. The commenter further stated that to comply with NEPA requirements, the NPS would need to analyze other USFS actions, APHIS actions, state actions, and even private actions. Another commenter stated that the park is an island surrounded by National Forest System lands, and therefore any plan must consider the impacts of activities that are occurring on surrounding National Forest System public lands.

RESPONSE: The CEQ regulations at 40 CFR 1508.1 define cumulative effects as those effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable action regardless of what agency or person undertakes such actions. The commenters did not submit any additional actions proposed by other agencies or persons that could be considered for the cumulative effects analysis. The NPS reviewed relevant past, present, and reasonably foreseeable actions by the NPS and other entities, including USFS actions, APHIS actions, and state actions and included these in the plan/EIS to support a cumulative effects analysis.

The NPS also reviewed the APHIS VS Guidance 6605.1, "Testing Procedures for Approved Bison Quarantine Facilities to Classify Bison as Brucellosis Free," that updates testing procedures of Yellowstone bison. This guidance reduces the overall time that male bison are quarantined, facilitating more rapid throughput of male bison to assurance testing and to conservation herds. The NPS added this as a cumulative action in the final plan/EIS, chapter 3 and appendix D. The NPS reviewed the USFS Custer Gallatin National Forest Land Management Plan and added this as a cumulative action in the final plan/EIS, chapter 3, and appendix D.

The NPS reviewed the "Notice of Availability of a Draft Federal Select Agent Program Policy Statement for Biosafety for Large Animal Study-Related Activities With Brucella abortus and Brucella suis Using Outdoor Containment Spaces" by APHIS, issued in January 2021. The NPS did not include this and related actions because this policy is on hold until Brucella strains are removed from the select agents and

toxins list. If changes do occur in the future, the NPS would review these changes and assess how that changes the management of bison within YNP.

American Indian Tribes and Ethnographic Resources

CONCERN STATEMENT 53: Commenters suggested that the NPS allow American Indian Tribes to handle the responsibility of bison management or be involved in the management. Commenters suggested that tribal organizations should be granted control over the management of bison hunting. One commenter suggested that the plan/EIS should include the delineation of agency and tribal partner roles in relation to the park's management. One commenter suggested that the NPS and USFS should convene members of the American Indian Tribes associated with the GYA and form a separate advisory council with the goal of co-stewardship of bison and to work with the NPS and facilitate effective tribal engagement and park management. Alternatively, one commenter stated that allowing American Indian Tribes to have greater oversight over bison management is in violation of the US Constitution because it creates a special category for people based solely on race. This commenter also stated that the NPS has no objective means of determining tribal association to the park.

RESPONSE: In 2022, the NPS Director issued a policy memorandum describing how the agency would ensure Tribal Nations play an integral role in decision-making related to the management of federal lands and waters through co-stewardship (USDOI, NPS 2022). Co-stewardship refers to collaborative partnerships between land managers and American Indian Tribes related to shared interests in managing, conserving, and preserving natural and cultural resources under the primary responsibility of federal land and water managers (USDOI, NPS 2022). It includes the sharing of expertise and information and combining capabilities to improve resource management, advance shared interests, and ensure tribal involvement when plans or activities may affect their interests, practices, or traditional use areas (USDOI, NPS 2022).

American Indian Tribes have been involved with the management of bison through the IBMP, which would continue under any alternative. In addition, the park has and will continue to consult with associated American Indian Tribes in a government-to-government manner as appropriate for significant bison management decisions. American Indian Tribes exercising treaty rights to harvest bison outside the park are involved in the development of the annual operations plan coordinated through the IBMP. The IBMP updates its operations plan annually and posts this to the public. This document outlines roles and actions each agency may take to manage bison within their jurisdictional authorities. Due to the coordination and role delineation through the IBMP, establishment of any additional committees or advisory groups would be redundant.

The three primary management tools proposed for bison (tribal harvest and public hunting outside the park, transfer for processing, the BCTP) directly benefit American Indian Tribes and that would continue under Alternatives 1 and 2, with some continued use of the tools under Alternative 3. A new alternative with a separate tribal advisory council is unnecessary and duplicative given tribal engagement through the IBMP and ongoing government-to-government consultation by the NPS. The NPS has a trust responsibility to American Indian Tribes through law, regulation, and policy and this would continue under all alternatives presented in the plan/EIS. Chapter 2 of the plan/EIS includes information on actions common to all alternatives, including honoring and supporting American Indian rights reserved through treaties, the establishment of collaborative partnerships with American Indian Tribes for bison management, and hunt-capture coordination efforts with American Indian Tribes. The US Constitution recognizes American Indian Tribes as distinct governments and they have, with a few exceptions, the same powers as federal and state governments to regulate their internal affairs. Consulting with American Indian Tribes on a government-to-government basis on bison management is not a violation of the US Constitution. Lastly, how the park determines tribal association is outside the scope of this plan/EIS.

CONCERN STATEMENT 54: One commenter suggested that the NPS include information on how tribal concerns submitted during the plan/EIS scoping phase were addressed and what additional or continuing consultations may be warranted. This commenter also recommended identifying any protection, mitigation, and enhancement measures identified by the American Indian Tribes, as well as all treaty rights and privileges relevant to the plan/EIS.

RESPONSE: YNP has and will continue to engage in government-to-government consultation with American Indian Tribes, including American Indian Tribes who participated as cooperating agencies in the plan/EIS planning effort. The NPS addressed comments from American Indian Tribes through its cooperating agency relationship, through individual consultation, and through the public review process for this plan/EIS. The draft and final plan/EIS include a summary of information, including alternatives and analyses, submitted by commenters, including American Indian Tribes, during the scoping process and draft plan/EIS review (40 CFR 1502.17). All alternatives carried forward support tribal treaty harvest outside the park, transfer for processing and the donation of meat, and the BCTP. American Indian Tribes have communicated the significance of bison and will continue to be engaged partners in bison management under decisions made through this plan/EIS process.

CONCERN STATEMENT 55: One commenter stated that a bison population in excess of 400 to 500 animals is not warranted based on historical assessments. This commenter stated that the draft plan/EIS indicates that "people have occupied the Yellowstone area for more than 11,000 years. Archeological, ethnographic, and historical evidence shows bison have been an important resource throughout the span of human occupation of the GYA, including the present-day YNP." The commenter noted that while that statement is true for the GYA, recent evaluations indicate that bison were historically scarce in the area that is now the park, except for the incursion of increased numbers toward the end of the period when bison were being slaughtered on the Great Plains. Commenters stated that there is no baseline information on bison populations within the park at the time of park establishment, and that this information is needed because that historical information is foundational to the establishment of management objectives for the species.

RESPONSE: The NPS revised chapter 1 of the final plan/EIS to address concerns regarding historic numbers of bison in and near YNP. Additionally, the NPS added text to chapter 2 in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section detailing the management of bison and vegetation communities present when the park was established.

CONCERN STATEMENT 56: One commenter stated that the text in the "American Indian Tribes and Ethnographic" section of the draft plan/EIS about white commercial hunting leading to a demise of western bison in not accurate.

RESPONSE: The NPS recognizes that colonial and tribal hunters extirpated bison from the southwestern portion of the GYA by 1840, including the Snake River plain west of the Continental Divide (Franke 2005; Schullery and Whittlesey 2006; Whittlesey and Bone 2020). Eventually, market hunting for bison hides by colonial and tribal hunters resulted in the near extinction of bison and the decimation of the American Indian Tribes that depended on them (Whittlesey and Bone 2020). The NPS did not make any changes to the final plan/EIS.

Vegetation

CONCERN STATEMENT 57: Commenters stated that an increase in the bison population would exacerbate the expansion of desert madwort in the Lamar Valley, which would be considered an impairment based on the Gardiner Basin experiment. One commenter noted that sites invaded with desert madwort cannot be restored. The commenter further noted that the implication in the draft plan/EIS that the establishment of desert madwort is related to climate change is incorrect, and that it is related to disturbance.

RESPONSE: The NPS revised the "Vegetation" section in chapter 3 of the final plan/EIS.

About 7,600 acres of arable land between Gardiner, Montana, and Reese Creek were added to YNP by 1941 for winter wildlife range. The area had been degraded through intensive livestock grazing, agriculture, and settlement. This Game Ranch addition was managed through the 1950s to provide winter forage for wildlife, including growing hay, irrigating, and widespread seeding of nonnative crested wheatgrass. These stewardship actions did not result in impairment at the time due to different interpretations and values of what constitutes good management of resources.

By the early 2000s, winter annuals including desert madwort, annual wheatgrass, and cheatgrass had invaded former agricultural fields, displacing crested wheatgrass in some cases. Contemporary policies of the NPS indicate that managers should implement restoration actions to alleviate such degradation where possible or manage these areas for educational and historical uses (USDOI, NPS 2006a). In 2005, the NPS, USFS, and Center for Invasive Plant Management convened a group of restoration specialists to develop recommendations for restoring native plant associations to about 1,200 acres (485 hectares) of former agricultural fields in YNP and nearby areas of the Custer Gallatin National Forest. Restoration efforts to restore native plant associations began during 2006 outside YNP and during 2008 within YNP. Restoration efforts have had variable success to date in restoring native plant assemblages.

Winter annuals, particularly desert madwort, are spreading into interior areas of the northern YNP, including the Lamar Valley. Bison both directly and indirectly increase the competitive advantage of invasive plants aiding their spread. NPS policies dictate "all exotic plant and animal species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if (1) control is prudent and feasible, and (2) the exotic species interferes with natural processes and the perpetuation of natural features, native species, or natural habitats" (USDOI, NPS 2006a, Section 4.4.4.2). The NPS will continue to act in managing winter annuals in accordance with policy.

An action constitutes impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise will be present for the enjoyment of those resources or values" (USDOI, NPS 2006a, Section 1.4.5). An impact on any park resources or values may constitute an impairment, but an impact is more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance (NPS 2006a Section 1.4.5).

Prior to signing a ROD, the NPS will prepare a non-impairment determination for resource topics analyzed in the plan/EIS, including vegetation.

CONCERN STATEMENT 58: One commenter stated that the establishment and spread of nonnative plant species is forecasted to increase under future climate conditions, which could threaten forage quantity and quality for all wildlife species in the park. The commenter requested the NPS give sufficient attention in the final plan/EIS to this issue. Commenters encouraged the NPS to prioritize monitoring and removal of invasive species and incorporate the threats of invasive species into the final plan/EIS. One commenter requested the NPS focus on habitat restoration (including native plant community restoration and riparian areas) and monitoring and provide specific measurements of plant species composition and structure as an important variable for managing habitat. One commenter stated that large populations of bison cause high levels of grazing and trampling, which results in the replacement of native plants with introduced plants and noxious weeds. This commenter further stated the NPS should analyze how bison numbers in the various alternatives affect exotic species to the detriment of native species.

RESPONSE: The NPS revised the "Vegetation" section in chapter 3 of the final plan/EIS to address these concerns. In addition, nothing in the plan/EIS precludes the NPS from considering habitat restoration where it is appropriate and feasible, and these actions would be evaluated through a separate planning process as it is outside the scope of this plan/EIS and does not meet the purpose of this plan. The NPS is dedicated to maintaining the natural integrity of plants, animals, ecosystems, and the processes that support them, emphasizing the minimization of human impact. In alignment with this commitment, the NPS gives precedence to natural processes, including allowing for natural variations in plant and animal populations and permitting natural landscapes to undergo disturbances and recover naturally. Consistent with NPS policies cited in response to other comments, the NPS would not manage nonnative vegetation in circumstances where removal is unfeasible.

CONCERN STATEMENT 59: One commenter requested the NPS consult or consider studies prepared by scientists with expertise in rangeland management. The commenter stated that the draft plan/EIS does not identify anyone with that type of specialty.

RESPONSE: The plan/EIS includes references prepared by rangeland scientists, including Fuhlendorf et al. 2012; Hunter et al. 2018; Moseley and Mundinger 2018; and Kauffman et al. 2023. The overwhelming majority of contemporary scientific research about vegetation in northern YNP was completed by professionals from outside this particular field of science.

CONCERN STATEMENT 60: Commenters stated that the estimates of "productivity" in functional grasslands in the draft plan/EIS are inaccurate. Commenters stated that the productivity is based on the aboveground net primary productivity (ANPP) of the grass component, which is confused with the total ecosystem productivity, and the ANPP is only a small fraction of the total ecosystem productivity. One commenter stated that the draft plan/EIS does not discuss the grazing impacts on belowground biomass or roots, which is a significant component of ecosystem productivity. The commenter further stated that the draft plan/EIS indicates that grazed plant communities would "maintain plant productivity, soil organic matter, and functioning energy, nutrient, and water cycles," which is a conclusion based on unpublished reports by Geremia and Hamilton 2019, 2022. The commenter noted that, to date, the public has not been able to access these internal NPS reports.

RESPONSE*:* NPS scientists measure net aboveground herbaceous primary production (NAP) using replicated exclosures that are moved sequentially through the growing season. Procedures are validated for measuring NAP in systems under grazing (Sala et al. 1988, McNaughton et al. 1996, Schoenecker et al. 2022) and validated by clipping and weighing vegetation. NAP includes the amount of plant tissue made from grasses, rushes, sedges, forbs, and non-woody sub-shrubs. NAP is measured in sites that are approximately 1 acre each across YNP. NPS scientists scale NAP estimates up to the entire park using remote sensing. Estimates do not include the amount of aboveground plant tissue made by woody species such as willows, aspens, sagebrush, and cottonwoods. NPS scientists do not measure belowground production. However, research in YNP confirmed that NAP is a reasonable approximation of total plant production (Frank et al. 2002) and root production has not been negatively impacted under natural grazing (Frank et al. 2002; Frank 2007). Similar findings have been reproduced in other naturally grazed systems throughout the world (Bardgett and Wardle 2003).

CONCERN STATEMENT 61: Commenters stated that the term "ecosystem engineer" used to describe the role of bison in the park should be removed in the plan/EIS. One commenter stated that the use of this term represents an anthropocentric characterization and greenwashing (i.e., making false or misleading claims about environmental benefits) compared to the true impacts of bison. In contrast, another commenter agreed with the term "ecosystem engineer," and provided scientific references for the beneficial role bison play in the local ecosystem by fertilizing the land, spreading native plants and encouraging plant development, creating water reservoirs from wallowing, supporting native bird species, causing ecological disturbances needed for balance, and promoting overall environmental equity.

RESPONSE: The Department of the Interior, Secretarial Order 3410, *Restoration of American Bison and the Prairie Grasslands*, includes an Interagency Bison Conservation Working Group Charter that references bison as "ecosystem engineers" that shape healthy and diverse ecological communities. The NPS agrees with this description and did not make any changes to the final plan/EIS.

CONCERN STATEMENT 62: Commenters stated that bison have had a particularly negative impact to the northern region of YNP, which should result in the NPS managing less bison in the park. Commenters requested the plan/EIS discuss the effects of soil trampling, compaction, and accelerated surface erosion. Commenters requested the plan/EIS discuss the spread of exotic grasses and other plants by bison, the widespread loss of riparian plant communities that would normally provide physical habitat and food resources for numerous terrestrial wildlife species, and the accelerated erosion of the banks of streams and rivers. The commenter stated that these actions adversely affect aquatic and amphibian habitats, as well as degradation of water quality from fecal deposition, bank erosion, and loss of riparian vegetation. It was suggested that this should be accomplished by looking at overall ecosystem impacts. One commenter stated that bison have a negative impact to stands of cottonwood, which are increasingly experiencing bark damage that exposes the underlying cambium due to horning and rubbing by bison. That commenter further stated that between 2012 and 2023 the proportion of Lamar Valley cottonwoods that experienced such bark damage increased from 32% to 55%, respectively. One commenter noted that the plan/EIS states that few bison management activities occur within or adjacent to floodplains or wetlands; however, bison in the northern range are currently creating significant effects on floodplains (repetitive grazing of forage plants throughout the growing season, increased bare ground from bison wallows, compaction of soils as bison repeatedly trail across floodplains in search of forage, accelerated spread of exotic plant species) and wetlands (trampling, post-holing, and mixing of wetland soils, intensive herbivory, fecal deposition). Additionally, commenters stated that natural springs are only mentioned once in the draft plan/EIS, but the natural springs in the vicinity of the Lamar Valley are heavily trampled by bison. Lastly, one commenter noted that the draft plan/EIS does not mention the direct and indirect effects of bison herbivory and trampling on riparian and aquatic systems. The draft plan/EIS does not mention direct and indirect effects on river morphology and water quality, any channel instabilities and erosion concerns related to the 2020 floods and their continued acceleration under all alternatives, or other factors that can affect the status and productivity of native fish communities in the Lamar River and its tributaries. One commenter suggested the NPS manage for a bison population that ensures utilization levels across the entire park remain at or below 40% to allow the native plant community an opportunity to reestablish and recover.

RESPONSE: The NPS revised the "Vegetation" section in chapter 3 of the final plan/EIS to address these concerns, focusing primarily on describing past and ongoing impacts to the vegetative community in the "Affected Environment" section to set an accurate baseline from which the NPS measures changes resulting from the range of alternatives. Although comments provided information on the historical state of vegetation in the park, the NPS notes that the baseline for measuring impacts in the plan/EIS is not the historical state of vegetative communities at the park, prior to larger populations of ungulates on the landscape. Rather, the baseline in this case is current conditions, consistent with 40 CFR 1508.1(g). The NPS includes a discussion in the plan/EIS of past actions that have impacted the current state of vegetation at YNP and included this in the cumulative effects analysis.

CONCERN STATEMENT 63: One commenter requested the NPS consider the use of passive restoration, which would entail removal, by managers, of bison that are causing degradation of riparian plant communities. Additionally, commenters requested that the NPS redraft the "Vegetation" section of the plan/EIS for the following reasons:

- This section of the draft plan/EIS treats vegetation primarily as a source of forage and bison as consumers of that forage; that is not how environmental consequences of high levels of bison herbivory and trampling should be addressed in the plan/EIS.

- There was no mention of any monitoring of woody species on hillsides (e.g., aspen, berry-producing shrubs, sagebrush) or within riparian areas (e.g., cottonwoods, willow, alder); a monitoring program for additional species in multiple ecotones should be considered.
- The term "intensively grazed" was not defined or described in the draft plan/EIS. The section summarizes the long-term impacts of elk "overgrazing" on deciduous woody plant communities (e.g., willows, cottonwoods, aspen) predominantly due to the intensive herbivory of elk; however, missing from the discussion is the fact that this "overgrazing" occurred during the seven decades of gray wolf absence.
- The draft plan/EIS ignores and understates the adverse impacts of a growing bison population on vegetation and waterways in and around the park. The draft plan/EIS claims an increase in the number of bison under Alternative 2 would "increase the production of grasses and health of soils." According to the commenter, the statement is both false and misleading, and forage productivity has been found to increase under light to moderate grazing but decrease under heavy grazing.
- The draft plan/EIS claims that the poor rangeland health and shift to a nonnative plant community within the park was caused by "heavy use by cattle and horses prior to 1905" and "cultivating and feeding hay" for bison between 1904 and 1952. It attributes some of the decline to excessive elk grazing and browsing between 1935 and 1968. According to the draft plan/EIS, none of the rangeland degradation or poor riparian health can be attributed to current management or an overabundance of bison, which is false.
- The draft plan/EIS attempts to absolve the NPS of responsibility for the native plant community and riparian habitat within and around the park by claiming the degradation is historical and irreversible.

RESPONSE: The NPS revised the "Vegetation" section in chapter 3 of the final plan/EIS to address these concerns.

CONCERN STATEMENT 64: One commenter stated that the use of "carrying capacity" is focused solely on food resources. The commenters notes that "carrying capacity" is defined as the maximum number of grazing animals that can be sustained without harm to the environment. The commenter states that current bison numbers are exceeding carrying capacity of the northern region of YNP due to widespread trampling, trailing, intensive grazing of woody plants, and the loss of riparian and aspen plant communities. The commenter requests the NPS identify a carrying capacity that will allow the recovery of woody plant communities.

RESPONSE: The NPS evaluated two assessments of carrying capacity in the plan/EIS and both estimates confirmed the number of bison considered under all alternatives was less than carrying capacity. Cougenhour (2005; also summarized in Plumb et al. 2009) estimated carrying capacity based on food limiting population growth. Geremia and Hamilton (2019) allocated forage to bison using Animal Units per Months (AUMs). The AUM approach to allocating forage utilizes a standardized measure, defining the amount of forage a 1,000-pound cow with or without a calf can consume in one month, to effectively manage and distribute grazing resources across various animal types and land areas. Geremia and Hamilton did not account for forage palatability, forage inaccessibility due to snow, or include Proper Use Factors by season, species, and geographic region to ensure even forage utilization, riparian area protection, and evenly distributed grazing. Geremia and Hamilton additionally evaluated the number of AUMs used by bison compared to the number available to them across the park. Even with around 5,000 bison, bison used fewer AUMs than available in about 80% of areas, used all available AUMs in about 10% of areas, and used more AUMs than available in about 10% of areas. A bison population of 5,000 animals would likely consume about 15% of total herbaceous plant material, leaving the rest available for other grazing animals. Such use is less than levels considered as benchmarks for sustainable livestock grazing on federal lands that leave sufficient forage for native herbivores and conserve long-term health and ecological integrity. As noted by the commentor, areas of trampling, trailing,

intensive grazing of woody plants and loss of riparian and aspen plant communities tended to occur where bison used more AUMs than were available to them. However, the NPS dismissed managing bison to recover hydrologic function and uniform grazing and managing for numbers of bison and vegetative communities present when the park was established in chapter 2 of this plan/EIS.

Yellowstone Bison

CONCERN STATEMENT 65: Commenters stated that the draft plan/EIS does not adequately acknowledge the FWS proposed action to consider Yellowstone bison as their own distinct population segment. They stated that this designation should be discussed further as it could influence future management actions.

RESPONSE: The FWS conducts Species Status Assessments to provide biological information, analyses, and predictions to support decisions pursuant to the ESA. An assessment begins with the compilation of information on the species in the wild, including natural history and ecological needs, and then describes the current condition of the species, including its current abundance and distribution, demographics and conditions of habitats, and genetic diversity. The assessment addresses the conservation biology principles of resiliency, redundancy, and representation, and forecasts the viability of the species over time given various scenarios of future environmental conditions and conservation efforts. The NPS has provided substantial information relevant to the status review of Yellowstone bison to the FWS for them to determine whether these bison constitute a distinct population segment, are threatened or endangered, and have sufficient resiliency, redundancy, and representation. The FWS developed a National Listing Workplan for addressing domestic listing and critical habitat decisions under the ESA. The FWS added Yellowstone bison to its workplan for fiscal year 2026 (USDOI, FWS 2023). At this time, no decision has been made regarding the listing of Yellowstone bison and for this reason would not influence NPS management actions. If the status of Yellowstone bison changes, the NPS would work closely with FWS on the management of this species.

CONCERN STATEMENT 66: Commenters requested the NPS explain the historic genetics of Yellowstone bison. Commenters specifically noted the varying science on the topic of a single intermixing population of bison or genetically distinct subpopulations and requested additional studies involving population structure and genetic diversity based on both mtDNA and nuclear genetic diversity assessments. Commenters asked other genetic questions, including whether a new review of genetics could be used to reconsider a minimum population range, and whether interactions between bison from Grand Teton National Park and the park affect the genetics of the herd. One commenter stated that there was a lack of analysis and disclosure regarding the condition of the central herd, which the commenter noted is the most threatened by hunting and is in danger of extinction.

RESPONSE: Archeological evidence indicates bison have lived in the GYA for more than 10,000 years, and historical narratives suggest they were abundant and widely distributed into the 1830s (Cannon et al. 2020; Whittlesey and Bone 2020). Bison were much more numerous at lower elevations in river valleys and on the surrounding plains, but many apparently migrated into the mountains during summer to access nutritious forage, and a smaller number lived year-round in the mountains, including the area encompassed by present-day YNP (Cannon et al. 2020; Whittlesey and Bone 2020). Numbers of bison using mountainous areas, like present-day YNP, may have increased when bison were being hunted to near extinction. Around 1,000 animals were estimated within the park near the time of establishment in 1872 (Meagher 1973). About 600 bison were reported in 1880 as poaching reduced numbers (NPS 1880; Meagher 1973). By 1902, only 23 bison were counted in the park. To preserve this population, additional bison were brought in from private ranches. Concern Statement 13 further details the history of bison brought into the park between 1092 and 1936, and the movement of these bison throughout the park in the following years. As noted in that concern statement, today, all Yellowstone bison roam relatively freely within YNP. For information on concerns related to genetic diversity, see Concern Statement 13.

Allelic diversity, or the number of different genes at each locus, is important to protect adaptive potential of a species (Allendorf 1986). Loci with large numbers of different genes require larger population sizes to maintain allelic diversity. Based on microsatellites, Yellowstone bison have loci that vary from 3 to 10 different genes (Halbert et al. 2012). Simulation models suggest that conservation of greater than 95% of allelic diversity at loci with more than 5 alleles requires a populations size greater than approximately 3,250 and removal of mainly or only juveniles (Pérez-Figueroa et al. 2012). This estimate accounts for genetic drift but does not account for genetic mutation. However, genetic drift (changes by random chance), not mutation, is the force that overwhelmingly influences allelic diversity in isolated populations. An isolated population is one where there is not introduction of new, unique genetic material through dispersing animals from other populations. Yellowstone bison are an isolated population where there is no known introductions of new animals since 1902 when 21 bison were brought to the park. Greater genetic loss could occur if intermixing and gene flow ceases between the two primary breeding herds, but current analysis supports significant gene flow presently (Stroupe et al., submitted).

Chapter 2 of the final plan/EIS was updated to reflect this information. Presently, the NPS is collaborating with the USDOI Bison Working Group, the US Geological Survey, and other scientists to monitor existing genetic conditions, define objectives for maintain genetic health, and evaluate new tools to monitor genetic conditions. The NPS is not aware of any substantial interaction between bison in YNP and bison in Grand Teton National Park. For this reason, an analysis of genetics of bison occupying Grand Teton National Park is outside the scope of this plan/EIS.

CONCERN STATEMENT 67: One commenter stated that at the June 29, 2023, meeting with YNP, the state requested an opportunity to review YNP information relating to bison grazing, genetics, and immunocontraception and that YNP committed to providing that information. The commenter stated that, to date, this science has not been provided by the NPS.

RESPONSE: The NPS made this commitment and continues to commit to data-sharing and scientific collaboration with the state. On July 1, 2023, a MFWP biologist requested information on bison grazing effects and genetics and the NPS provided the following reports and publications that day via email:

Forgacs, D., R. L. Wallen, L. K. Dobson, and J. N. Derr. 2016. Mitochondrial genome analysis reveals historical lineages in Yellowstone bison. PLoS ONE 11:0166081.

Geremia, C., and W. E. Hamilton. 2019. The effects of bison grazing and their movements on grasslands in northern Yellowstone. Technical report, Yellowstone National Park, Mammoth, Wyoming.

Hobbs, N. T., C. Geremia, J. Treanor, R. Wallen, P. J. White, M. B. Hooten, and J. C. Rhyan. 2015. State-space modeling to support adaptive management of brucellosis in the Yellowstone bison population. *Ecological Monographs* 85: 525-556.

Kamath, P. L., J. T. Foster, K. P. Drees, G. Luikart, C. Quance, N. J. Anderson, P. R. Clarke, E. K. Cole, M. L. Drew, W. H. Edwards, J. C. Rhyan, J. J. Treanor, R. L. Wallen, P. J. White, S. Robbe-Austerman, and P. C. Cross. 2016. Disease transmission among wildlife and livestock in the Greater Yellowstone Ecosystem revealed by genomics. *Nature Communications* 7: 11448.

Geremia, C., J. A. Merkle, M. Hebblewhite, D. R. Eacker, R. L. Wallen, P. J. White, and M. J. Kauffman. 2019. Yellowstone bison engineer the green wave. Proceedings of the National Academy Sciences 116: 25707-25713.

Stroupe, S., D. Forgacs, A. Harris, J. N. Derr, and B. W. Davis. 2022. Genomic evaluation of hybridization in historic and modern North American bison (Bison bison). *Nature Scientific Reports* 12: 6397.

CONCERN STATEMENT 68: Commenters stated that the plan/EIS incorrectly labels bison as livestock when discussing the Stephens Creek Administrative Area.

RESPONSE: The livestock referred to in the plan/EIS are the horses or mules used to support park-wide operations, not bison. For this reason, no change was made to the final plan/EIS.

CONCERN STATEMENT 69: Commenters stated that the discussion of the 2020 National Academies of Sciences, Engineering, and Medicine publication *Revisiting Brucellosis in the Greater Yellowstone Area* in the draft plan/EIS is incorrect. Commenters stated that the 2020 study does not recommend abandonment of disease management actions in bison. The commenter stated that the 2020 National Academies of Sciences, Engineering, and Medicine study states that for free-ranging bison and elk, appropriate and cost-effective vaccine delivery systems would be critical. The commenter stated that maintaining an emphasis on vaccination of bison is important.

RESPONSE: The NPS has extensively considered remote vaccination (2014 Remote Vaccination EIS) and APHIS investigated immunocontraception. The development of new vaccines and delivery technologies should occur in controlled experiments, not tried ad hoc on the Yellowstone bison population. The Centers for Disease Control and Prevention (CDC) and APHIS consider the bacteria Brucella abortus a select agent and toxin because it has the potential to pose a severe threat to human and animal health, plant health, or animal and plant products. These rules restrict the use of the field strain of this bacterium in scientifically controlled laboratory research and large animal studies in outdoor containment spaces. In January 2021, the CDC issued a draft policy statement on "Biosafety for Large Animal Study-Related Activities with Brucella abortus and Brucella suis Using Outdoor Containment Spaces" (*Federal Register* 86:3987–3988, *Federal Register* 86:4079–4080). If this policy is eventually adopted, research on brucellosis suppression techniques could occur in facilities outside YNP. The NPS would consider providing APHIS or other parties with some Yellowstone bison for such research. Any brucellosis suppression techniques developed during such research would not be implemented as part of operations on Yellowstone bison until they are proven effective without significant adverse effects, additional NEPA compliance is conducted, and tools become available to eliminate brucellosis in elk as recommended by the National Academies of Sciences, Engineering, and Medicine in a 2017 evaluation of brucellosis in the GYA.

The recommendations made by the National Academies of Sciences, Engineering, and Medicine referenced in the comment letter and in the plan/EIS (https://nap.nationalacademies.org/catalog/24750/revisiting-brucellosis-in-the-greater-yellowstone-area) are provided below to show they were not misrepresented (emphasis added):

1. **To address brucellosis in the GYA, federal and state agencies should prioritize efforts on preventing *B. abortus* transmission by elk.**
2. In making timely and data-based decisions for reducing the risk of *B. abortus* transmission from elk, federal and state agencies should use an *active* adaptive management approach that would include iterative hypothesis testing and mandated periodic scientific assessments.
3. Use of supplemental feed grounds should be gradually reduced.
4. **Agencies involved in implementing the IBMP should continue to maintain a separation of bison from cattle when bison are outside YNP boundaries**.
    - "Removal of bison for population management purposes could target *B. abortus*-infected individuals if further reducing the prevalence of brucellosis is a goal; however, **until tools become available that would simultaneously allow for an eradication program in elk, additional aggressive control measures in bison seem unwarranted**."
5. In response to an increased risk of brucellosis transmission and spread beyond the GYA, APHIS should take the following measures:

A: Work with appropriate wildlife agencies to establish an elk wildlife surveillance program that uses a modeling framework to optimize sampling effort and incorporates multiple sources of uncertainty in observation and biological processes.

B: Establish uniform, risk-based standards for expanding the DSA boundaries in response to finding seropositive wildlife. The use of multiple concentric DSA zones with, for example, different surveillance, herd management, biosecurity, testing, and/or movement requirements should be considered based on differing levels of risk, similar to current disease outbreak response approaches.

C: Revise the national brucellosis surveillance plan to include and focus on slaughter and market surveillance streams for cattle in and around the GYA.

6. All federal, state, and tribal agencies with jurisdiction in wildlife management and in cattle and domestic bison disease control should work in a coordinated, transparent manner to address brucellosis in multiple areas and across multiple jurisdictions.

7. The research community should address the knowledge and data gaps that impede progress in managing or reducing risk of *B. abortus* transmission to cattle and domestic bison from wildlife.

Other Wildlife

CONCERN STATEMENT 70: Commenters questioned the accuracy of the draft plan/EIS statement that the alternatives would have negligible impacts on aquatic resources given the impact bison have when walking and grazing along the Lamar River. Commenters stated that the draft plan/EIS fails to analyze and disclose impacts to migratory birds, songbirds, raptors, small mammals, invertebrates, reptiles, riparian conditions, hydrologic conditions, and beaver activity and recovery under each alternative. Another commenter expressed concern about cutthroat trout, stating the NPS should consider the impact on Yellowstone Lake's cutthroat trout fishery and downstream fisheries that are likely to receive more whirling disease exposure owing to more bison and their impacts on the environment.

RESPONSE: The NPS added a section to appendix C of the final plan/EIS addressing impacts to other wildlife. The NPS added information to the "Aquatic Resources" section of appendix C to address concerns related to native fish species in the park. The NPS revised the "Vegetation" section of chapter 3 to better address effects to riparian habitats.

CONCERN STATEMENT 71: One commenter stated that the plan/EIS should analyze bison habitat needs, specifically habitat connectivity and forage quality and quantity within and adjacent to the park. The commenter requested that desired conditions be disclosed, and each alternative should discuss how it meets the desired conditions. The commenter also suggested that the plan/EIS address general ecological conditions, community trends, and desired conditions for other wildlife and plant species known or predicted to occur within habitat used by bison.

RESPONSE: In chapter 2 of the plan/EIS, in the section "Actions Common to All Alternatives," the NPS states what ecological objectives it would manage for and includes a discussion of habitat conservation and enhancement, as well as forage production and grazing research. These sections include a discussion of actions to promote forage quality and quantity and actions on adjacent lands that would work to conserve and enhance habitat as well as promote habitat connectivity. The current and expected future condition of resources affected by actions proposed in the plan/EIS are included in chapter 3, which also discusses trends that would affect each resource. Regarding the commenter's request to include desired conditions, desired conditions are not required in an EIS, and a comparison to achieving those desired conditions is also not required. For these reasons, the NPS did not revise the final plan/EIS.

CONCERN STATEMENT 72: Commenters stated that the draft plan/EIS fails to analyze impacts of brucellosis transmission from bison to elk. Commenters stated that the draft plan/EIS misinterprets one of the main points of wild bison-elk interaction, being that "animal visitors to organ piles prolong and increase the statistical chances for brucellosis and other viral and bacterial (tuberculosis) disease transmission to other animals and humans."

Commenters stated that bison carcasses spread brucellosis to the elk, and the elk spread it to the cattle. This commenter states that the plan/EIS should analyze that vector of transmission.

RESPONSE: Chapter 3 of the plan/EIS addresses impacts to wildlife, including elk, from the alternatives. This section includes an analysis of brucellosis prevalence in elk. Each alternative includes an analysis of brucellosis transmission from bison to elk. Regarding the spread of brucellosis from elk to cattle, chapter 2 of the plan/EIS in the "Alternatives and Alternative Elements Considered but Dismissed from Detailed Analysis" section details an alternative that would manage elk to substantially decrease or eradicate brucellosis and prevent mingling with cattle. For these reasons, the NPS did not make revisions to the final plan/EIS.

CONCERN STATEMENT 73: Commenters stated that abundant bison are suppressing the regeneration of some riparian habitats in northern portion of the park, and that the recovery of riparian plant communities represents a fundamental prerequisite for return of beaver to the northern range. Commenters stated that increasing beaver presence should be a fundamental priority of the NPS, not only because they were once widely distributed and that doing so would be consistent with the NPS mission statement, but because beavers provide a wide range of ecological benefits.

RESPONSE: Impacts to vegetation and the resulting indirect effects to habitat for beaver are included in chapter 3 of the final plan/EIS in the "Vegetation" section. Additionally, the NPS included section on other wildlife in appendix C providing a rationale for why it did not carry forward beaver for detailed analysis in the final plan/EIS. The NPS discusses issues that are driving management concerns in chapter 1 of the plan/EIS. These concerns resulted in the purpose and need of the plan which sets the scope of the plan/EIS and the range of alternatives. The purpose and need of the plan focuses on the management of bison, not beaver. Nothing in the plan/EIS precludes the NPS from addressing beaver management in the future, but the NPS need not address this in this plan/EIS because it is outside the scope.

CONCERN STATEMENT 74: Commenters stated that by removing or slaughtering bison, the NPS has created an unquantified subsistence loss for predators and other ecosystem components (i.e., plants, fungi, insects, scavengers) within the Yellowstone ecosystem. One commenter specifically raised concern with regards to grizzly bear recovery, stating that the NPS needs to consult with the FWS to obtain a "take permit" for the loss of a food source that might otherwise contribute to grizzly bear recovery. Another commenter stated that NPS management actions and bison migration out of the park in the winter results in food scarcity for wolves. The commenter further stated that the Yellowstone ecosystem is being impoverished by removing so many bison for so many years.

RESPONSE: Management removal of bison undoubtedly results in some loss of energy and nutrients. In YNP, there is no evidence that predator species like grizzly bears are food-limited and, when the grizzly bear was listed under the ESA in 1975, it was not due to lack of bison as a food resource but rather threats from increasing human activity (USDOI, FWS 1975). Populations of cougars, grizzly bears, and wolves have continued their recovery in YNP and surrounding areas since the 2000 IBMP ROD during which substantial bison removals occurred. In September 2012, the NPS reinitiated consultation with the FWS on the hazing of Yellowstone bison as part of the IBMP and its potential effects on threatened grizzly bears, as well as new information on key grizzly bear foods. The NPS estimated similar numbers of bison carcasses were available to grizzly bears before and after implementation of the IBMP. The NPS will complete its consultation with the FWS on actions proposed in this plan/EIS prior to signing a ROD.

Alternatives 2 and 3 would increase the number of bison on the landscape, not decrease it. As stated in the plan/EIS, chapter 3, with more bison on the landscape, there could be more carcasses available for grizzly bears, lynx, wolves, and wolverines, which would indirectly support plants, fungi, insects, and other scavengers. Evidence suggests that soil carbon and nitrogen inside areas excluded from elk, deer, and bison for over 60 years is similar to areas outside these exclosures (Frank and Groffman 1998; Chuckran and Frank 2013). Most nutrients consumed by bison are recycled through urine and dung. Migratory animals also play a critical role in transporting these nutrients across the landscape. For these reasons, the NPS disagrees that any of the alternatives would disrupt the long-term availability of nutrients on the landscape.

Socioeconomics

CONCERN STATEMENT 75: Commenters stated that while the socioeconomic section of the draft plan/EIS focuses primarily on tourism and the potential impact of spreading brucellosis to cattle farms, the draft plan/EIS needs to address the economic impacts of bison grazing on the long-term health, diversity, and sustainability of the native plant community in and around the park (i.e., invasive plant species replacing native plant communities within the park spreading to neighboring lands; impacts to aquatic health downstream). The commenter suggested that the indirect impacts of bison grazing would particularly impact groups who rely on the health of surrounding rangelands and water for their livelihoods.

RESPONSE: The NPS addresses direct and indirect impacts to vegetation, including nonnative plants, in chapter 3 of the plan/EIS in the "Vegetation" section. The NPS recognizes the interconnectedness of the GYA ecosystem; however, there is nothing to indicate that bison management would affect the health of or cause changes to surrounding rangelands, aquatic health, and water resulting in socioeconomic impacts. Additionally, the commenter did not submit documentation or literature to support these claims. Therefore, the NPS did not make any changes to the final plan/EIS.

CONCERN STATEMENT 76: One commenter requested that the "Food Insecurity" section in the plan/EIS discuss whether there could be negative impacts on food insecure households from decreasing or ceasing the shipment of bison to slaughter as planned under Alternatives 2 and 3.

RESPONSE: Any reduction in available meat from transfer for processing would be offset by the increase in bison placed in the BCTP and resulting meat available to American Indian Tribes. With this offset, negative impacts are not expected. This information is stated in chapter 3 of the final plan/EIS.

CONCERN STATEMENT 77: One commenter stated that livestock producers in the GYA operate under restrictions imposed by the Brucellosis Designated Surveillance Zone, which adds additional time, expense, and stress to their businesses because of bison.

RESPONSE: The NPS does not dispute that livestock producers incur additional time and expense due to operating in the DSA for brucellosis. However, brucellosis is spreading in elk throughout the GYA, and genetic data indicate elk have infected cattle herds with brucellosis at least 27 times since 1998 with no transmissions attributed to bison (National Academies of Sciences, Engineering, and Medicine 2020). As a result, in 2010 the state established a DSA for brucellosis defined by occurrence of the disease in elk, not bison (MDOL 2011). Elk exposed to brucellosis now inhabit an area encompassing about 17 million acres, and the current spread is not linked to Yellowstone bison or elk, but rather other lineages in elk (Kamath et al. 2016). There is one lineage of Brucella (brucellosis) bacteria in bison and northern Yellowstone elk that range from YNP to the southern Paradise Valley. This lineage has not spread west of the park even though bison and elk mix in this area (Kamath et al. 2016). Control measures in bison would not affect the dynamics of unrelated Brucella abortus strains in elk elsewhere (Kamath et al. 2016). As a result, the National Academies of Sciences, Engineering, and Medicine (2020) recommended prioritizing efforts on preventing brucellosis transmission by elk, while maintaining separation between

bison and cattle. It also recommended not using aggressive control measures on bison until tools became available for an eradication program in elk.

Health and Safety

CONCERN STATEMENT 78: Commenters expressed concern over the safety of bison hunting in Beattie Gulch. Commenters stated that in January 2023, an incident occurred where a bullet fragment from a shot to a bison allegedly accidentally struck a nearby man and caused non-life-threatening injury, and commenters fear similar incidents may occur in the future. One commenter stated that because the NPS would rely on hunting outside the park to regulate bison numbers, each alternative's safety impacts for shooters, residents, and visitors in and near Beattie Gulch should be analyzed, and that NEPA requires analysis of the shooting under 40 CFR § 1502.21d and 1502.16a(2). This commenter also suggested that the NPS should consider the impacts of hunters that do not comply with the USFS's "Clean Zone" and hunters that shoot at night. The commenter stated the plan/EIS is required to address this impact as this is a connected action related to NPS management actions within the park. Commenters also questioned the accuracy of the safety measures explained in the draft plan/EIS that Custer Gallatin National Forest takes to improve public safety, because evidence of the violation of these safety measures is present (i.e., gut piles remain, continued shooting, and illegal hunting is still performed). One commenter felt there were discrepancies between the NPS saying it has a responsibility to provide tribal hunting opportunities outside the park, but the NPS does not have responsibility for safety outside the park for residents.

RESPONSE: The NPS does not have regulatory authority or jurisdiction over hunts or other management actions that occur outside YNP (16 USC 24, 54 USC 100101, USDOI, NPS 2006a). The NPS cannot require hunters (including tribal treaty hunters) to follow Montana or tribal hunting regulations and illegal hunting outside the park is not a federal action. Additionally, some treaty hunting regulations administered by American Indian Tribes allow for 24-hour hunting, which the NPS has no control over.

In chapter 2, the NPS includes an overall objective of protecting human safety and property, stating that the NPS would work with its partners to reduce and alleviate conflicts with livestock, people, and property.

As stated in the plan/EIS, in April 2019, the IBMP agencies met with the Bear Creek Council (2019a) and other residents for a field trip to the Beattie Gulch and Eagle Creek areas and more discussion the following day. Residents shared concerns about the hunt, and attendees brainstormed solutions to increase the safety of hunters and residents. In July 2019, the Bear Creek Council presented recommendations to the IBMP agencies for consideration. The IBMP agencies considered these recommendations and have taken several actions in response, including closing areas near residences and roads to hunting and requiring hunters to place unused parts of carcasses at least 150 yards (137 meters) from roads and homes. In addition, there is coordination among hunting parties, oversight by law enforcement officers, and the designation of a "lead hunter" in each party to implement safe practices and good decision-making in tribal hunting groups. These actions should reduce the likelihood of injuries to hunters, residents, or visitors traveling on Old Yellowstone Trail South Road.

Hunting outside the park is not a connected action as defined at 40 CFR 1501.9(e) that requires analysis in this plan/EIS. Hunting is regulated by the state and, where applicable, American Indian Tribes, and is carried out in a manner of choice by individual hunters. It is not automatically triggered by or dependent on this plan/EIS, nor does the NPS have jurisdiction to regulate any aspect of hunting outside the park. The NPS has met its obligations under NEPA to disclose reasonably foreseeable effects, including those indirect effects that may occur outside the park.

CONCERN STATEMENT 79: Commenters requested the NPS address the following impacts resulting from carcasses and gut piles in Beattie Gulch:

- Impacts to endangered species and Bald and Golden Eagles, both from gut piles on the landscape in general, and lead bullets in the gut piles.
- Impacts to human health from the spread of diseases, noting that the NPS should include an analysis of gut-pile infectiousness with a differentiation between different times of year.
- Impacts to human safety from the attraction of wolves, bears, and other scavengers into the area.
- Gut-pile quantity and disposal across alternatives.

One commenter suggested that an agreement should be made among the federal, state, tribal, and private interests to ensure the prompt and safe disposal of gut piles. Lastly, one commenter stated that NPS violated the ESA by failing to consult and disclose impacts to ESA listed species from bison carcasses in Beattie Gulch, on national forest land.

RESPONSE: The NPS added text to the final plan/EIS in chapter 3 to address indirect effects of hunting outside the park.

The USFS and other IBMP agencies have taken several actions in response to hunting impacts, including closing areas near residences and roads to hunting and encouraging hunters to place unused parts of carcasses certain distances from roads and homes.

Hunters also are instructed to spread stomach contents on the ground to reduce attractions to scavengers. Other risk mitigation methods, such as incineration of remains and trucking remains to local landfills, are being considered by IBMP members and nongovernmental organizations (IBMP Subcommittee 2020). In 2023, staff from the Custer Gallatin National Forest, the state, the FWS, and members of the Shoshone-Bannock Tribes, removed gut piles and other parts from bison harvested in Beattie Gulch to reduce the chance of grizzly bears congregating in the area. Neither the USFS, American Indian Tribes, nor the state have yet to require additional safety measures or the removal of gut piles in Beattie Gulch, but these types of actions would be determined by those agencies and not the NPS as this is outside the jurisdiction of the NPS.

In addition, there is coordination among hunting parties, oversight by law enforcement officers, and the designation of a "lead hunter" in each party to implement safe practices and good decision-making in tribal hunting groups. These actions should reduce the likelihood of injuries to hunters, residents, or visitors traveling on Old Yellowstone Trail South Road. American Indian Tribes hunting outside the park pursuant to treaty rights hunt under individual tribal regulatory and season frameworks. Montana regulates public hunts outside the park. In 2022, the Nez Perce Tribe presented a position paper on use of non-lead ammunition during tribal bison hunts to IBMP partners. This presentation included options for purchasing discounted non-lead ammunition and a recommendation to all treaty American Indian Tribes to adopt hunt regulations requiring non-lead ammunition. MFWP currently has no regulatory requirement for use of non-lead ammunition during state big-game hunts in Montana. In 2011, research on the persistence of Brucella on birth materials was conducted by MFWP and APHIS.

The NPS will complete consultation with the FWS regarding its action and effects to threatened and endangered species prior to signing a ROD. A private individual hunting bison outside the park is not a "federal action" under Section 7 of the ESA. The NPS can only consult with the FWS on actions it "authorizes, funds, or carries out" under ESA section 7(a)(2). The NPS does not authorize, fund, or carry out hunting bison outside the park.

CONCERN STATEMENT 80: Commenters expressed concern over close encounters between bison and park visitors. Commenters suggested that the park advisory distance of keeping 25 yards from bison should be increased. Commenters suggested increasing ranger presence, imposing significant fines, and running educational programs to discourage visitors from approaching bison.

RESPONSE: The NPS will consider these suggestions, and nothing in the plan/EIS precludes the NPS from implementing such changes where warranted.

Climate Change

CONCERN STATEMENT 81: One commenter noted that the following statement in the draft plan/EIS is not accurate: "The proposed bison management alternatives would not affect climate change but could be affected by climate change." This commenter stated that infiltration capacity and total water-holding capacity of soils are reduced when compacted, which this commenter states is happening in northern YNP. The commenter stated that this can exacerbate warmer and drier conditions associated with climate change. One commenter noted that current levels of bison are diminishing landscape carbon storage/stocks through the loss of forest ecosystems and conversion to grasslands, notably aspen and cottonwood forests, shifting them from carbon sinks of greenhouse gas (GHG) to sources, causing the emission of GHG into the atmosphere.

The commenter stated that the draft plan/EIS did not consider the CEQ interim GHG guidance or US Department of the Interior Secretarial Order 3399, which directs agencies to consider GHG emissions and the social cost of carbon. The commenter stated that current levels of bison in northern YNP are diminishing landscape carbon storage/stocks through the loss of forest ecosystems and degradation of riparian areas. The commenter cited Kauffman et al. 2022[2] when discussing impacts to carbon stores from large herbivore use. The commenter quantified the GHG emissions from bison including the social cost of carbon as follows:

- Enteric fermentation emissions from bison average 82.2 kilograms methane/head/year (USEPA 2018[3]). Using a 20-year global warming potential for methane suggests that bison emit an equivalent of 7.07 tons of carbon dioxide equivalent per year. Therefore, the commenter stated that 5,000, 6,000, and 7,000 bison would emit 35,000, 42,000, and 49,000 tons of carbon dioxide equivalent per year only through enteric fermentation.
- The commenter stated that manure deposition would increase the above numbers. The NPS could use a social carbon cost (SCC) of $51 per ton of carbon dioxide equivalent; however, a more recent SCC of $19 per ton of carbon dioxide has been recommended by the US Environmental Protection Agency. The SCC to future generations would be $6.8 million/year for 5,000 bison, $7.8 million/year for 6,000 bison, and $9.2 million/year for 7,000 bison.

Lastly, the commenter submitted a visual comparison of soils in YNP meant to illustrate a decline in soil carbon from grazed sites.

RESPONSE: The NPS removed the following text from the final plan/EIS in chapter 1: "The proposed bison management alternatives would not affect climate change but could be affected by climate change."

The commenter requested the NPS address GHG emissions and the SCC from bison on the landscape. The NPS is not aware of available information or data to complete a full quantification of GHG emissions for native wildlife species within native ecosystems, and therefore cannot complete a SCC analysis, as further detailed below. Quantitative assessment would require monthly monitoring of carbon fluxes over multiple years across all habitats of YNP to determine the amount of carbon sequestered by the ecosystem and carbon methane equivalents of all wild ruminants using YNP. Because a full quantification of GHG

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[2] Kauffman J.B., Beschta R.L., Lacy P.M., and Liverman M. 2022. Livestock on public lands of the western USA accentuate effects of climate change: Implications for mitigation and adaptation. Environmental Management. https://doi.org/10.1007/s00267-022-01633-8.

[3] US Environmental Protection Agency. 2018. A-250. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016. United States Environmental Protection Agency. https://www.epa.gov/sites/production/files/2018-01/documents/2018_annex_3_-_part_b.pdf

emissions and the SCC is not possible, the NPS included a qualitative discussion of climate considerations in appendix C of the final plan/EIS.

The commenter requested the NPS address Secretarial Order 3399 and the CEQ's interim NEPA Guidance on Considerations of GHG and Climate Change in the final plan/EIS (USDOI 2021, CEQ 2023). Both are now cited in appendix C of the final plan/EIS. The NPS disagrees with the commenter's assertion that these two guidance documents require the NPS to include a quantification of GHG emissions and the SCC in the plan/EIS. Secretarial Order 3399 states that, "when considering the impact of GHG emissions from a proposed action, Bureaus/Offices should use appropriate tools, methodologies, and resources available to quantify GHG emissions and compare GHG quantities across alternatives. When quantifying GHG emissions is not possible because tools, methodologies, or data inputs are not reasonably available, Bureaus/Offices will provide a qualitative analysis and the rationale for determining that a quantitative analysis is not warranted" In its interim guidance, CEQ recommends that "agencies quantify a proposed action's projected GHG emissions or reductions for the expected lifetime of the action, considering available data and GHG quantification tools that are suitable for the proposed action" CEQ gives agencies the latitude to discuss GHG emissions and impacts in a qualitative rather than quantitative analysis when it lacks the tools necessary to fully quantify GHG emissions. Any consideration of biological GHG, which would apply to this plan/EIS, is addressed under the Special Considerations for Biological GHG Sources and Sinks section of the interim guidance. Secretarial Order 3399 and CEQ's interim guidance allow agencies discretion in selecting appropriate analysis tools and metrics for decisions that affect biological sources and sinks of GHG, which is the case with actions proposed in this plan/EIS.

In support of the commenter's assertion that GHG emission calculations and an SCC analysis are required, the commenter presented an analysis of the GHG emissions and SCC from enteric fermentation on the landscape resulting from bison. The commenter incorrectly assumed that the baseline for an analysis is no bison on the landscape. The no-action alternative (Alternative 1) serves as the baseline against which the proposed action and other alternatives are compared. Under Alternative 1 (the no-action alternative), the NPS expects bison would range between 3,500 and 5,000 after calving; under Alternative 2, between 3,500 and 6,000; and under Alternative 3, between 3,500 and 7,000. These alternatives show a possible increase of up to 2,000 bison on the landscape after calving. For these reasons, the NPS did not include the commenter's GHG emissions calculations or SCC analysis in the final plan/EIS.

The commenter used the Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3, Part B (USEPA 2018) and Kauffman et al. (2022a) to quantify GHG emissions and the SCC from bison. These documents discuss enteric fermentation from livestock, including bison managed as livestock. Yellowstone bison are not considered livestock and are considered a native, wild, migratory species within their native range. For this reason, applying enteric fermentation estimates developed for livestock as the sole measure to quantify GHG emissions would be inappropriate for Yellowstone bison. Even if the NPS had available data to complete an SCC analysis, the commenter's SCC analysis is flawed as it relies on literature primarily focused on livestock grazing (Kauffman et al. 2022a) and only considers a small fraction of the GHG/carbon cycling in the system. The NPS did not find this information relevant to the plan/EIS and thus is did not include it in the final plan/EIS.

The commenter stated that Yellowstone bison are a managed wildlife species, like livestock. As noted in the plan/EIS, the management of bison is a complicated topic. Per statute and policy, the NPS manages wildlife populations to sustain them in their natural condition and support ecological processes. For this reason, to the extent feasible, bison move freely and unpursued within the interior of the park with their behavior, movements, reproductive success, and survival primarily affected by their decisions and natural selection. Brucellosis in bison concerns livestock producers, as discussed in the plan/EIS. These concerns have influenced the management of bison and constrained their distribution across the GYA and elsewhere. Bison are allowed to migrate from YNP during winter and spring into relatively small management (tolerance) areas in Montana adjacent to the northern and western boundaries of YNP. While

in the park, the NPS exerts little control over the behavior, movement, reproductive success, and management of bison. For these reasons, the NPS does not believe Yellowstone bison are managed like livestock and does not believe the literature presented by the commenter specific to impacts from livestock is relevant.

The NPS is not aware of available information or data to complete a full quantification of GHG emissions associated with bison impacts on natural carbon cycling in native ecosystems. This would be an incredibly complex analysis that involves numerous ecosystem processes and feedback loops. Additionally, it is not clear that Yellowstone bison are responsible for the ecosystem changes and/or declines cited by the commenter, as observed declines or ecosystem changes may also be attributed to other stressors, including (but not limited to) historic land management practices and climate change. The NPS is proposing only minor increases in bison numbers compared to the no-action alternative; an increase of 1,000 bison compared to the no-action alternative under Alternative 2; and a potential increase of 2,000 bison under Alternative 3. It is unlikely that any quantification of GHGs resulting from the action alternatives would demonstrate a meaningful contribution to climate change. Because a full quantification of GHG emissions and the SCC is not possible, the NPS included a qualitative discussion of climate considerations in appendix C of the final plan/EIS, consistent with guidance from Secretarial Order 3399 and CEQ's interim guidance.

Lastly, the commenter asserted that current bison levels in northern YNP are diminishing landscape carbon storage/stocks from changes to vegetation and soil composition. The commenter presented a visual comparison of soils in YNP meant to illustrate a decline in soil carbon from grazed sites. The revised "Vegetation" section in chapter 3 of the final plan/EIS discusses the current and expected future condition and impacts from bison management on wet grassland habitats, riparian areas including aspens and cottonwoods, sagebrush-steppe ecosystems, and wetlands. Within chapter 3 of the "Vegetation" section of the final plan/EIS, the NPS presents quantitative data regarding soil carbon, which the NPS believes better serves the analysis than the photos presented by the commenter.

CONCERN STATEMENT 82: One commenter encouraged the NPS to discuss any measures it has developed to provide for diverse, healthy ecosystems that are resilient to climate stressors, as well as discuss actions to improve adaptation to changing environmental conditions. Commenters stated that the NPS needs to identify ways to mitigate impacts that may be exacerbated by climate change and prepare a mitigation plan.

RESPONSE: The NPS updated the "Habitat Conservation and Enhancement" section of chapter 2 in the final plan/EIS to address this concern.

NEPA Process

CONCERN STATEMENT 83: One commenter suggested the NPS prepare a supplemental plan/EIS that addresses how current and projected levels of bison use are exacerbating the effects of climate change on park resources and how bison uses may affect the capacity of ecosystems to sequester carbon. One commenter requested the NPS prepare a supplemental plan/EIS to address a perceived lack of abundance of critically important published peer-reviewed science regarding the effects of bison on natural resources, specifically vegetation. Commenters suggested the entire "Vegetation" section of the draft plan/EIS should be revised and a supplemental plan/EIS issued to correct inaccuracies and false statements. One commenter requested the NPS prepare a supplemental plan/EIS to address an alternative that would move hunting in Beattie Gulch to a new area. Another commenter requested the NPS prepare a supplemental plan/EIS to address impacts to genetic diversity from a larger herd of bison. This commenter stated that information exists to suggest longitudinal differences in migration patterns for Yellowstone bison, which suggests there are two distinct subpopulations of bison that require different management actions. Commenters requested the NPS prepare a supplemental plan/EIS to address

perceived legal and policy inaccuracies. Commenters requested the NPS prepare a supplemental plan/EIS to add an analysis of disease transmission from gut piles in Beattie Gulch to other wildlife.

RESPONSE: CEQ regulations state that a supplemental EIS may be required if the agency makes substantial changes to the proposed action that are relevant to environmental concerns or there are significant, substantial, or important new circumstances or information relevant to environmental concerns and bearing on the proposed action or its effects (40 CFR § 1502.9). The NPS made changes to the final plan/EIS based on public comments on the draft plan/EIS but the NPS did not make substantial changes to the proposed action that resulted in changes to environmental impacts and the NPS did not identify any new significant, substantial, or important new circumstances that would warrant preparing a supplemental plan/EIS. The NPS revised Alternative 2 in chapter 2 of the final plan/EIS to add additional information requested by commenters. This alternative was revised to place a stronger emphasis on using the BCTP and tribal harvest outside the park over the transfer of bison for processing. The alternative also clarifies that bison numbers would range between 3,500 and 6,000 with an average of 5,000 bison. More information is provided in the final plan/EIS regarding removal guidelines and management tools under Alternative 2. This information does not substantially change the alternative or result in substantial or significant changes to impacts or conclusions. For this reason, the NPS did not prepare a supplemental plan/EIS. Specific supplementation requests and additional NPS responses are detailed below.

- After review of public comments, the NPS revised chapter 1 of the final plan/EIS to remove a statement that the management alternatives would not affect climate change. The NPS added a dismissal of climate considerations in appendix C of the final plan/EIS discussing the NPS's effects to climate change. As noted in the final plan/EIS, climate change was not carried forward for detailed analysis because the action alternatives would likely have minimal net impact on biogenic carbon cycling throughout the system and GHG emissions. Within the context of this plan/EIS, impacts to climate change from NPS management actions are minor, and would primarily be indirect effects of a slightly larger bison population on the landscape potentially resulting in enteric fermentation and changes to vegetation, which could affect carbon sources and sinks. This added information is not significant, nor are the impacts significant, and this inclusion did not change any impact analyses or conclusions reached in the plan/EIS. For this reason, the NPS did not prepare a supplemental plan/EIS. For additional information on climate change, see Comment Response #82.
- The NPS reviewed all literature submitted by the state, agencies, American Indian Tribes, and the public and incorporated relevant literature in the final plan/EIS. Incorporation of new literature in the final plan/EIS did not substantially change the impact analysis or conclusions. For these reasons, the NPS did not prepare a supplemental plan/EIS. For additional information on literature submitted by commenters, see Comment Response #97.
- The NPS revised the "Vegetation" section in chapter 3 of the final plan/EIS, focusing on changes to the current and expected future condition of the environment and the impact analysis. Based on public comments, the NPS refocused the discussion of this section on vegetation only, and removed a discussion of the effects that changes in vegetation can have on other ungulate species. These effects are captured under the corresponding impact topic. Additionally, the NPS added specific sections on wet grassland habitats, riparian habitats, sagebrush-steppe habitats, and wetland habitats to focus the discussion and directly respond to public comments. The focus of the analysis is on areas in the northern region of YNP where bison abundance is more robust. The NPS incorporated literature presented by the public. The revision of this section reorganized the discussion, moved impacts related to other species to their appropriate sections, and clarified information based on public comments. The impacts and conclusions in this section are substantially the same as the draft plan/EIS. For these reasons, the NPS did not prepare a supplemental plan/EIS.

- Actions such as changing the way hunting is conducted around Beattie Gulch, or the locations available for hunting outside the park are outside the NPS' jurisdiction and were not addressed in the draft or final plan/EIS. Because this resulted in no changes to the plan/EIS, the NPS did not prepare a supplemental plan/EIS. For additional information on actions or changes in hunting conducted around Beattie Gulch, see Comment Response #35.
- A discussion on the genetics of Yellowstone bison is included in the draft plan/EIS. In response to public comments, the NPS added information to the final plan/EIS further addressing the genetics of Yellowstone bison. This information did not result in any significant changes relevant to environmental concerns. For this reason, the NPS did not prepare a supplemental plan/EIS. For additional information on genetics of Yellowstone bison, see Comment Responses #44 and #45.
- Relevant laws, regulations, and policies are included in the draft and final plan/EIS. The NPS did not make any changes between draft and final plan/EIS related to laws, regulations, and policies that have a significant bearing on the proposed action or its impacts. For these reasons, the NPS did not prepare a supplemental plan/EIS. For additional information on relevant laws, regulations, and policies included in the draft and final plan/EIS, see Comment Response #96.
- The draft plan/EIS discusses actions that other agencies take to remove gut piles in Beattie Gulch to reduce impacts to other wildlife species as well as transmission of diseases from gut piles to other wildlife in chapter 3. The final plan/EIS includes additional information on this topic. New information added to the final plan/EIS did not significantly change the impacts or conclusions reached. For these reasons, the NPS did not prepare a supplemental plan/EIS. For additional information on actions related to the removal of gut piles in Beattie Gulch, see Comment Response #35.

CONCERN STATEMENT 84: Commenters expressed concern that a preferred alternative was not identified in the draft plan/EIS. Commenters requested the final plan/EIS include an explanation for not identifying a preferred alternative in the draft plan/EIS.

RESPONSE: The NPS did not identify a preferred alternative in the draft plan/EIS because one did not exist at the time the NPS released the draft plan/EIS (40 CFR 1502.14). The NPS NEPA Handbook 2015, Section 4.3C states that, "it is standard NPS practice to identify the preferred alternative in EAs and is required by the CEQ regulations in *most* instances for draft EISs and in all instances for final EISs unless another law prohibits the expression of a preference (46.425(b)). *The only instances where a preferred alternative does not need to be identified in a draft EIS is when the NPS truly does not have a preferred alternative at the time the draft EIS is released* or when another law prohibits the expression of a preference (46.425(a)) (emphasis added)". Alternative 2 is identified as the preferred alternative in the final plan/EIS. This information is now included in the final plan/EIS in chapter 2.

CONCERN STATEMENT 85: One commenter expressed concern regarding the timeline of the NEPA process. The commenter stated that perceived delays in the NEPA process represent a failure to respond to Congress's statutory directions. This commenter also requested the NPS disclose what set of NEPA regulations it is using for the plan/EIS process.

RESPONSE: The NPS is following all guidance from law, regulation, and policy for its timeline for this plan/EIS process. In June 2022, YNP experienced record-breaking flooding events. Due to these unforeseen circumstances, park staff were diverted to the emergency flooding assessment and repairs. In addition to staffing concerns, there was also a need to reevaluate if the historic flooding within the park had a material effect on the description of resources that would be within the plan/EIS. Therefore, the NPS requested and received a waiver from the DOI of the original schedule requirements and proposed a final plan/EIS and ROD date by the end of July 2024, which it is currently on schedule to meet.

On January 28, 2022, the NPS issued a NOI in the *Federal Register* to prepare an plan/EIS. This was prepared under the July 2020 Final CEQ regulations. On April 20, 2022, CEQ issued the Phase 1 Final

Rule, which finalized a narrow set of changes to generally restore regulatory provisions that were in effect for decades before the 2020 rule modified them for the first time. On July 28, 2023, CEQ announced a Phase 2 Notice of Proposed Rulemaking, the "Bipartisan Permitting Reform Implementation Rule," to revise its regulations for implementing the procedural provisions of NEPA, including to implement the amendments to NEPA by the Fiscal Responsibility Act of 2023. As the July 2023 regulations are not final, the NPS is following NEPA regulations in accordance with the 2020 regulations as amended by the Phase 1 Final Rule and the Fiscal Responsibility Act of 2023, which was signed on June 3, 2023.

CONCERN STATEMENT 86: Commenters stated that the draft plan/EIS violates NEPA by failing to specify criteria for adaptive management of the IBMP and what actions would result in another NEPA process. Commenters requested the NPS further refine its adaptative management strategy by defining hard and soft triggers for action, setting clear monitoring indicators and presenting a well-articulated plan for management implementation. The commenter stated that thresholds for the bison population and corresponding management actions should be regularly updated based on best available science, changing conditions on the landscape, changes in forage quality and quantity, and improvements to non-slaughter related management tools. Commenters requested tribal members be included in the development of adaptative management measures. Commenters also requested adaptive management evaluate progress toward meeting the NPS's federal trust responsibilities to American Indian Tribes.

RESPONSE: The NPS would continue to participate in the IBMP and coordinate with its partners on adaptive management actions. As stated in chapter 2 of the plan/EIS, the NPS would adaptively manage for demographic, genetic, ecological, and social objectives based on information gained by research and experience. The NPS would continue to evaluate current conditions, identify undesired trends, implement management actions, monitor progress toward desired conditions, and adjust actions to improve progress. The NPS would work with partners to explore other management options outside the park, including streamlining testing protocols for quarantine as part of the BCTP and the construction of additional quarantine facilities and capture facilities near the outer boundaries of management zones. Adaptive management is intended to be applied within the framework of the goals and management objectives of this plan/EIS and would not alter the basic management direction of the alternatives. The NPS will assess whether any adaptive management changes would affect the environment in a manner or to a degree not previously considered and conduct additional NEPA analysis, if necessary, at that time. For these reasons, the NPS did not revise the final plan/EIS.

Regarding tribal relationships, the NPS would continue to work closely with IBMP members, including member American Indian Tribes, on adaptive management changes and would continue to fulfill its government-to-government consultation responsibilities with American Indian Tribes (see Concern Statement #54). As stated above, any future adaptive management changes would adhere to the goals and management objectives of the final plan/EIS, including working with partners to fulfill tribal trust responsibilities.

CONCERN STATEMENT 87: Commenters stated that actions related to hunting on USFS lands, specifically in the area of Beattie Gulch, are connected to NPS actions. Due to this connection, commenters felt that the agencies should have a joint decision on this plan/EIS and that the USFS issuing any categorical exclusion related to shooting in Beattie Gulch outside this plan/EIS process would be considered segmentation under NEPA.

RESPONSE: Hunting outside the park is not a connected action as defined at 40 CFR 1501.9(e) that requires analysis in this plan/EIS. Hunting is regulated by the state and, where applicable, American Indian Tribes, and is carried out in a manner of choice by individual hunters. It is not automatically triggered by or dependent on this plan, nor does the NPS have jurisdiction to regulate any aspect of hunting outside the park. The NPS has met its obligations under NEPA to disclose reasonably foreseeable effects, including those indirect effects that may occur outside the park.

This plan/EIS is different from the IBMP, which prescribed management actions for multiple agencies. In 1995, the federal government and Montana entered into a court-approved settlement agreement for issuing a final EIS and ROD regarding the management of Yellowstone bison (USDOI and USDA 2000b). Originating from concerns that bison migrating outside YNP would transmit brucellosis to cattle and, thereby, jeopardize interstate and international trade, staff for the Secretaries of Agriculture and the Department of the Interior (USDOI) and the Governor of Montana developed the IBMP. This plan/EIS process will result in a new ROD regarding how the NPS would manage bison within YNP. The plan/EIS considers bison management actions likely to occur on lands outside the park in Montana, while acknowledging the NPS does not have jurisdiction or control over actions beyond the park boundary. The ROD would not prescribe any management for other agencies. The USFS recently issued a land management plan for the Custer Gallatin National Forest that prescribes possible USFS actions related to bison management. Additionally, should the State of Montana want to change its actions related to bison management, it would follow its own Montana Environmental Policy Act process, which the NPS has no jurisdiction over. The NPS does not agree that any decisions made by other agencies related to the management of bison outside the park's boundaries would be segmentation, as no connected action exists

NEPA Process: Consultation and Coordination

CONCERN STATEMENT 88: Commenters suggested that the park should coordinate bison management actions with organizations such as The Nature Conservancy, various Canadian wildlife organizations, the American Prairie Organization, the Greater Yellowstone Coalition, nearby law enforcement, other environmental organizations, the state, other federal agencies, the Native Buffalo Council, IBMP partners, members of the Yellowstone Bison Coexistence Program, and the Bison Citizens Working Group. Commenters also suggested the park increase its coordination with the USFS, especially Custer Gallatin National Forest, with the intention of granting bison access to USFS land. Commenters asked why the USFS was not involved in the plan/EIS and why the NPS did not consult with APHIS on elements in the plan/EIS where this agency has special expertise or jurisdiction by law.

RESPONSE: Nothing in the plan/EIS precludes the NPS from working with nongovernmental agencies on bison management issues at YNP. The NPS is part of the DOI Bison Working Group that engages these groups on broader bison conservation issues. The NPS would continue to work with IBMP partners for the management of bison in the GYA. The NPS prepared the plan/EIS in cooperation with the following agencies: the state (Governor's Office, MDOL, MFWP), APHIS (VS), USFS (Custer Gallatin National Forest), InterTribal Buffalo Council, Confederated Salish and Kootenai Tribes of the Flathead Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and the Yakama Nation. Both the USFS and APHIS were consulted regarding their special expertise in the development of the plan/EIS.

CONCERN STATEMENT 89: The State of Montana stated that the NPS failed to uphold its cooperating agency responsibilities. They stated that the NPS did not allow enough time for the state to sufficiently comment on the draft plan/EIS and did not make it clear how the input provided by the state was included or considered in the draft plan/EIS. Because of what the state felt was a lack of meaningful engagement, they stated that their status of a cooperating agency does not equate to endorsement of the draft plan/EIS or its alternatives.

RESPONSE: YNP invited the state to become a cooperating agency in the development of the plan/EIS and they signed a memorandum of agreement to participate as such on November 5, 2020. Prior to publishing the NOI for the plan/EIS on January 28, 2022, park staff and the Superintendent met with state officials on November 18, 2021, and January 10, 2022, to discuss and seek feedback on the purpose and need for the plan/EIS, preliminary alternatives, and the planning process. The Superintendent repeatedly discussed his intent to prepare the plan/EIS, its scope, and issues to be addressed with state officials

during IBMP proceedings. Park staff also considered previous planning exercises with the state, such as those held from 2014 to 2016, while developing the preliminary alternatives in the NOI.

On February 28, 2022, Governor Gianforte sent a letter to the Director of the NPS and the Superintendent of YNP indicating he did not like any of the preliminary alternatives and requested the NPS withdraw the NOI and engage in consultation to identify mutually acceptable alternatives. On April 19, 2022, the Superintendent met with the Governor and his Natural Resources Policy Adviser in Helena, Montana, to discuss their comments. The Governor stated he would not support any alternatives not tied to the original IBMP population target of 3,000 bison. The Superintendent conveyed that the NPS would continue to prepare the plan/EIS, which focuses on actions the NPS could take to manage bison within the park, in accordance with law, regulation, and policy. The Superintendent acknowledged that the state and other governmental and tribal agencies play important roles in bison management outside the park and indicated the NPS would continue to work cooperatively with them. He also conveyed the alternatives presented in the NOI could be adjusted or new alternatives could be created as the NPS developed the draft plan/EIS. The Superintendent asked the Governor to provide alternatives or additional elements for evaluation and indicated that the NPS would continue to proactively engage the state as a cooperating agency throughout the NEPA process. Following this meeting, the NPS did not receive any recommendations from Montana regarding alternatives or additional elements for the plan/EIS. However, park staff did evaluate a population target of 3,000 bison and vaccination in the draft plan/EIS and a detailed explanation of this is included in the plan/EIS.

On May 17, 2023, the Superintendent met with Governor Gianforte in Helena, Montana. The Governor maintained the state did not have input into the development of the alternatives for the draft plan/EIS. The Superintendent reminded the Governor that he had asked him to provide alternatives or additional elements for evaluation more than one year ago but received no response. The Governor requested additional tools be added to control the population, including placing additional trap(s) inside the park, and that bison needed to be vaccinated. At the Governor's request, the Superintendent committed to having park wildlife staff and bison managers meet with MDOL and MFWP staff. This meeting took place on June 29, 2023.

At the June 29, 2023, meeting park staff informed MDOL of the upcoming internal review of the draft plan/EIS for cooperating agencies and communicated the desired timeframe for comments. The NPS was and is committed to ensuring all of the state's comments are taken into consideration through an iterative process involving multiple consultations and comment periods. As a cooperating agency, the state was not constrained by the review timeline for the internal draft plan/EIS because the NPS has communicated that it will always accept the state's comments, even after the public comment period closes. Thus, the state has had considerable time to convey any changes or considerations they would like the NPS to make. Additionally, at the state's request, the NPS extended the public comment period from 45 days to 60 days to allow additional time for review of the draft plan/EIS. All comments submitted by the state during the cooperating agency review were closely reviewed and changes were incorporated into the draft plan/EIS before it was published for public review.

NEPA Process: Public Involvement

CONCERN STATEMENT 90: Commenters requested that the NPS extend the draft plan/EIS comment period for at least 30 days, with some suggestions to extend by 60 days. Commenters suggested that there was not enough time to sufficiently notify the public about the release of the draft plan/EIS and that the NPS failed to provide any notice to interested parties who provided scoping comments and that violated 40 CFR 1506.6 (b).

RESPONSE: After careful consideration, the NPS extended the public comment period by 15 days, allowing a full 60 days to submit comments on the draft plan/EIS. Extending the public comment period further would not allow the NPS to meet its timelines set forth in law and regulation. The NPS did not

violate 40 CFR § 1506.6, as it provided ample public notice of the draft plan/EIS. The NPS issued a Notice of Availability of the draft plan/EIS in the *Federal Register* on August 11, 2023. On August 10, 2023, the NPS issued a press release, updated its website and Planning, Environment, and Public Comment (PEPC) website, announced the availability of the draft plan/EIS on social media, and notified all congressional offices, cooperating agencies including the state and American Indian Tribes, and consulting agencies. Over 10 local and national publications ran articles on the release of the draft plan/EIS, including print, web, and radio publications. The NPS received over 27,000 public comments indicating the public was aware of and given ample opportunity to comment on the draft plan/EIS. The NPS does not have an obligation to specifically notify those individuals or organizations who commented on the NOI of the availability of the draft plan/EIS.

CONCERN STATEMENT 91: One commenter stated that the NPS violated NEPA by failing to honor a Freedom of Information Act (FOIA) request submitted during the plan/EIS process. Furthermore, the commenter noted that the NPS did not provide a meaningful summary of the scoping comments in the draft plan/EIS, which is required by NEPA.

RESPONSE: The NPS did not violate NEPA while addressing a FOIA request as FOIA and NEPA are separate laws. Consistent with 40 CFR 1502.17, the NPS included a summary of information, including alternatives and analyses submitted by commenters during public scoping, in the draft plan/EIS. A summary of information, alternatives, and analyses submitted by commenters during the public review of the draft plan/EIS is included in the final plan/EIS.

NEPA Process: Purpose and Need

CONCERN STATEMENT 92: Commenters stated that the purpose of the plan/EIS violates the Act Establishing Yellowstone National Park (1872), the 1978 Redwood Act, and NPS *Management Policies 2006* because it does not adhere to the principal of law and mandatory NPS policy to preserve a landscape that is minimally influenced by human actions. The commenter stated that the purpose of the plan/EIS would result in a human managed "bison ranch" and would be at odds with this mandate. They further stated that the purpose of the plan/EIS would change the purpose of the park without the consent of Congress.

RESPONSE: The plan/EIS does not violate or propose a fundamental change in the purpose of the park. The 1872 Act Establishing Yellowstone National Park set apart about 2.2 million acres (890,300 hectares) in the future states of Wyoming, Montana, and Idaho "as a public park or pleasuring ground for the benefit and enjoyment of the people." It requires the Secretary of the Interior to preserve "from injury or spoilation" the "timber, mineral deposits, natural curiosities and wonders" of YNP and to ensure "their retention in their natural condition" (16 USC 21 et seq., 17 Stat. 32). The NPS Organic Act of 1916 directed park managers to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations" (54 USC 100101 a,b).

Contemporary management policies have remained consistent with these tenets, but clarified that managers should preserve "components and processes in their natural condition," which was defined as "the condition of resources that would occur in the absence of human dominance over the landscape." Additional contemporary principles for managing biological resources include "preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur; restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them" (USDOI, NPS 2006a:36, 42).

The purpose statement in the plan/EIS for bison management in YNP relates to the overall goals for managing Yellowstone bison, not the entire park. Regardless, the following goals of bison conservation and management, as outlined in the "Actions Common to All Alternatives" section of chapter 2 of the plan/EIS, are in accordance with the NPS principles for managing biological resources and would maintain landscape integrity. These goals include (1) sustain a viable, wild population; (2) sustain the role of bison as ecosystem engineers; (3) maintain functional grasslands; and (4) sustain bison as a meaningful component of the food web influencing energy and nutrient transfer through the ecosystem. Bison will not be ranched under any of the alternatives proposed in the plan/EIS.

CONCERN STATEMENT 93: Commenters stated that the NPS violated NEPA by having increased tribal hunting as part of the purpose, but not having an alternative that allows hunting in the park. Commenters further stated that the NPS cannot define the objectives of its action in unreasonably narrow terms, and that stating a goal to allow hunting outside the park only leaves one alternative. Commenters stated that under NEPA the NPS needs to consider the possibility of opening the park to hunting.

RESPONSE: The NPS revised its purpose statement in the final plan/EIS in chapter 1 as follows: "The purpose of the plan is to preserve an ecologically sustainable population of wild, migratory bison while continuing to work with partners to address brucellosis transmission, human safety, and property damage and fulfill tribal trust responsibilities."

The NPS revised its purpose statement to expand its goals of working with partners to fulfill tribal trust responsibilities, which also includes supporting tribal hunting outside the park.

The NPS considered and dismissed an alternative that would allow hunting in the park, as described in chapter 2 of the plan/EIS.

CONCERN STATEMENT 94: Commenters stated that the plan/EIS should have a purpose of supporting the long-term genetic health of bison, as well as their important ecological and cultural role in the landscape of the GYA ecosystem. The commenters noted that this means allowing for the natural migration of bison and not managing for commercial interests, such as cattle. Some commenters stated that this concept is backed by the National Parks Omnibus Management Act of 1998, and that making management decisions to fulfill tribal or social demands rather than relying on science could be argued to be illegal.

RESPONSE: As stated in chapter 2 of the plan/EIS, all alternatives include a goal of sustaining a viable, wild bison population, including the genetic health of Yellowstone bison, and a goal of preserving existing genetic diversity. This same section states that, to the extent possible, the NPS would allow ecological processes, such as natural selection, migration, and dispersal, to prevail and influence population and genetic substructure (White and Wallen 2012; Wallen and White 2015). The NPS does not manage bison and other wildlife for commercial interests, such as cattle.

Law, Policy, Science

CONCERN STATEMENT 95: Commenters stated that the NPS failed to analyze potential conflicts with tribal law, Montana laws, and other laws that could apply to Yellowstone bison. This commenter also stated that the NPS needs to articulate the specific legal reasons why it can capture bison within YNP but prohibits tribal hunting, killing, or culling within the park.

RESPONSE: State laws and specific tribal laws do not apply to the management of wildlife within YNP. The NPS discussed laws related to hunting in the park in its dismissal for an alternative that would allow such hunting in chapter 2 of the plan/EIS.

CONCERN STATEMENT 96: Commenters submitted additional images, maps, and literature for the NPS to include in the final plan/EIS. Commenters stated that peer-reviewed science critical of YNP's existing bison population numbers and range management practices was not included and that the NPS

used unpublished or agency-published material instead. One commenter stated that the 2000 IBMP is not included in the list of references. Lastly, one commenter stated that the NPS should include a graph showing historical population data, and one commenter provided a correction to a citation.

Literature submitted included topics such as:

- Ungulate impacts on riparian areas, wet grassland areas, sagebrush-steppe areas, and wetlands
- Ecosystem changes following predator introduction in YNP
- GHG emissions from livestock
- Bison impacts on vegetation in northern YNP
- Beaver, elk, birds, grizzly bears
- Brucellosis in the GYA including quarantine procedures
- Bison genetics

RESPONSE: The NPS reviewed the submitted images, maps, and literature and incorporated additional content and references into the final plan/EIS, where appropriate. The NPS identified unpublished references in its "References" section in the plan/EIS.

The IBMP is correctly cited in the plan/EIS.

The NPS included a graph with historic population data in chapter 3 of the plan/EIS, labeled as figure 6. The NPS corrected the citation submitted by a commenter.

In response to commenters concerns that the agency did not include science that was critical of the park's existing bison population numbers and range management practices, the NPS revised the final plan/EIS, expanding its evaluation of bison impacts on vegetation conditions, incorporating literature submitted by commenters.

CONCERN STATEMENT 97: Commenters suggested the NPS seek an external review of the management of bison by an independent body such as the National Academies of Science.

RESPONSE: In 2016, APHIS commissioned the study by the National Academies of Sciences, Engineering, and Medicine to review brucellosis in bison and elk in the GYA. In its 2017 report, the National Academies of Sciences, Engineering, and Medicine concluded infected elk had transmitted brucellosis to livestock in the area at least 27 times since 1998, with no transmissions attributed to bison. It also recommended prioritizing efforts on preventing brucellosis transmission by elk, while maintaining separation between bison and cattle. The National Academies of Sciences, Engineering, and Medicine recommended not using aggressive control measures on bison until tools became available for an eradication program in elk. See appendix E in the plan/EIS for the National Academies of Sciences, Engineering, and Medicine's recommendations, which supported the conclusions of the NPS in a previous final EIS that the park-wide vaccination of bison would not achieve desired results and could have unknown yet potentially negative effects to the population and visitor experience (USDOI, NPS 2014b).

CONCERN STATEMENT 98: Commenters stated that the NPS omitted analysis of overlapping statutory authorities and stated the plan/EIS violates both the 1894 Act to Protect the Birds and Animals and the 1916 Organic Act, stating that the NPS cannot regulate wildlife numbers within the park.

RESPONSE: The1894 Act does not preclude the NPS from taking its own wildlife management actions under the Organic Act and other authorities. Moreover, YNP has specific authority under 16 USC 36 with respect to "surplus. . . buffalo." These authorities are all explained further in the plan/EIS.

CONCERN STATEMENT 99: Commenters stated that the plan/EIS is not based on the best available science and is a violation of NEPA. One commenter stated that the NPS failed to ensure the professional integrity, including scientific integrity, of the discussion and analysis in the plan/EIS because it did not include data from a 2012–2017 APHIS study on possible vaccines. The commenter did not include

additional information on the study from APHIS such as a citation or reference. One commenter stated that the plan/EIS goes against Secretarial Order 3410 to manage bison based on the best available science because it uses human selection to artificially suppress a wild bison population. Commenters stated that if there is conflicting science, additional studies need to be conducted before new management is proposed.

RESPONSE: The NPS based its analysis on best available science. The NPS disagrees with the commenter that the plan goes against Secretarial Order 3410, which states that agencies should "restore wild and healthy populations of American Bison and the prairie grassland ecosystem through collaboration among the Department's bureaus and partners such as other federal agencies, states, American Indian Tribes and landowners using the best available science and indigenous knowledge." As stated in chapter 2 of the plan/EIS, to the extent feasible, the NPS would allow bison to move unfettered in the interior of YNP so they can fulfill their ecological role. Given existing political and social constraints, NPS personnel have captured bison near the northern boundary of YNP during winter to reduce bison numbers and prevent movements outside the designated management areas in Montana. As stated in the plan/EIS, these management actions have not suppressed the bison population in a meaningful way and have not had a detectable impact on bison genetic health, natural migratory tendencies, or overall herd health of YNP.

The NPS assumes the commenter is referring to the six-year study conducted by APHIS, starting in 2012. In 2012, APHIS began a six-year study of the effectiveness of the vaccine GonaCon™ at preventing gonadotropin-releasing hormone from initiating follicle growth and ovulation in Yellowstone bison, thereby resulting in infertility. The objectives were to determine whether GonaCon™ vaccine could prevent the shedding of brucellosis bacteria in young, recently infected bison throughout the infection cycle. Researchers also wanted to determine whether bacteria that remain dormant in infected animals during fertility control would increase again during pregnancies after the effects of the vaccine decreased. This study ended during 2017, but data and findings have not been published or provided to the NPS and independent scientists for scientific peer review. Thus, this technology is not ready for implementation on Yellowstone bison and the testing of this or another fertility control method likely will take many years to evaluate sufficiently. The NPS is not aware of any significant improvements in existing vaccines or delivery technologies for bison since the 2014 issuance of the ROD not to implement remote vaccination. Nor is the NPS aware of studies being conducted by APHIS, MDOL, or MFWP on these issues, for either elk or bison.

When new information was presented to the NPS, the NPS reviewed this information in detail. Some literature provided by the public was incorporated into the final plan/EIS.

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under US administration.

June 2024

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