

National Park Service  
U.S. Department of the Interior

Theodore Roosevelt National Park  
North Dakota



# Livestock Plan Environmental Assessment

SEPTEMBER 2023



---

# TABLE OF CONTENTS

Chapter

Page

---

<b>CHAPTER 1: PURPOSE AND NEED FOR ACTION.....</b>	<b>1</b>
1.1 Introduction .....	1
1.2 Background.....	1
1.2.1 History of Livestock in the Park.....	2
1.2.2 Relationship to Existing Laws and Policies .....	4
1.3 Purpose and Need .....	5
1.4 Project Area.....	5
1.5 Public Involvement.....	5
1.5.1 Civic Engagement.....	5
1.5.2 Public Scoping.....	8
<b>CHAPTER 2: ALTERNATIVES .....</b>	<b>9</b>
2.1 Introduction .....	9
2.2 Alternative A: No Action .....	9
2.3 Alternative B: Expedited Reduction of Herds to no Livestock.....	10
2.4 Alternative C: Phased Reduction of Herds to no Livestock .....	10
2.5 Actions Common to All Alternatives.....	10
2.5.1 Capture Methods .....	10
2.5.2 Post-Capture Methods.....	11
2.5.3 Other Management Components .....	12
2.6 Mitigation Measures and Best Management Practices .....	12
<b>CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES .....</b>	<b>14</b>
3.1 Introduction .....	14
3.2 Visitor Use and Experience .....	15
3.2.1 Affected Environment: Current Conditions and Trends .....	15
3.2.2 Environmental Consequences .....	23
3.3 Cultural Resources .....	27
3.3.1 Affected Environment: Current Conditions and Trends .....	27
3.3.2 Environmental Consequences .....	31
3.4 Wildlife and Wildlife Habitat .....	35
3.4.1 Affected Environment: Current Conditions and Trends .....	35
3.4.2 Environmental Consequences .....	43
3.5 Vegetation .....	45
3.5.1 Affected Environment: Current Conditions and Trends .....	45
3.5.2 Environmental Consequences .....	50
3.6 Water Resources.....	53
3.6.1 Affected Environment: Current Conditions and Trends .....	53
3.6.2 Environmental Consequences .....	59
3.7 Socioeconomics.....	61
3.7.1 Affected Environment: Current Conditions and Trends .....	61

3.7.2 Environmental Consequences .....	65
3.8 Wilderness.....	67
3.8.1 Affected Environment: Current Conditions and Trends .....	67
3.8.2 Environmental Consequences .....	69
<b>CHAPTER 4: LIST OF AGENCIES, TRIBES, AND PERSONS CONSULTED.....</b>	<b>72</b>

<b>TABLES</b>	Page
1. Park Visitation by Type, 2022 .....	15
2. Visitation in the South Unit (2018 – 2022) .....	17
3. Visitation in the North Unit During 2018 – 2022 .....	18
4. Sound Levels and Human Response.....	22
5. Rare Plant Species Documented in the North and South Units .....	48
6. Socioeconomic Study Area Population 2000–2020 .....	64
7. Wilderness Acreages in the Park’s North and South Units.....	68

<b>MAPS</b>	Page
1. South Unit Project Area.....	6
2. North Unit Project Area.....	7
3. South Unit Horse Use Areas .....	19
4. North Unit Cattle Use Areas .....	20
5. South Unit Estimated Bison Core and High Use Areas .....	39
6. South Unit Estimated Elk Core and High Use Areas .....	40
7. North Unit Estimated Bison Core and High Use Areas.....	42
8. South Unit Water Features .....	54
9. North Unit Water Features .....	55
10. Socioeconomic Study Area .....	62

<b>APPENDIXES</b>	Page
A References	
B Comparison of Alternatives	
C Impact Topics Considered But Dismissed From Further Analysis	
D Alternatives Considered But Dismissed From Further Analysis	

---

**ACRONYMS AND ABBREVIATIONS**

Full Phrase

---

ACETA	Aerial Capture, Eradication, and Tagging of Animals
BCE	Before Common Era
CCC	Civilian Conservation Corps
CE	Common Era
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COVID	Coronavirus Disease of 2019
DNA	Deoxyribonucleic acid
EA	Environmental Assessment
FONSI	finding of no significant impact
GIS	Geographic Information Systems
GSA	General Services Administration
IPaC	Information for Planning and Consultation
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
Park	Theodore Roosevelt National Park
PEPC	Planning, Environment, and Public Comment
THPO	Tribal Historic Preservation Officer
TRPL	Theodore Roosevelt Presidential Library
USC	United States Code
UTV	utility-terrain vehicle
WPA	Works Progress Administration

# CHAPTER 1: PURPOSE AND NEED FOR ACTION

## 1.1 INTRODUCTION

The National Park Service (NPS) prepared this environmental assessment (EA) to assess the potential impacts of continuing current livestock management (No Action Alternative) and implementing one of the action alternatives that would remove livestock from Theodore Roosevelt National Park (the Park). At the conclusion of this National Environmental Policy Act (NEPA) analysis and the decision-making process, the alternative selected for implementation would become the Livestock Plan for the Park. This EA has been prepared pursuant to NEPA (42 United States Code [USC] 4321, *et seq.*), the Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508), NPS Director’s Order 12, and the NPS NEPA Handbook (NPS 2015a).

## 1.2 BACKGROUND

Theodore Roosevelt National Park comprises 70,447 acres of land in three separate units—the South Unit, the North Unit, and the Elkhorn Ranch Unit—in Billings and McKenzie Counties, North Dakota. The Park was established in 1947 as Theodore Roosevelt National Memorial Park (South Unit and Elkhorn Ranch Unit) to honor Theodore Roosevelt. The North Unit was added in 1948. In 1978, Congress redesignated the area as Theodore Roosevelt National Park and established the 29,920-acre Theodore Roosevelt Wilderness within the Park’s North and South Units.

As described by the Park’s purpose statement, “Theodore Roosevelt National Park memorializes Theodore Roosevelt and pays tribute to his enduring contribution to the conservation of our nation’s resources by preserving and protecting the scenery, wildlife, and wilderness qualities of the North Dakota Badlands – the landscape that inspired Roosevelt and still inspires visitors today.”

In addition to the native species that reside in the Park, including elk and bison herds, two livestock<sup>1</sup> herds reside in the Park. While livestock numbers have fluctuated over time, there are currently nine cattle (steers only) in the North Unit and approximately 200 horses in the South Unit. Both livestock herds have been allowed to inhabit NPS lands as nonnative livestock.

This proposed livestock plan takes into consideration the context of these livestock species’ existence on NPS lands in accordance with current NPS laws, regulations, and policies and in balance with natural and cultural resource management priorities.

---

<sup>1</sup> Livestock include any species of animal that has been selectively bred by humans for domestic and agricultural purposes, including, but not limited to, cattle, sheep, horses, burros, mules, goats, and swine.

## 1.2.1 History of Livestock in the Park

### 1.2.1.1 Horses

The unowned, untamed bands of horses on the Great Plains are descended from domesticated horses. While these horses are often referred to as wild, the more appropriate designation of these horses is feral. A feral animal is one that was once domesticated but has adjusted to surviving in a natural environment without human support.

The history of horses in the area stems back to their use by Tribal Nations and later by homesteaders to the Dakotas. Tribal Nations began to acquire horses from the Spanish settlements in New Mexico in the early 1600s. Following the Spanish withdrawal from New Mexico after the Pueblo Revolt of 1680, the Pueblos added horses to their active trade with Plains tribes, resulting in horses reaching the Missouri River by the 1730s and the Canadian Prairies by the 1770s (Ewers 1995; Holder 1970).

By the late 1800s, settlement of the Great Plains by homesteaders had reached the Dakotas (McLaughlin 1989). Ranchers turned some horses they had brought with them out on the open range to live and breed. When needed, ranchers would round up horses and their offspring for use as ranch horses. For generations, including up to and into the time of Park establishment, ranchers used land that would become the Park for open-range grazing of both horses and cattle. This is the landscape Theodore Roosevelt would have experienced during his time at Elkhorn Ranch. At the same time, bison populations in the area had declined dramatically due to a number of factors, making them hard to find during Theodore Roosevelt's time in North Dakota. His concern over their loss entirely informed his conservation ethic, as captured in the Park's purpose statement described in Section 1.2, above.

The history of horses in the Park dates back to the Park's establishment in the late 1940s. With a focus on recreating the natural environs that Roosevelt would have experienced, which included reintroducing bison and other native species, horse removal was a Park priority (McLaughlin 1989). Horse removal efforts were undertaken over the first decade of Park management, primarily through notification to owners to remove their branded horses, and by 1954 all horses had been removed from the North Unit (McLaughlin 1989). With fencing of the South Unit nearly complete, a large-scale horse roundup was held by the NPS and area ranchers in 1954 to attempt to remove the remaining horses. This effort removed 125 branded horses out of the 200 or more horses estimated to occupy the unit at that time (McLaughlin 1989). Fencing of the South Unit was completed and the NPS began introducing bison into the unit in 1956. While the NPS continued to try to remove all horses through the mid-1960s, some horses eluded capture and continued to occupy the South Unit. Recent genetic research comparing DNA<sup>1</sup> from 188 horses at the Park to 35 established horse breeds indicates that the horses in the Park today show no clear ancestral relationship to any one breed, but have the strongest genetic influence from draft breeds and not horses of Spanish origin (Thompson 2022).

---

<sup>1</sup> Deoxyribonucleic acid, or DNA, is the molecule that carries the genetic information of an organism.

By the 1970s, the Park was no longer pursuing total removal of horses and began managing the horses as a historic demonstration herd (NPS 1976).<sup>1</sup> Subsequent Park planning documents reference this management (NPS 1984, 1994), while the 2014 Foundation Document for the Park describes horses as an “other important resource and value.” These are resources that are not fundamental to the Park’s purpose but are important to consider in planning processes (NPS 2014). In contrast, “fundamental resources and values” are those features, systems, processes, experiences, stories, scenes, sounds, smells, or other attributes determined to warrant primary consideration during planning and management processes because they are essential to achieving the purpose of the Park and maintaining its significance. Fundamental resources and values identified for the Park include native wildlife and habitat, the Little Missouri River, outstanding geological and paleontological resources, scenic views, wilderness and wilderness qualities, and built features related to Theodore Roosevelt’s time in the area.

In 1978, the NPS developed an EA for feral horse reduction (NPS 1978). This document formed the basis for current management of horses in the Park. At the time of the document’s publication, between 65 and 75 head of feral horses were within the South Unit. The EA called for an initial reduction of the existing herd by 30 to 40 horses and periodic reductions every two to four years to maintain a herd size of 35 to 60 horses. The horses were not classified as wildlife but as display livestock that contributed to the historical interpretation at the Park (NPS 1978).

To meet the 1978 EA herd size objectives, the Park has used mounted wranglers or helicopters to herd horses to corrals for capture, after which excess horses were sold at auction. In recent years, the Park has also utilized other methods for herd management, including contraceptives, low-stress herding, tranquilizer darting for capture, and transfer of horses to private ownership through partnerships with nonprofit groups. During a contraception research project conducted from 2009 through 2020, the herd size was allowed to increase to accommodate treatment and control groups of sufficient number to detect statistical effects. Efforts to decrease the herd size to management objective levels since have been affected by several factors, including the coronavirus (COVID-19) pandemic, during which roundups were limited; drought and wildfire, which complicated staffing and capture operations; and the delay of regular captures.

Over recent decades, the herd size has ranged from 83 to 214 horses with numbers now at approximately 200 horses. Managing the horse herd and addressing the health and safety issues associated with the horses takes a substantial amount of Park staff time on an annual basis that could otherwise be used to preserve and protect other Park resources.

### **1.2.1.2 Cattle**

Similar to horses, ranchers used the area for open-range grazing of cattle prior to the Park’s establishment. Cattle were removed from the North and South Units as the boundary fences were constructed.

---

<sup>1</sup> A demonstration herd is defined as an administrative use of nonnative livestock that maintains a historic scene.

Cattle were returned to the Park in the late 1960s and were originally intended to be placed in the Elkhorn Unit, but were subsequently placed in the North Unit. In 1967 and 1969, two shipments of six cattle each originating from the Fort Niobrara Wildlife Refuge in Nebraska were obtained and brought to the North Unit of the Park, for a total of 12 cattle. A third shipment of an unspecified number was received in 1974 (NPS 1976).

A small number of cattle are managed pursuant to a 1970 Management Plan for Longhorn Cattle (NPS 1970). Because these cattle are all steer (nonreproductive males), their numbers have been replenished from time to time as individuals have perished.

### **1.2.2 Relationship to Existing Laws and Policies**

There is no legislation directing the NPS to maintain horses or cattle in the Park, and horses on NPS units do not fall under the jurisdiction of the Wild Free-Roaming Horses and Burros Act, which only applies to horses on lands managed by the US Forest Service and the Bureau of Land Management.

NPS Management Policies guide the management of National Park System units (NPS 2006). This guidance prioritizes the conservation of natural and cultural resources, including native species and ecosystems. Policy 4.4.2.2 calls on the NPS to restore extirpated native plant and animal species to parks where adequate habitat to support the species exists or can be reasonably restored. Policy 4.4.4 states that exotic species<sup>1</sup> will not be allowed to displace native species<sup>2</sup> if such displacement can be prohibited, and Policy 4.4.4.2 addresses management, up to and including eradication, of exotic species. Livestock, such as the horses and cattle at the Park, are considered exotic species under Policy 4.4.4.1. Policy 8.6.8.3 addresses feral livestock in National Park System units, stating that wild living or feral livestock that have no known owner may be removed. In addition, 54 USC 100752 allows for the removal of such plants and animals that may be detrimental to the use of any NPS unit.

As described in Section 1.2.1, the intention of the NPS at Park inception was to remove livestock from the Park in order to recreate a more natural environment reflective of Theodore Roosevelt's conservation ethos, and removal actions for livestock were therefore actively pursued into the 1960s. While the Park's horses and cattle have been maintained as demonstration herds since the 1970s, conservation principles and practices have evolved since that time to reflect a more up-to-date scientific understanding of wildlife biology and landscape ecology. Current NPS and Park priorities are to manage the species, resources, and ecosystems that are native to the Park's landscape. This includes being responsive to Secretarial Order 3410—Restoration of American Bison and the Prairie Grasslands, which calls on the NPS, other Department of the Interior bureaus, and partners to restore wild and healthy populations of

---

<sup>1</sup> Policy 4.4.1.3 states that exotic species are not considered native; rather, they are species that occupy or could occupy NPS lands directly or indirectly as the result of deliberate or accidental human activities (NPS 2006).

<sup>2</sup> Policy 4.4.1.3 states that native species are defined as all species that have occurred, now occur, or may occur because of natural processes on lands designated as units of the National Park System (NPS 2006).

American bison and the prairie grassland ecosystem using the best available science and Indigenous knowledge.

### **1.3 PURPOSE AND NEED**

The purpose of the proposed action is to address livestock—horse and cattle herds—within the Park, under relevant laws, regulations, policies, and management priorities, including the conservation of native species and natural prairie ecosystem functions.

The proposed action is needed to:

- Address operational commitments to livestock management
- Address potential impacts of livestock on the landscape and natural resources, including native wildlife, native vegetation, and water resources
- Address potential impacts of livestock on cultural resources, including archeological sites and cultural landscapes
- Provide resiliency for native ecosystems and species in the face of a changing climate
- Align livestock management with relevant laws, regulations, and policies
- Emphasize bison management in alignment with Secretarial Order 3410

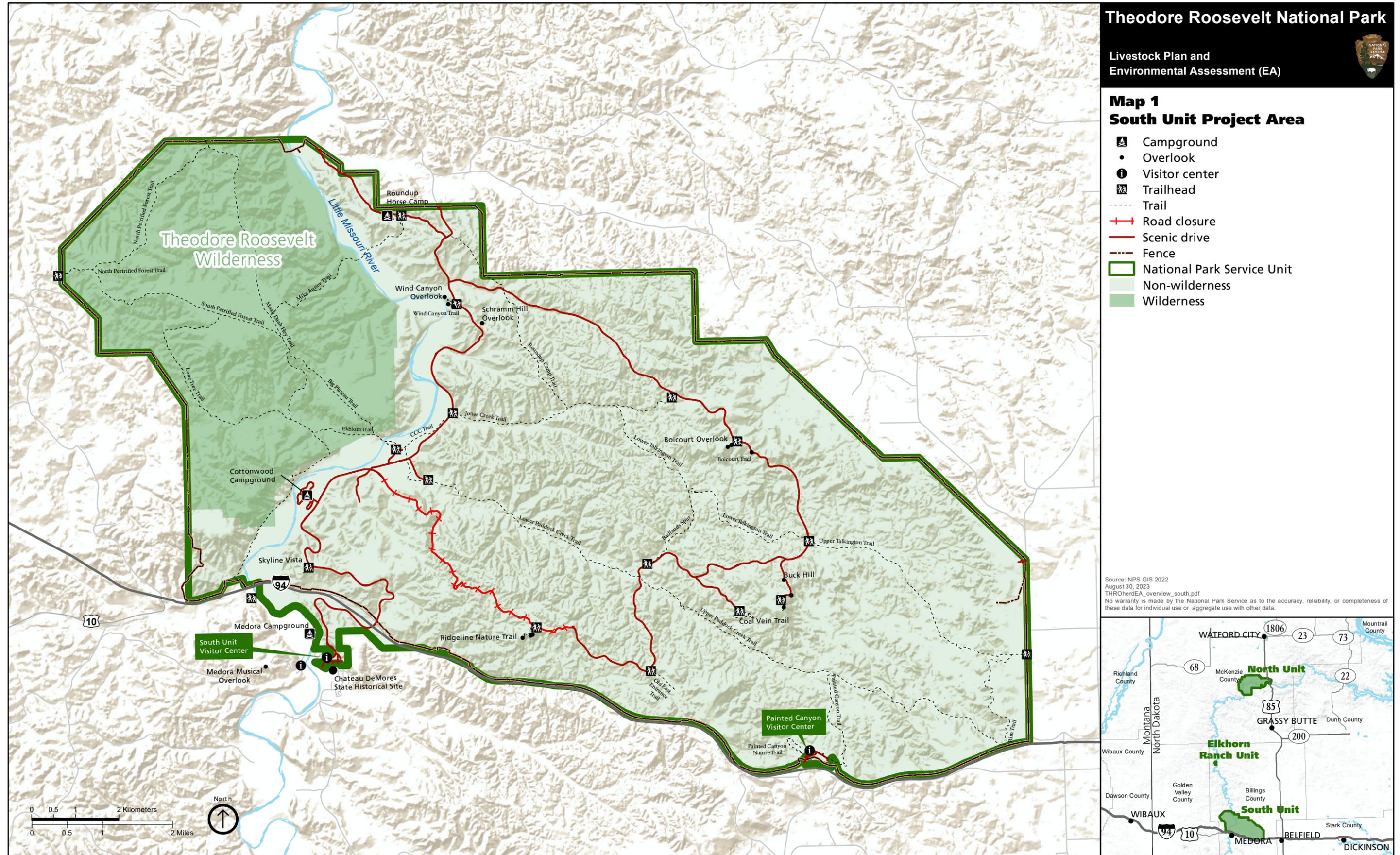
### **1.4 PROJECT AREA**

The EA project area includes the approximately 46,000-acre South Unit (Map 1) and the approximately 24,100-acre North Unit (Map 2) of the Park. The South Unit lies alongside Interstate 94 near Medora, North Dakota, while the North Unit is approximately 80 miles north of the South Unit on Highway 85 just south of Watford City, North Dakota. The Little Missouri River flows through both units. The South Unit’s western portion is designated as the Theodore Roosevelt Wilderness. Almost the entire land area in the North Unit is also designated as the Theodore Roosevelt Wilderness, with the exception of a narrow corridor alongside the unit’s 14-mile Scenic Drive. The project area does not include the Elkhorn Ranch Unit, as no livestock are maintained in this area of the Park.

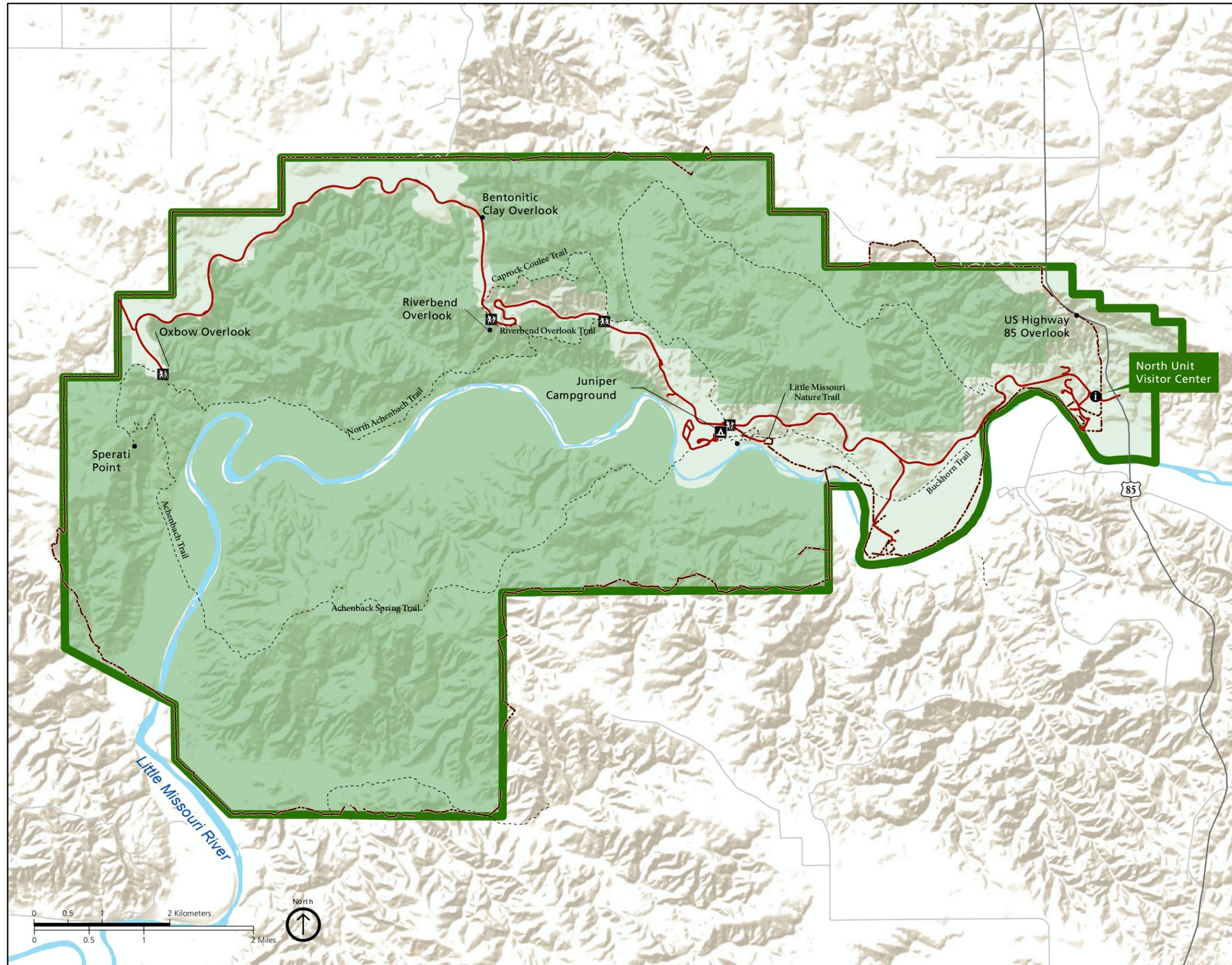
### **1.5 PUBLIC INVOLVEMENT**

#### **1.5.1 Civic Engagement**

The NPS has sought to engage the public throughout the development of this proposed Livestock Plan. On March 16, 2022, the NPS published a civic engagement newsletter and initiated a 30-day public civic engagement comment period. The newsletter included a description of the project background, the project’s purpose and goals, and several preliminary alternatives. On March 30, 2022, the NPS held a virtual civic engagement meeting to present information on the proposed project and answer questions posed by the public. The NPS invited members of the public to electronically submit comments on the project and preliminary alternatives through the NPS Planning, Environment, and Public Comment (PEPC) website.



Source: NPS GIS 2022  
 August 30, 2023  
 THROtherdEA\_overview\_south.pdf  
 No warranty is made by the National Park Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



## Theodore Roosevelt National Park

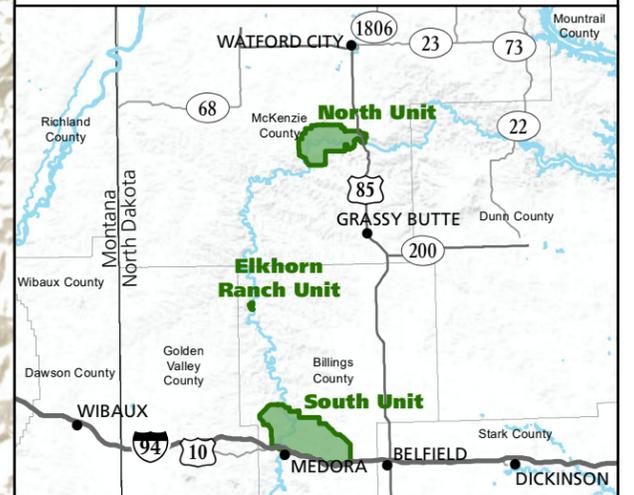


Livestock Plan and Environmental Assessment (EA)

### Map 2 North Unit Project Area

- Campground
- Overlook
- Visitor center
- Trailhead
- Trail
- Scenic drive
- Fence
- National Park Service Unit
- Non-wilderness
- Wilderness

Source: NPS GIS 2022  
 August 30, 2023  
 THROherdEA\_overview\_north.pdf  
 No warranty is made by the National Park Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Comments were also accepted via US mail. The comment period closing date was extended from April 15, 2022 to April 18, 2022, due to a severe storm that resulted in widespread power outages in the project area.

The NPS received 1,774 pieces of correspondence during the civic engagement period. Of these correspondences, 1,241 were considered unique and 533 were part of four separate form-letter campaigns. The topics that received the most comments related to the management of horses within the Park; fewer comments related to the management of cattle. The NPS also received comments on visitor use and the purpose and need. An overview of the comments received may be reviewed in the Civic Engagement Comment Analysis Report that is available on the project PEPC page<sup>1</sup>.

### **1.5.2 Public Scoping**

After review of NPS policies applicable to livestock in parks and consideration of the comments received during the civic engagement process, the alternatives were refined and reduced to three alternatives for public scoping. On December 12, 2022, the NPS published a scoping newsletter and initiated the start of a 50-day public scoping comment period. The newsletter included a description of the project background, the project's purpose and goals, and revised preliminary alternatives. On January 12, 2023, the NPS held a virtual scoping meeting to present information on the proposed project and answer questions from the public. The NPS invited members of the public to electronically submit comments through the NPS PEPC website or by US mail.

The NPS received 19,012 pieces of correspondence during the scoping comment period. Of these correspondences, 5,138 were considered unique and 13,874 letters were part of form-letter campaigns. Most comments related to the management of horses within the Park; fewer comments related to the management of cattle. Comments were also received on bison, mule deer, elk, pronghorn, and prairie dog management. An overview of the comments received may be reviewed in the Public Scoping Comment Summary Report that is available on the project PEPC page.

During public scoping for this EA the NPS identified Alternative C, Phased Reduction of Herds to No Livestock, as the proposed action. At this time the NPS has not identified a preferred alternative. The NPS will consider public comments on the EA and will identify the selected action in the finding of no significant impact (FONSI).

---

<sup>1</sup> <https://parkplanning.nps.gov/documentsList.cfm?parkID=167&projectID=105110>

## CHAPTER 2: ALTERNATIVES

### 2.1 INTRODUCTION

This chapter describes the three alternatives under consideration for livestock management in the Park: a no action alternative and two action alternatives.

The NPS interdisciplinary team developed the action alternatives after reviewing NPS policies related to livestock and nonnative and exotic species within parks as well as reviewing the Park's enabling legislation. Comments received during the civic engagement and public scoping processes described in Section 1.5 were also considered in the development of the alternatives. Action alternatives may originate from the proponent agency, local government officials, or members of the public at public meetings or during the early stages of project development, and they can be developed in consideration of comments from agencies. The alternatives analyzed in this document, in accordance with NEPA, are the result of information received during internal, agency, and public scoping.

The action alternatives presented in this EA meet the overall purpose and need for taking action and are consistent with laws, regulations, and policies that guide the NPS in managing livestock in the Park. Action alternatives considered to be reasonable (40 CFR 1508.1(z)) must be technically and economically feasible and must meet the purpose of and need for the proposed action. Appendix B provides a comparison of the alternatives.

### 2.2 ALTERNATIVE A: NO ACTION

Alternative A, the no action alternative, is a continuation of current management. Stewardship of the demonstration herds would continue under current management practices with a herd size objective of 35–60 horses and up to 12 cattle. Under Alternative A, the NPS may periodically introduce horses from outside sources to ensure genetic variation (NPS 1984).

Although the horse herd size fluctuates from year to year, there are currently approximately 200 horses in the South Unit. Active capture, handling, transfer to authorized entities, sale through a US General Services Administration (GSA) auction, contraception on a segment of the horse herd using chemical or surgical methods, and removal of excess horses would continue to occur to achieve the herd size objective defined in the 1978 EA (NPS 1978). Techniques for the capture, handling, and removal of horses would be as described in Section 2.5. To help meet the herd size objective, there would be an initial, weeklong roundup during the fall to reduce the number of horses in the Park. Helicopter roundups to meet or maintain the herd size objective would occur approximately every four years thereafter, with other capture techniques described in Section 2.5 used in the intervening years as needed.

Under Alternative A, cattle would be replenished from external sources as individuals perish to maintain numbers at or below 12 cattle, as indicated in the 1970 Management Plan for Longhorn Cattle (NPS 1970). Basic veterinary care would continue to be provided to cattle as needed when health issues arise. If any individual cattle needed to be transferred out of the Park, capture, handling, and removal techniques would be as described in Section 2.5.

## **2.3 ALTERNATIVE B: EXPEDITED REDUCTION OF HERDS TO NO LIVESTOCK**

Under Alternative B, active capture, handling, and removal of horses and cattle would occur to reduce the herd sizes to zero in an expedited fashion. Techniques for the capture, handling, and removal would be as described in Section 2.5.

To meet the horse herd size objective of zero, there would initially be a phase of weeklong roundups during the fall to remove most of the horses in the Park. Roundups using helicopters or other methods described in Section 2.5 would continue to occur in an expedited manner following the initial roundups until all horses were removed from the Park. Once the horses are captured, federally recognized Tribal Nations with affiliation to the project area would be provided with the first opportunity to receive the horses. Opportunities for transfer would then be extended to other entities such as other federally recognized Tribal Nations, non-federally recognized tribes, tribal corporations or tribal non-profit entities, or other entities as appropriate. After tribal requests are fulfilled, remaining livestock would be transferred to other authorized entities (such as institutions with an educational mission or other state or federal entities) or sold via a GSA auction. The NPS would plan to remove all horses within two years of implementation, though logistical, operational, and environmental circumstances may dictate that the effort could take longer. No further contraception activities would occur under this alternative. Under Alternative B, cattle would be removed in an expedited manner (within two years) using the capture, handling, and removal techniques described in Section 2.5. Basic veterinary care would be provided as needed upon capture.

## **2.4 ALTERNATIVE C: PHASED REDUCTION OF HERDS TO NO LIVESTOCK**

Under Alternative C, active capture, handling, and removal of horses and cattle would occur to reduce the herd sizes to zero, but with a phased approach for horses. Techniques for the capture, handling, and removal would be as described in Section 2.5.

Similar to Alternative B, an initial roundup effort would be conducted to significantly reduce the number of horses in the Park. As the horses are captured, they would be removed from the Park using the methods described under Sections 2.3 and 2.5. A representative subset of nonreproductive (chemically or surgically contracepted) horses would be returned to the Park to live out their lives. It is anticipated that the phased reduction would occur over 10 years or longer.

Under Alternative C, cattle removal would be as described for Alternative B.

## **2.5 ACTIONS COMMON TO ALL ALTERNATIVES**

### **2.5.1 Capture Methods**

#### **2.5.1.1 Horses**

Under all alternatives, the key method for capture would be helicopter roundups, which are the most efficient technique for horse removal and herd reduction on the landscape, particularly where the terrain is not favorable for off-road vehicles. Helicopter roundups use deliberate and

consistent pressure to herd horses from locations throughout the Park toward a corral location, where a wing fence is used as a barrier to guide the animals to holding pastures. Roundups generally occur once per year in the fall, when temperatures have cooled, and foals have developed the endurance for herding.

The NPS would select experienced helicopter operators from a list of certified ACETA (Aerial Capture, Eradication, and Tagging of Animals) vendors. To ensure public and staff safety during helicopter operations, an approved Project Aviation Safety Plan would be followed, and a helicopter manager would be on site to conduct safety and equipment checks and flight following. During herding operations, the helicopters would typically fly from 100 feet to just above ground level to herd the horses to corrals, but at no time would a helicopter contact the horses. The pilot and crew would evaluate horse behavior and make judgement decisions regarding whether or not to pursue individual horses that falter or fail to keep up with the herd. If one or more horses are not captured, an additional helicopter roundup or different capture method could be used later.

Horses that are not captured during initial helicopter roundups would be collected by wranglers on horseback, wranglers on foot using low-stress herding techniques, additional subsequent helicopter roundups, or on-the-ground tranquilizer darting techniques. Baiting and trapping is another potential capture method that would remain a tool under all alternatives. However, trapping has not yet proven effective because forage and water are readily available on the landscape, non-target wildlife consume the bait, and the horses are dispersed widely in the Park.

### **2.5.1.2 Cattle**

Cattle frequent the North Unit bison handling facility site, which makes them easy to locate and capture using low-stress movements (similar to shepherding sheep) that promote instinctual bunching behavior, or they would be baited into pastures or trailers. While unlikely, if these techniques are not effective, the Park would attempt to drive cattle with wranglers on horseback, coupled with low-stress herding by wranglers on foot, or tranquilizer darting techniques would be applied to effect capture. Lastly, the NPS may employ the use of a helicopter to round up the cattle to corral facilities.

## **2.5.2 Post-Capture Methods**

### **2.5.2.1 Horses**

Captured horses would be held in corral pastures and pens until they are transferred out of the Park. Holding pastures are approximately seven acres in size, with another one-half acre of holding pens used for sorting and handling horses. During the holding period, active management would include providing hay, water, and veterinary services for the horses, as well as ground training to acclimate horses to handling and loading onto trailers. To minimize the holding time, and before capture activities begin, NPS staff would begin working with the qualifying entities described in Section 2.3 to arrange the transfer. The timeline for transferring the horses to qualifying entities would take approximately three to five weeks after capture. Otherwise, a sale through a GSA auction would occur during the first week after capture, and

buyers would have two weeks to retrieve the horses; however, the process may take longer to accommodate administrative procedure and recipients' schedules for pickup.

### **2.5.2.2 Cattle**

Captured cattle would be held in the approximately 30 acres of pasture at the North Unit corrals or in another one-half acre of holding pens until they are transferred out of the Park. During the holding period, active management would include providing hay, water, and veterinary services for cattle, as well as ground training to acclimate cattle to handling and loading onto trailers. NPS staff would first work with qualifying entities to arrange the transfer of cattle. The timeline for transferring the cattle to qualifying entities may take up to 45 days. Otherwise, a sale through a GSA auction would occur during the first week after capture, and buyers would have two weeks to retrieve the cattle; however, the process may take longer to accommodate administrative procedure and recipients' schedules for pickup.

### **2.5.3 Other Management Components**

Euthanasia of individual horses or cattle could be used under certain circumstances, including individuals affected by a chronic or incurable disease, injury, lameness, or serious physical defect that would not allow them to maintain an acceptable quality of life for the foreseeable future; individuals posing a danger to visitors, threatening Park resources, or presenting a nuisance; and individuals that the NPS is unable to place or sell (as a last resort).

## **2.6 MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES**

Mitigation measures are specific actions that, when implemented, minimize, avoid, or eliminate impacts on resources caused or affected by alternative actions. The NPS would fully comply with all applicable laws, regulations, and policies governing resource protection, including the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and agency-specific guidelines.

The NPS would institute a series of best management practices during roundups and after capture, including low-stress herding movements, livestock health monitoring, adequate pen space to avoid livestock conflicts, and implementing adjustments to roundup techniques as needed. All efforts would be made to move and handle livestock in a humane manner. Oversight for livestock care would be provided by the NPS Natural Resources Stewardship and Science, Biological Resources Division, Wildlife Health Branch. NPS staff would provide adequate food and water while livestock are held at the handling facility. Veterinary staff would address any health needs.

Additionally, the following mitigations and practices would be employed to protect Park resources under all alternatives:

- Helicopter roundups would be timed when temperatures and animal condition are favorable for herding: when most mares are not pregnant, foals are mature enough to traverse the Park to corrals, and weather would not stress the animals. Stock trailers used for pickup would be required to be clean and free of weeds, hay, or animal excrement.

- Notifications would be publicized on the Park website to inform visitors of roundups to avoid conflicts with visitor activities.
- For any actions that would occur within wilderness, a Minimum Requirements Analysis would be conducted prior to taking action.

## CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

### 3.1 INTRODUCTION

This chapter describes the current and expected future conditions of the following impact topics: visitor use and experience, cultural resources, wildlife, vegetation, water resources, socioeconomics, and wilderness. These impact topics were identified through scoping as having the potential to be affected by the implementation of the alternatives described in Chapter 2. Additionally, this chapter analyzes the beneficial and adverse impacts that would likely result from implementing any of the alternatives considered in this EA. Impact topics considered but dismissed from detailed analysis are described in Appendix C.

This chapter is organized by impact topic. The Affected Environment: Current Conditions and Trends section for each impact topic is presented first and includes a discussion of trends and past, present, and reasonably foreseeable future actions that could affect that impact topic. The Environmental Consequences section evaluates direct, indirect, and cumulative impacts from the implementation of each alternative. A factual description of the direct and indirect impacts provides the reader with an understanding of how the current and expected future condition of the resource would likely change as a result of implementing the alternatives. Cumulative impacts, which are those that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions, are also analyzed.

Past, present, and reasonably foreseeable future actions in the project area that could affect the impact topics in the Park include the following:

- Oil and gas leasing and development occurs on lands adjacent to the Park. Oil and gas equipment, including pump jacks and flares, on lands bordering the Park are a visual and audible presence.
- Livestock grazing occurs on lands adjacent to the Park; there are private ranches and permitted grazing on Forest Service lands adjacent to the Park boundaries.
- The South Unit lies alongside Interstate 94, and the North Unit lies along Highway 85; traffic, periodic road maintenance, and construction operations are a visual and audible presence.
- The Theodore Roosevelt Presidential Library is forecast to open in 2026 in Medora (TRPL 2022). The library will honor the life, legacy, and enduring relevance of the 26th president. A site for the library has been selected near the Park in Medora.
- The Medora Foundation has proposed a vision document calling for the expansion of visitor opportunities in the town of Medora in the summer season (NPS 2022h).

In addition to the actions described above, the changing climate has the potential to affect resources in the Park. Annual average temperatures in North Dakota have warmed by about 2.6°F since the start of 20th century; annual precipitation amounts have also increased, with

rainstorms becoming more intense (Kunkel et al. 2022). These trends are anticipated to continue under high and low greenhouse gas emission pathways (Kunkel et al. 2022) and would continue to affect resources under all livestock plan alternatives, as described further under individual impact topic areas in this chapter.

## 3.2 VISITOR USE AND EXPERIENCE

### 3.2.1 Affected Environment: Current Conditions and Trends

NPS Management Policies state that the public’s enjoyment of NPS resources and values is part of the fundamental purpose of all parks, and the NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks (NPS 2006). Visitor amenities provide opportunities to explore the Park throughout the year. While the visitor center hours vary by season, and occasional road closures occur in winter, some campgrounds are open year-round and backcountry camping is available via a free permit.

The Park is the most popular tourist destination in North Dakota, and approximately 92 percent of Park visitors place “scenery viewing” as an important factor in visiting the Park (NPS 2015b). Scenic drives provide access to Park amenities along with scenic views and wildlife viewing opportunities. Numerous hiking trails, ranging in length from 0.1 to 19.4 miles, occur throughout the Park (NPS 2022a). These roadways and trails provide the public access to the Park’s unique landscape and scenery.

#### 3.2.1.1 Visitation

The Park has averaged 657,558 recreation visits per year since 2012 (NPS 2022b). Most visitors to the Park reside in North Dakota (26.9 percent), Minnesota (13.6 percent), and Wisconsin (5.2 percent) (Brownlee et al. 2020). During the most recent data year (2022), over 70 percent of day visits occurred during summer, and most overnight stays were in campgrounds (Table 1).

Table 1. Park Visitation by Type, 2022

Month	Total Day Recreation Visitors	Overnight Stays			
		Campers at Campgrounds	Backcountry Campers	Miscellaneous Campers	Total Overnight Stays
January	2,449	19	0	0	19
February	2,568	38	2	0	40
March	6,645	105	0	0	105
April	7,366	186	4	0	190
May	66,678	4,385	63	176	4,624
June	124,089	6,872	154	501	7,527
July	150,994	7,053	183	1,012	8,247
August	137,454	7,622	130	936	8,688
September	114,280	7,371	87	531	7,989
October	50,215	1,965	29	65	2,060
November	4,614	127	0	0	127

Month	Total Day Recreation Visitors	Overnight Stays			
		Campers at Campgrounds	Backcountry Campers	Miscellaneous Campers	Total Overnight Stays
December	1,327	19	6	0	25
Totals	668,679	35,762	658	3,221	39,641

Source: NPS 2022c

Note: Miscellaneous campers are those in areas not otherwise described above, such as in group camping areas, on board transport or boats, or in undeveloped overflow areas.

### 3.2.1.2 Visitor Use and Experience

The Park provides a variety of visitor opportunities. Visitor centers offer interpretive information on the Park's history and natural resources, and ranger-led interpretive programs are available seasonally. Overnight stays are available in the Park via developed campgrounds, and the backcountry, including the Theodore Roosevelt Wilderness, provides opportunities for backcountry camping. Other visitor opportunities include scenic drives, hiking, horseback riding, birdwatching, biking on Park roadways, kayaking and canoeing on the Little Missouri River, and cross-country skiing and snowshoeing in winter months.

The NPS has conducted periodic surveys and studies to understand visitor characteristics at the Park. A 2020 study (Brownlee et al. 2020) provided a snapshot on visitor use at the Park based on information collected from 1,474 Park visitors in the fall of 2017 and the spring and summer of 2018. During this study, 57 percent of those surveyed reported being first-time visitors. The primary activities reported by visitors were wildlife viewing (86 percent of respondents), followed by wildflower or general plant viewing (71 percent of respondents) and hiking on designated trails (65 percent of respondents). Fewer than one-quarter of respondents (22 percent) reported camping at the Park during their stay.

Aspects of the Park that visitors most identified as contributing to their experience included the clean environment (low litter, air, and noise pollution), its few human structures, being away from crowds, and being able to view and learn about wildlife. Scenic overlooks and interpretive signage about the Park, its geology, and Theodore Roosevelt also ranked highly with visitors surveyed.

### South Unit

The South Unit of the Park receives a much higher share of recreation visitors than the North Unit (Table 2 and Table 3). The South Unit received 276,814 recreation visitors in 2022 compared with 91,341 recreation visitors in the North Unit (NPS 2022e).

The Little Missouri River, which flows from south to north, bisects the South Unit. Visitor opportunities in the Theodore Roosevelt Wilderness lie to the west of the river, while a mix of backcountry and more developed visitor opportunities occur to the east (see Map 1).

**Table 2. Visitation in the South Unit (2018 – 2022)**

Type of Visit	Year				
	2018	2019	2020	2021	2022
Recreation visitors	302,008	292,434	258,079	334,190	276,814
Campers	26,064	27,024	541	28,912	28,606
Painted Canyon rest area	330,893	302,430	198,105	352,566	296,010

Source: NPS 2022e

Notes: The 2020 visitation, which indicates a sharp decline over previous years, was affected by COVID-related closures. The 2021 visitation, which indicates a sharp rise over previous years, was affected by post-COVID lifting of closures. Neither data set should be used to interpolate general trends.

The Painted Canyon area is a common destination, given its easy access from the adjacent interstate highway. The Visitor Center and entrance to the South Unit in the town of Medora are also easily accessed via the interstate highway. Visitation to the South Unit in general is enhanced because of its proximity to highways and the town of Medora. Theodore Roosevelt’s Maltese Cross Cabin can be viewed via a self-guided tour on the grounds of the South Unit Visitor Center. The town of Medora also offers many opportunities to visitors for overnight accommodations.

Visitors can use the South Unit’s 48-mile scenic drive and stop at the multiple overlooks to view the scenic and geological features of the North Dakota Badlands. Visitors can camp at the Cottonwood campground or the Roundup Group Horse Campground, a group campsite that allows horses. Many visitors stop to see the historic Peaceful Valley Ranch structures listed on the National Register of Historic Places (NRHP). There are numerous hiking trails of varying lengths and difficulty that offer visitors opportunities to experience the natural beauty of the North Dakota Badlands; both day hiking and overnight backpacking occur in the South Unit. Wildlife viewing is also a popular visitor activity. A nearly complete assemblage of native wildlife species can be viewed in the mixed grass prairie, sage scrublands, riparian forests, and other vegetative communities of the South Unit. These include bison, deer, prairie dogs, and a variety of other wildlife native to the region.

Horses are popular with some visitors and are generally viewed along roads and trails in the South Unit’s eastern portion, though the horses are unconfined within the Park and have access to the entire South Unit (Map 3; NPS GIS 2022). While no comprehensive visitor use survey has been conducted specific to horses in the Park, 49 percent of visitors interviewed for the Brownlee et al. (2020) study supported maintaining horse herds in the South Unit.

Within the South Unit, periodic operations and maintenance activities as well as ongoing natural and cultural resource management activities can affect the visitor experience. Road maintenance can last from hours to weeks depending on the project and can cause temporary interruption in traffic flow along the scenic drive. Trail maintenance activities and resource management projects occur in both the developed and undeveloped areas and have the potential to temporarily disrupt visitor access to certain areas of the unit. Bison and elk management activities are recurring efforts that involve the use of helicopters. Vegetation management efforts to restore and maintain the native prairie vegetation also include the use of helicopters for aerial application of herbicides to treat invasive plant species during summer and fall months.

Helicopters, which can present a highly visible and contrasting feature in backcountry areas, can adversely affect the experience of visitors seeking opportunities for quiet recreation away from visible signs of human influence on the natural landscape.

Removal activities associated with the South Unit's horses can periodically affect the visitor experience through the increased presence of staff and ground-based and helicopter use. In years without horse roundups, other less disruptive capture methods would be used to maintain herd size, with minimal impacts on visitor use and experience. Removal activities occur on an intermittent basis primarily in the eastern portion of the South Unit; the last helicopter use for horse management occurred in 2013 and lasted less than a week.

## North Unit

The North Unit sees similar trends in day use and overnight use as the South Unit, though at much lower levels (Table 3).

**Table 3. Visitation in the North Unit During 2018 – 2022**

Type of Visit	Year				
	2018	2019	2020	2021	2022
Recreation visitors	111,975	92,281	90,605	104,813	91,341
Campers	9,292	12,655	186	11,956	10,367

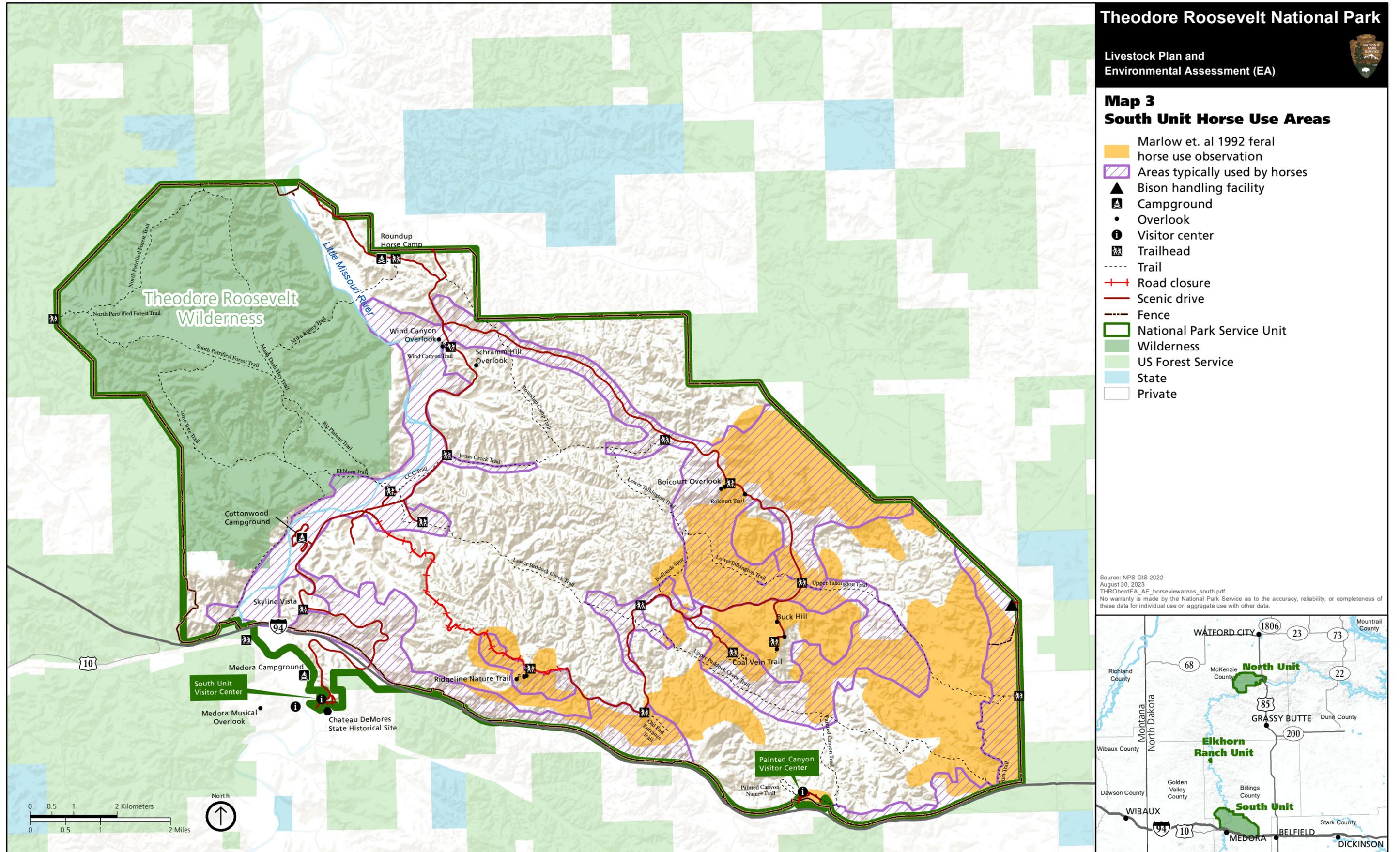
Source: NPS 2022e

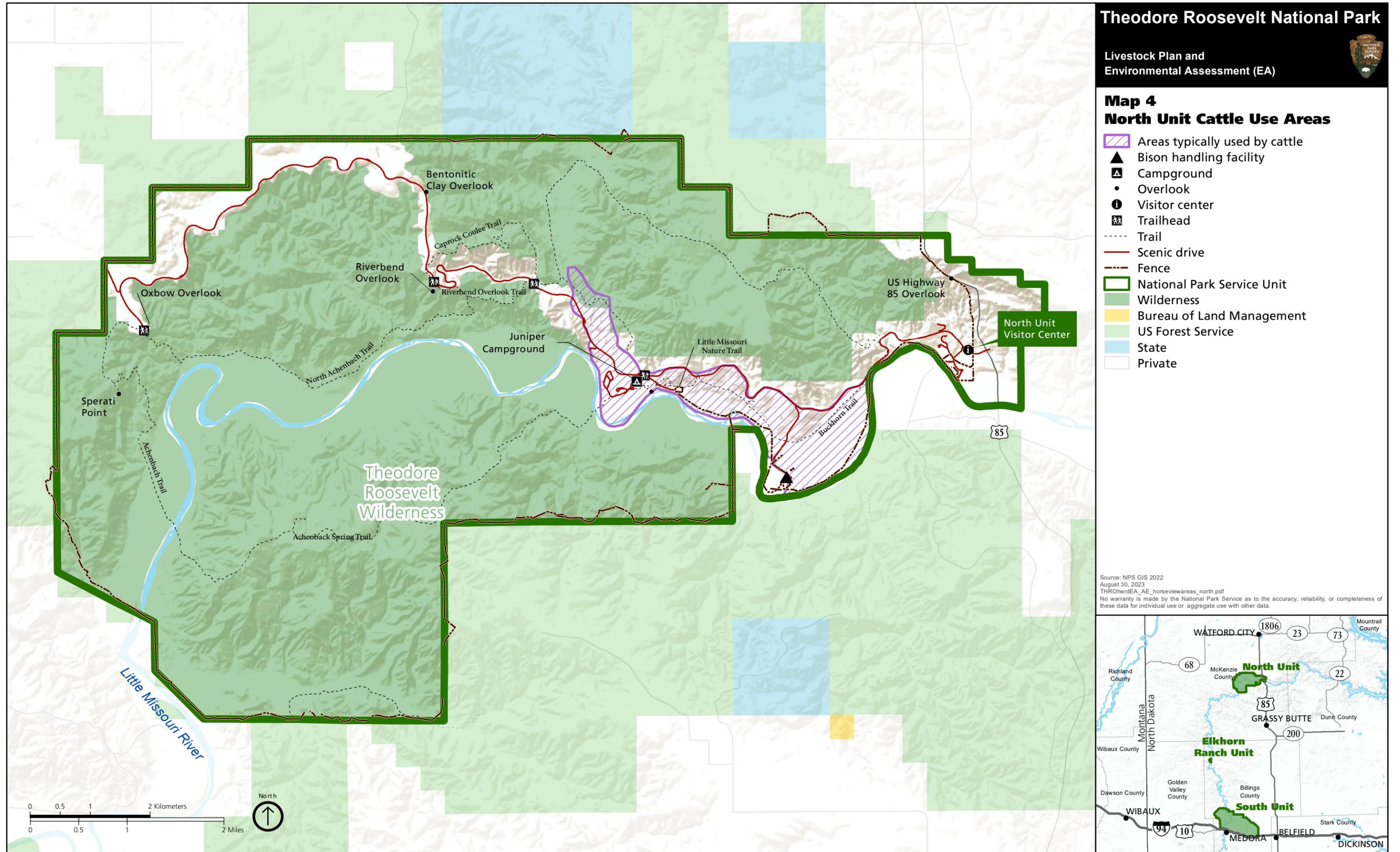
Note: The 2020 visitation, which indicates a sharp decline over previous years, was affected by the COVID-related closures. The 2021 visitation, which indicates a sharp rise over previous years, was affected by post-COVID lifting of closures. Neither data set should be used to interpolate general trends.

In contrast to the South Unit, the more-remote North Unit is composed mostly of the Theodore Roosevelt Wilderness. The Little Missouri River flows south to north where it enters the Park boundary but then flows east through most of the North Unit (see Map 2).

Visitors to the North Unit engage in similar activities to those described for the South Unit. The North Unit contact station is easily accessible via Highway 85 at the entrance to the Unit. Visitors can travel the 14-mile out-and-back (28-mile round trip) scenic drive to experience the scenic beauty of the North Dakota Badlands and the Little Missouri River, including expansive views from the Riverbend Overlook and Oxbow Overlook. Visitors can camp at the Juniper campground, which includes single and group campsites, and experience river bottom habitat at the Little Missouri Nature Trail. Like the South Unit, there are numerous hiking trails of varying lengths and difficulty that provide access to the North Unit's vast wilderness and unique backcountry experiences, including opportunities for backcountry camping. Wildlife viewing is a popular visitor activity, with opportunities to see native wildlife such as bison, prairie dogs, and bighorn sheep.

Cattle in the North Unit represent a small component of the visitor experience. While cattle may access the entire Unit, they generally congregate within lowland areas along the Little Missouri River where they are occasionally visible from the eastern portion of the scenic drive (see Map 4). While no comprehensive visitor use survey has been conducted specific to cattle in the Park,





43 percent of visitors interviewed for the Brownlee et al. (2020) study supported maintaining cattle in the North Unit.

Within the North Unit, as in the South Unit, periodic operations and maintenance activities as well as ongoing natural and cultural resource management activities can affect the visitor experience. Road maintenance can cause temporary interruption in traffic flow along the scenic drive, while trail maintenance activities and resource management projects have the potential to temporarily disrupt visitor access to certain areas of the unit. Bison management and vegetation management are recurring activities that involve the use of helicopters that can present a highly visible and contrasting feature in backcountry areas, including the wilderness areas. This can adversely affect the experience of visitors seeking opportunities for quiet recreation away from visible signs of human influence on the natural landscape.

Management activities associated with maintenance of cattle in the North Unit have a minimal effect on the visitor experience because they are short term, lasting only a few hours to a few days. In addition, management activities are generally focused in the small amount of lowland area depicted on Map 4 or in the immediate vicinity of the corrals near the bison handling facility, which are closed to the public. While management activities typically do not occur within the wilderness, on occasion management activities have required herding cattle out of wilderness.

### **3.2.1.3 Noise**

Manmade sounds, or noise, in the Park is a component of the visitor experience. Noise levels and their subsequent effects on visitors differ in the two units based on the source of the noise and the distance from the origin of the noise to the visitors.

#### **South Unit**

Noise levels in the South Unit are influenced by sources inside and outside the Unit. The primary noise sources originating within the unit are vehicle use along Park roadways and human voices from visitors. Occasional noise may also occur from operations and maintenance along roadways and include heavy equipment such as paving equipment and lighter equipment such as mowers, string trimmers, and chainsaws. The noises generated from operations and maintenance activities tend to be relatively short term, ranging from hours to weeks, and can be sporadic. However, to visitors encountering such noise, it can be disruptive. Noises may cause visitors to avoid or leave areas where they are occurring, thereby disrupting visitor enjoyment. Some visitors may endure a noisy area but have a less enjoyable experience. To support Park projects, helicopters are used for bison roundups, horse roundups, elk collaring, and invasive weed spraying. The use of helicopters for project support is typically a short-term disruption lasting only hours to days.

Helicopter use for management activities, including horse roundups in the South Unit, contributes up to 100 decibels of noise to the soundscape and can temporarily affect visitor enjoyment (see Table 4, below). The noise is concentrated along herding routes and adjacent to

the wing fence and bison handling facility. The intensity of these impacts would be highest during the active capture period and subside shortly afterward.

Noise sources outside the South Unit can also affect the experience of visitors in the South Unit. Aircraft overflights, both commercial and smaller private aircraft, can be heard by visitors in the Park. Utility terrain vehicles (UTVs), and cattle calling associated with adjacent livestock operations are additional sources of noise. Oil and gas operations (pump jacks) near the South Unit boundary also contribute to background noise (Amberg et al. 2014). Compared with these noise sources, highway traffic along Interstate 94 is the most prevalent external source of noise heard in the South Unit.

Table 4, below, presents the common sound levels and human response values. As noted in the table, conversational speech and freeway traffic are perceived at levels of 60–70 decibels. These noises would be the most disruptive for visitors that are nearest to roads and other visitors.

**Table 4. Sound Levels and Human Response**

Common Sounds	Noise Level (Decibels)	Effect
Automobile horn (3 feet)	120	Maximum vocal effort
Garbage truck Helicopter (100 feet)*	100	Very loud
Noisy restaurant Freeway traffic Business office	70	Telephone use difficult
Conversational speech	60	Intrusive
Soft whisper (15 feet)	30	Very quiet

Sources: Olivera et al. 2011; \*Nexflow 2022

## North Unit

Relative to the South Unit, the North Unit experiences a more natural soundscape due to its remoteness. Noise sources and types within and outside the Unit are similar to those described above for the South Unit but at a reduced scale, with similar potential effects on the visitor experience while noise is occurring. As in the South Unit, the primary noise sources originating within the North Unit are vehicle use along Park roadways and human voices from visitors; however, these occur at a much lower level given the fewer number of visitors to the North Unit. Occasional noise may also occur from operations and maintenance along roadways. In the North Unit, helicopters are used for bison roundups and invasive weed spraying and are a short-term disruption lasting only hours to days. Cattle management activities are a minimal source of noise in the North Unit.

The types of external noise sources described for the South Unit also occur near the North Unit. Highway 85 runs along the Unit's eastern boundary and carries passenger and commercial vehicles. The sounds of the highway can be heard within the Park, particularly toward the eastern portion of the North Unit. The highway sounds dissipate the further visitors travel westward into the Unit.

### 3.2.1.4 Trends and Planned Actions

An increase in visitation at the Park, as in other NPS units, is projected to continue to occur. Actions contributing to this trend are the scheduled opening of the Theodore Roosevelt Presidential Library in 2026 and the Medora Foundation's upcoming vision document that calls for expansion of visitor opportunities in Medora in the summer season (NPS 2022h). Activities that bring more visitors to Medora are likely to indirectly increase visitation to the Park, while promotion of the Park by the North Dakota Tourism Division is anticipated to more directly increase the number of Park visitors annually.

Additional actions that affect visitor use and experience include continuing oil and gas leasing and development on lands adjacent to the Park units. The continued operation of oil and gas equipment such as pump jacks are a visual and audible presence on the outskirts of the Park. Livestock grazing will continue to occur on lands that are adjacent to the Park. There are private ranches that border the NPS lands along with permitted grazing on Forest Service lands adjacent to the Park boundaries. These livestock are sometimes visible along the shared fence line with the Park, which would continue to contrast with the natural views that visitors experience within the Park. Maintenance of roadways adjacent to the Park is an action that would continue to occur as needed. The South Unit lies alongside Interstate 94, and the North Unit lies along Highway 85. Periodic road maintenance occurs on these and other roadways near the Park.

The changing climate has the potential to affect resources and the visitor experience in the Park. Annual average temperatures in North Dakota have warmed by about 2.6°F since the start of 20th century (Kunkel et al. 2022). Warming rates have been more than double in the winter compared with the other seasons. Annual precipitation amounts have also increased, with rainstorms becoming more intense. These trends are anticipated to continue (Kunkel et al. 2022). The changing climate could affect the presence and abundance of wildlife and the viewing opportunities for visitors. More severe weather events also could lead to potential access limitations, thereby affecting visitor enjoyment. Conversely, a Park-specific climate assessment (Todhunter and DeVries 2021) has suggested the potential for expanded visitation in the shoulder seasons (April–May and September–October) due to warming temperatures.

## 3.2.2 Environmental Consequences

### 3.2.2.1 Alternative A: No Action

#### South Unit

Under Alternative A—No Action, current management of the horse herd would continue. The visitor use and experience would not differ from current conditions described above. While the number of horses would decrease over recent levels, horse levels at the Park have fluctuated over time.

### *Cumulative Impacts*

Under Alternative A—No Action, the presence of horses in the South Unit would continue, with no new direct impacts on visitor use or experience compared with the current conditions and trends described under the Affected Environment: Current Conditions and Trends section above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

### **North Unit**

Under Alternative A—No Action, current management of the cattle in the North Unit would continue. The visitor use and experience would not differ from current conditions described above.

### *Cumulative Impacts*

Under Alternative A—No Action, the presence of cattle in the North Unit would continue to be managed as it is currently, with no new direct impacts on visitor use or experience compared with the current conditions and trends described under the Affected Environment: Current Conditions and Trends. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

### **3.2.2.2 Alternative B: Expedited Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative B, opportunities for visitors to view horses in the South Unit would cease after capture and removal activities were complete. Impacts on visitor use and experience would occur for those visitors desiring opportunities to view horses in the Park. Removal of horses from the landscape may negatively affect the experience for visitors who consider the horse herds to be part of the aesthetic experience of the Park.

Conversely, some visitors' experiences may be enhanced for those who prioritize opportunities for viewing native wildlife such as elk and bison. As discussed under Section 3.4, Wildlife and Section 3.5, Vegetation, removing horses from the South Unit would be beneficial to native flora and fauna, resulting in long-term benefits to native species' diversity and general prairie ecosystem health. These improved natural conditions would allow visitors to experience a more natural native prairie ecosystem.

Under Alternative B, short-term visual and noise impacts on visitor use and experience from helicopter use for horse roundup activities would be the same as described under current conditions. Due to the expedited nature of horse capture and removal activities, however, the noise and visual effects could occur in a compressed time frame and more frequently per year, compared with those that occur under Alternative A—No Action. Under Alternative B, the short-term impacts related to horse management activities would cease once all horses are relocated from the Park.

### *Cumulative Impacts*

The removal of horses in the South Unit under Alternative B would contribute an adverse incremental impact on the visitor use and experience for those visitors who come to the Park to view the horses. When considered along with other past, present, and reasonably foreseeable future actions described above in Affected Environment: Current Conditions and Trends, there would be a slight adverse cumulative impact on visitor use and experience. Past, present, and reasonably foreseeable actions described under Affected Environment: Current Conditions and Trends would continue to provide for a range of visitor opportunities in the Park.

Under Alternative B, the noise impacts associated with horse management actions would be those described under Affected Environment: Current Conditions and Trends until the horses were removed from the Park. After removal, one source of intermittent noise and visual intrusion in the South Unit would cease; therefore, there would be no contribution of horse herd management to cumulative impacts of noise on visitor use and enjoyment.

### **North Unit**

Under Alternative B, opportunities to view cattle in the North Unit would cease. Adverse impacts on visitor use and experience would occur for those visitors desiring opportunities to view longhorn cattle in the Park. Removal of cattle from the landscape may negatively affect the experience for visitors who consider the cattle to be part of the aesthetic experience of the Park.

Conversely, visitor use and experience may be enhanced for those visitors to the North Unit who value a more natural experience. The removal of cattle in the North Unit would be beneficial to the native flora and fauna. These improved conditions in the Park would promote visitor enjoyment of natural resources and wildlife.

Under Alternative B, short-term impacts on visitor use and experience from cattle removal activities would be minimal since the removal of the cattle would take only a few days or less. Many visitors would not be disturbed by the removal action unless they were in the immediate area. While a full suite of removal actions would be available, cattle would most likely be loaded onto trailers at the corrals that are closed to visitor access and transported out of the North Unit, with no impact on visitor use or experience from this action.

### *Cumulative Impacts*

The removal of cattle in the North Unit under Alternative B would contribute an adverse incremental impact on the visitor use and experience for those visitors who come to the Park to view cattle. When considered along with other past, present, and reasonably foreseeable future actions described above in Affected Environment: Current Conditions and Trends, there would be a slight adverse cumulative impact to visitor use and experience. Because their numbers are so few and they are not always visible to visitors, this contribution to the cumulative impact on visitor use and enjoyment would be small.

Under Alternative B, the noise associated with cattle management actions would be those described under Affected Environment: Current Conditions and Trends until the cattle were

removed from the Park. After the cattle are removed, there would be no contribution from cattle management to cumulative impacts of noise on visitor use and enjoyment.

### **3.2.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative C, opportunities to view horses in the South Unit would be reduced over time until no horses remain in the Park. The number of remaining horses could potentially be less than under Alternative A—No Action, and there would be no growth in the herd, which would result in fewer opportunities for horse viewing after the initial removal effort. As the herd size decreases over time, the opportunity for visitors to view horses would likely decrease until the herd size reached zero. It is anticipated that there would be some opportunity for viewing horses for 10 or more years after the initial herd reduction effort.

Under Alternative C, short-term visual and noise impacts on visitor use and experience from helicopter use for horse roundup activities would be similar to those described under current conditions. Annual roundups would continue to occur until all horses were contracepted, after which helicopter use for horse herd management would only occur in rare instances.

#### *Cumulative Impacts*

Under Alternative C, the eventual removal of horses in the South Unit would contribute an adverse incremental impact on the visitor use and experience for those visitors who come to the Park to view the horses. When considered along with other past, present, and reasonably foreseeable future actions described above in Affected Environment: Current Conditions and Trends, there would be a slight adverse cumulative impact on visitor use and experience. Past, present, and reasonably foreseeable actions described under Affected Environment: Current Conditions and Trends would continue to provide for a range of visitor opportunities in the Park.

As described for Alternative B, incremental impacts of horse roundup activities when considered along with other wildlife and vegetation management actions would continue to produce the intermittent noise and visual intrusions described under the Affected Environment: Current Conditions and Trends until the horses were removed from the Park. After removal, there would be no contribution to the cumulative impact of intermittent noise and visual intrusion in the South Unit.

#### **North Unit**

Under Alternative C, impacts on visitor use and experience from the removal of cattle from the landscape and from removal activities themselves would be the same as described under Alternative B.

#### *Cumulative Impacts*

Cumulative impacts would be the same as described under Alternative B.

### 3.3 CULTURAL RESOURCES

#### 3.3.1 Affected Environment: Current Conditions and Trends

“Cultural resources” is an inclusive term and has been adopted and widely used to refer to the diverse human record found in sites, structures, objects, and places created or used by people. These may comprise archeological, historic, or architectural districts, sites, structures, objects, or places. The term cultural resources includes “historic properties” as defined in the National Historic Preservation Act, cultural resources determined to be eligible for listing in the NRHP, as well as ethnographic resources.

The NPS defines ethnographic resources as “variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. The decision to call resources ‘ethnographic’ depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their lifeways” (NPS 1998a). In other words, ethnographic resources can be any of a wide variety of resources, as they are understood by people or groups for which they have a special importance distinct from the understanding of others.

Archeological and ethnographic resources at the Park reflect almost 10,000 years of human history. Based on the Park’s cultural resource data as of October 2022, 384 cultural sites have been documented. Many of these sites provide evidence for Native American lifeways and settlement of the West by homesteaders (NPS 2014; Fiege et al. 2017). There are archeological sites in the Park dating to the Plains Archaic (5500 BCE to 400 CE [common era]) and Plains Woodland periods (400 to 1000 CE). The Park contains numerous archeological sites and resources dating to the historic period (1780 to 1950; Fiege et al. 2017). These sites represent early European American exploration and settlement of the region, including homesteading, cattle ranching, and the Civilian Conservation Corps (CCC). Many historic archeological sites are associated with historic built resources, such as the ranches and associated facilities that spread across the region when Theodore Roosevelt first visited the Badlands.

While the cultural resources in the Park serve as evidence for millennia of past human use (see Fiege et al. 2017), the Park’s purpose is to memorialize and pay tribute to President Theodore Roosevelt and to preserve and protect the natural and cultural resources that inspired his conservation ethic (NPS 2014). Roosevelt first visited the Badlands in 1883 and bought into a partnership at the Maltese Cross Ranch. Following the loss of his wife and mother, Roosevelt returned to the Badlands and began the life of a cattle rancher.

The Park features historic structures and cultural landscapes associated with recreational facilities and other infrastructure constructed by the CCC and Works Progress Administration (WPA) during the Great Depression, including the Old East Entrance Station (Figure 1) and stone entrance pylons in the South Unit, and the Riverbend Overlook, picnic shelters, and campgrounds in the North Unit. Additionally, the CCC and WPA constructed roads and trails throughout both units of the Park, with associated stone culverts and walls. During

construction, members of the CCC resided within the Park at several locations, which are also known archeological sites.

The historic built environment is a prominent aspect of the Park's cultural resources; however, because no effects on historic structures by livestock have been documented at the Park to date and these resources are unlikely to be impacted under any of the alternatives considered in this EA, they are not discussed further.

### **3.3.1.1 Ethnographic Resources**

An ethnographic overview and inventory project conducted by the University of Arizona (Daughtry et al. 2016) described the cultural connections between resources at the Park and various cultural groups, both living and past. A wide range of Native American and European American ethnographic resources in the Great Plains were recognized, including animals, plants, landforms, minerals, and archeological resources. Many of these resources are found in the Park, including many species of native wildlife and vegetation discussed in the respective sections of this EA, as well as horses and longhorn cattle. Current conditions and trends relating to ethnographic resources in the Park are best understood here as a combination of those for archeological resources, wildlife (Section 3.4), and vegetation (Section 3.5).

### **3.3.1.2 Archeological Resources**

The condition of archeological sites at the Park is constantly changing, though the speed with which this occurs can vary dramatically between resource types and settings. The continued presence of livestock is one factor among many that can influence the condition of archeological sites, including erosion, wildlife impacts, looting, and development.

## **South Unit**

In the South Unit, approximately 23,000 acres out of 46,000 acres (50 percent) have been surveyed for archeological resources. There are 291 known archeological sites, of which 38 are recommended as eligible for listing, have been nominated for listing, or have been listed in the NRHP. Since approximately half of the South Unit is unsurveyed, it likely contains many more archeological sites than are currently known.

Archeological resources in the South Unit can be affected by both human-caused activities and natural events. Construction or maintenance of Park infrastructure or other surface-disturbing activities can inadvertently damage undiscovered resources, though the potential for this is minimized at the project level through surveys and other measures to reduce the potential for impact. Visitors to the Park can impact archeological resources through looting, vandalism, or unintentional damage. Because the South Unit receives a much higher proportion of recreational visits than the North Unit (Table 2 and Table 3), archeological resources in this unit are likely to receive a larger proportion of such impacts. Damage to archeological material can destroy information, and displacement can separate these resources from their context. Both processes decrease the ability to develop meaningful interpretations about the past using those materials.

Archeological sites in the Park are potentially subject to trampling by both native species and livestock. Trampling is an action, whether from livestock or other large native mammals, that can degrade archeological sites. Trampling has been shown to cause damage to fragile resources (Douglas and Wandsnider 2012; Pargeter and Bradfield 2012). Studies have documented the impact of trampling on archeological materials, such as lithics (Gifford-Gonzalez et al. 1985), bone (Olsen and Shipman 1988), or ceramics (Stoops 1989). Trampling also causes horizontal and vertical displacement of artifacts; these impacts are most pronounced in areas associated with springs, seeps, or other water features (Wildesen 1982; NPS 2018). While these studies mostly examined trampling effects from cattle, these effects can be extrapolated to horses and native wildlife of similar size and weight.

Impacts on archeological resources from native species have been documented in other parks and likely occur in the South Unit. For example, the NPS has noted that bison have impacted numerous archeological sites at other parks, causing artifact concealment, breakage, displacement, and damage to prehistoric structures (NPS 2017). Burrowing animals such as prairie dogs, common in the Park (see Section 3.4, Wildlife), also create potential for the displacement and damage of archeological materials.

Based on the Park's cultural resource data and horse location observations by Marlow et al. (1992), approximately 9,300 acres (56 percent) of the area most frequently used by horses (16,700 acres) in the South Unit have been surveyed, with 120 known archeological sites. Of these 120 sites, 25 are recommended as eligible for listing, have been nominated for listing, or have been listed in the NRHP. While these areas represent those most likely to be frequented by horses during the time period they were observed by Marlow et al. (1993), horses have access to the entire South Unit of the Park and could potentially affect archeological sites in other areas of the Unit. While not specifically documented, horses at the Park may contribute to impacts on archeological resources similar to those described above for native species where such resources overlap with horse use or areas in which ground-based horse management activities occur.

### **North Unit**

In the North Unit, approximately 9,700 acres out of 24,100 acres (40 percent) have been surveyed for archeological resources. There are 92 known archeological resource sites, of which 21 are determined eligible or have been nominated for inclusion in the NRHP.

Impacts on archeological resources in the North Unit can be affected by similar human-caused activities as those described above for the South Unit, though to a potentially lesser degree due to the fewer areas of developed uses and the lower level of visitation. As in the South Unit, damage and displacement of archeological material can affect the cultural setting and decrease the ability to develop meaningful interpretations about the past using those materials.

As in the South Unit, archeological sites in the North Unit are also potentially subject to trampling by native species such as bison and displacement or damage from burrowing animals such as prairie dogs. Cattle also represent a potential effect on archeological resources from trampling and cattle management activities, though this effect is likely not widespread given the

small number of cattle and the localized area they generally occupy. However, cattle and cattle management activities can occur within the entirety of the North Unit.

### **3.3.1.3 Trends and Planned Actions**

Much of the North and South Units of the Park remain unsurveyed for archeological resources (60 percent and 50 percent, respectively), and they likely contain more cultural resources than are currently known. It can be assumed that more cultural resources will be discovered as inventories continue throughout the Park, including within the areas most heavily used by livestock. As part of the ongoing work related to cultural resources, historic districts and cultural landscapes have been recognized and proposed for listing in the NRHP, such as the Peaceful Valley Ranch Cultural Landscape (NPS 2019). The management actions subsequent to these designations can aid in preservation and interpretation of cultural resources within the Park's boundaries.

Climate change, in particular climate-driven changes in ground cover and ground-disturbing natural processes, is an emerging stressor on cultural resources. More frequent and more intense droughts, wildfires, and storms would increase the potential erosion of soils, changes in the vegetation cover, and direct damage to structures built of flammable materials (Davis 2018). This can be an impact in and of itself depending on the nature of the cultural resource and could result in some cultural resources becoming more exposed and susceptible to other impacts such as trampling. As noted in the Park's Foundation Document, cultural resources at the Park (particularly archeological sites and historic resources such as the buildings at the Peaceful Valley Ranch) continue to deteriorate due to natural processes, age, and security concerns, and climate change could accelerate weathering, deterioration, and the loss of archeological resources (NPS 2014). Ethnographic resources in the Park such as wildlife and vegetation are also subject to increasing stress due to climate change, among other trends such as herbivore grazing, invasive species presence, and wildfire (Section 3.4.1.3, Wildlife and Section 3.5.1.2, Vegetation).

Ongoing and reasonably foreseeable future actions with the potential to impact cultural resources at the Park include ongoing road and infrastructure maintenance as well as construction of new housing and administration buildings in the North Unit (NPS 2022i). Capture of horses and ongoing wildlife management actions such as bison roundups have the potential to impact cultural resources through trampling, similar to the trampling impacts described above. As also described above, potential impacts from maintenance or construction actions would be analyzed and mitigated through the National Historic Preservation Act Section 106 process, often in the form of cultural surveys, avoidance, and construction monitoring.

Projected increases in visitation resulting from reasonably foreseeable future actions such as the construction of the Theodore Roosevelt Presidential Library near Medora and efforts by the state of North Dakota to promote the Park in tourism literature could increase the potential for looting, vandalism, and inadvertent damage to cultural resources.

A number of trends also have the potential to result in beneficial impacts on the Park's cultural resources. Ethnographic work (2016 and 2006) and ongoing archeological inventories have led

to greater recognition and documentation of the ethnographic resources within the Park, enabling a greater degree of protection for these resources. The NPS has completed rehabilitation and revitalization of historic structures, such as the Peaceful Valley Ranch, and ongoing maintenance to historic roads in the Park like the CCC's Scenic Drive in the South Unit (NPS 2022i). These activities contribute to the preservation and interpretation of the affected resources. Archeological site condition assessments are carried out periodically (every one to 15 years) on subsets of sites by staff, offering an opportunity to further recognize and reduce threats to the Park's cultural resources.

### **3.3.2 Environmental Consequences**

Section 106 of the National Historic Preservation Act requires all federal agencies to consider the effects of undertakings on cultural resources that are eligible for or listed in the NRHP. Through the Section 106 process, the NPS would seek to avoid, minimize, or mitigate any impacts on cultural resources. The NEPA process also includes the consideration of impacts to cultural resources, including ethnographic resources, which are presented below. Though Section 106 and NEPA processes are separate, in complying with Section 106 the Park will work to ensure that impacts on cultural resources from activities carried out during any of the alternatives will be avoided, minimized, or mitigated.

#### **3.3.2.1 Alternative A: No Action**

##### **South Unit**

Under Alternative A—No Action, current management of the horse herd would continue. Impacts on cultural resources of all types, including archeological and ethnographic resources, would not differ from the current conditions described above.

##### *Cumulative Impacts*

Under Alternative A—No Action, the presence of horses in the South Unit would continue, with no new direct impacts on cultural resources compared with the current conditions and trends described above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

##### **North Unit**

Under Alternative A—No Action, current management of the cattle in the North Unit would continue. Impacts on cultural resources of all types, including archeological and ethnographic resources, would not differ from current conditions described above.

##### *Cumulative Impacts*

Under Alternative A—No Action, the presence of cattle in the North Unit would continue, with no new direct impacts on cultural resources compared with the current conditions and trends described above. Past, present, and reasonably foreseeable actions and their impacts would be

the same as those described in the Affected Environment: Current Conditions and Trends section.

### **3.3.2.2 Alternative B: Expedited Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative B, reducing the herd to zero horses within approximately two years would remove the contribution of impacts on archeological resources from the presence of horses described under current conditions in the Affected Environment: Current Conditions and Trends section once capture and removal activities are complete. Impacts on archeological resources would be as described under current conditions until the horses are removed.

As discussed under Section 3.4, Wildlife and Section 3.5, Vegetation, removing horses from the South Unit would be beneficial to native flora and fauna, with potential indirect benefits to ethnographic resources in the South Unit. The Park would prioritize management and protection of native species, including the native wildlife and plants identified as potential ethnographic resources, and would be able to prioritize native species management within approximately two years. Conversely, expedited removal of horses from the South Unit would result in the loss of an ethnographic resource (the horse itself) and could impact the sense of place experienced and sought after by some Park visitors tied to the cultural roots of Native Americans, homesteaders, ranchers, and the Badlands in general (Daughtry et al. 2016).

Short-term impacts on archeological resources from horse capture and removal activities, including the potential for trampling effects during herding and disturbance through ground-based horse management activities, would be the same as described in the Affected Environment: Current Conditions and Trends section. The potential impacts from these activities would cease once all horses are removed from the South Unit, removing a potential long-term source of impacts on archeological resources when compared with Alternative A—No Action.

#### *Cumulative Impacts*

Under Alternative B, the presence of horses and horse management activities would continue to contribute incrementally, in a slightly adverse manner, to the cumulative effects on archeological resources in the South Unit as described in Affected Environment: Current Conditions and Trends until the horses were removed from the Park within approximately two years. After removal, this incremental contribution would cease; therefore, there would be no contribution of horses or horse herd management to cumulative impacts on archeological resources.

The expedited removal of horses in the South Unit under Alternative B would have a beneficial incremental contribution to the cumulative impact on native vegetation and wildlife-based ethnographic resources in the South Unit. Within approximately two years, the Park would prioritize the management and protection of the native species that have been identified as ethnographic resources. This alternative would have an adverse impact on one identified ethnographic resource in the South Unit (the feral horses themselves), which would be removed

from the Park. Tribal Nations having traditional association with the Park would be given first opportunity to received captured horses, which would help to maintain this ethnographic resource in the Great Plains region.

### **North Unit**

Under Alternative B, the removal of cattle from the landscape would remove the potential for impacts on archeological resources described under current conditions in the Affected Environment: Current Conditions and Trends section once cattle removal actions are complete. Impacts on archeological resources would be as described under current conditions until the cattle are removed.

Removing cattle from the North Unit would be beneficial to native flora and fauna, with potential indirect benefits to these ethnographic resources. Conversely, the removal of cattle from the North Unit would result in the loss of an ethnographic resource (the cattle themselves) and could impact the sense of place experienced and sought after by some Park visitors, tied to the cultural roots of homesteaders and ranchers (Daughtry et al. 2016).

The potential for impacts on archeological resources from cattle removal activities would be low, as removal would occur in previously disturbed areas of the North Unit.

#### *Cumulative Impacts*

Under Alternative B, the presence of cattle and cattle management activities would contribute a minor adverse incremental cumulative impact on archeological resources in the North Unit as described in Affected Environment: Current Conditions and Trends until the cattle were removed from the Park. After removal, this incremental contribution would cease; therefore, there would be no contribution to cumulative impacts on archeological resources.

The removal of cattle in the North Unit under Alternative B would incrementally contribute a beneficial impact on native vegetation and wildlife-based ethnographic resources. Over the long term, the Park would prioritize the management and protection of the native species that have been identified as ethnographic resources. This alternative would have an adverse impact on one identified ethnographic resource in the North Unit (the cattle themselves), which would be removed from the Park. Cattle would continue to persist on the landscape of the Great Plains, including on ranches adjacent to the Park; removal of the nine head of cattle from the Park would have negligible impact on this ethnographic resource.

### **3.3.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative C, potential impacts on archeological resources from the presence of horses in the South Unit would be similar to those described under current conditions in the Affected Environment: Current Conditions and Trends section until the horse population is reduced to below the current plan's herd objective level, after which they would continue to decrease until eventually no horses or potential for impact remains.

As discussed under Section 3.4, Wildlife and Section 3.5, Vegetation, the phased removal of horses from the South Unit would be beneficial to native flora and fauna in the long term, with potential indirect benefits to ethnographic resources in the South Unit. The Park would prioritize management and protection of native species, including the native wildlife and plants identified as ethnographic resources. Conversely, the removal of horses from the South Unit would result in the loss of an ethnographic resource (the feral horses themselves) and could impact the sense of place experienced and sought after by some Park visitors tied to the cultural roots of Native Americans, homesteaders, ranchers, and the Badlands in general (Daughtry et al. 2016).

Short-term impacts on archeological resources from horse capture and removal activities, including the potential for trampling effects during herding and disturbance through ground-based horse management activities, would be the same as described in the Affected Environment: Current Conditions and Trends section. These activities would continue to occur until all horses were captured and contracepted, after which impacts would lessen and then ultimately cease once all horses are removed from the South Unit after approximately 10 or more years. This would remove a potential long-term source of impacts on archeological resources when compared with Alternative A—No Action.

#### *Cumulative Impacts*

Under Alternative C, the presence of horses and horse management activities would continue to contribute incrementally to the cumulative adverse effects on archeological resources in the South Unit as described in Affected Environment: Current Conditions and Trends, at a reduced level, until the horses were entirely removed from the unit. After removal, this incremental contribution would cease and there would be no contribution of horses or horse herd management to cumulative impacts on archeological resources.

The eventual removal of horses in the South Unit under Alternative C have a beneficial incremental cumulative impact on native vegetation and wildlife-based ethnographic resources in the South Unit. Over the long term, the Park would prioritize the management and protection of the native species that have been identified as ethnographic resources. This alternative would have an adverse impact on one identified ethnographic resource in the South Unit (the feral horses themselves) from its eventual removal from the Park. However, some horses would live out their lives on the landscape in the near term. Tribal Nations having traditional association with the Park would be given first opportunity to received captured horses, which would help to maintain this ethnographic resource in the Great Plains region.

### **North Unit**

Under Alternative C, impacts on cultural resources from the removal of cattle from the landscape and from removal activities themselves would be the same as described under Alternative B.

#### *Cumulative Impacts*

Cumulative impacts would be the same as described under Alternative B.

## 3.4 WILDLIFE AND WILDLIFE HABITAT

### 3.4.1 Affected Environment: Current Conditions and Trends

#### 3.4.1.1 Wildlife

Ecosystems found in the Park include floodplains, forests, prairies and grasslands, and rivers and streams (see the Vegetation section for more details on the vegetation types in these habitats). These ecosystems support over 250 vertebrate species. Key species found in the Park that may compete with livestock for resources include American bison (*Bison bison*), elk (*Cervus canadensis*), pronghorn antelope (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), and deer (*Odocoileus spp.*) (Westfall et al. 1993, Fietzek-DeVries 2013). Elk, bighorn sheep, bison, and pronghorn antelope were once extirpated from the region, mainly due to overhunting and habitat loss.

Reintroductions of native prairie ecosystem biota began a few years after the Park was founded in the late 1940s. The first native mammal species reintroduced to the Park was pronghorn antelope in 1951, with 75 pronghorns that were transported from Yellowstone National Park. Following some success with the pronghorn antelope, bison, elk, and bighorn sheep were also reintroduced (NPS 2004, Harmon 1986). Currently, pronghorn antelope populations fluctuate as they roam freely in and out of the Park, primarily the South Unit.

Bison were nearly driven to extinction by the end of the nineteenth century due to a variety of factors, including overhunting. When the Park was founded in 1947, bison were not present. Less than a decade later, reintroduction efforts began with 24 cows and five bulls translocated to the Park's South Unit. Six years after reintroduction, 20 bison were relocated from the Park's South Unit to the North Unit. The NPS actively manages bison for optimal populations, based on forage allocation models, of roughly 100–300 bison in the North Unit and 200–500 bison in the South Unit (Westfall et al. 1993). Research has found that grasslands and prairie are the preferred habitat type for bison in the Park, while forested areas are typically used as corridors (Norland 1984). Bison, elk, and livestock typically use upland grasslands for important foraging grounds; however, an overlap in diet and foraging resources among bison and elk has been found to be minimal (Westfall 1989).

Elk were once common throughout the Great Plains and mountains of North America. Since early settlement, elk populations have drastically declined due to overhunting, land use changes, and habitat fragmentation. By the late 1800s, elk were completely extirpated from the Badlands region. In an attempt to reestablish major native ungulate species and native ecosystems in the Park, 47 elk were relocated from Wind Cave National Park and reintroduced in the South Unit in 1985 (Westfall 1989). Elk culls take place annually in the South Unit through lethal removal by firearm. The elk population size in the Park is currently maintained within the population objective of 100–400 individuals (NPS 2010). Management of the elk population in the Park generally involves removing mostly cows (NPS 2010). Management of this population is designed with the goal of preventing sustained heavy use of forage by elk and the resulting vegetative cover loss, and reducing soil erosion to decrease sediment in surface waters.

Bighorn sheep are the most recent native species reintroduced to the Park. The reintroduction of bighorn sheep has involved collaboration with the North Dakota Game and Fish Department. The reintroductions began in 1959 with five rams donated by the North Dakota Game and Fish Department (Harmon 1986). The management of bighorn sheep is quite different from management of bison or elk because the bighorn sheep have yet to be able to sustain a regenerative population within the Park (NPS 2018). Difficulties with poor recruitment and occurrence of pneumonia (*Mycoplasma ovipneumoniae*), a bacterium common in domestic sheep and fatal in wild bighorn sheep, are the main factors that limit success of herd establishment (Wilson 2019). Bighorn sheep prefer grassland habitat, with adjacent steep terrain used for protection from predators (Lewis 1998).

Other native wildlife species potentially interacting with livestock and found in the Park include mule deer (*Odocoileus hemionus*); white-tailed deer (*Odocoileus virginianus*); badger (*Taxidea taxus*); mountain lion (*Puma concolor*); beaver (*Castor canadensis*); coyote (*Canis latrans*); porcupine (*Erethizon dorsatum*); prairie dog (*Cynomys ludovicianus*); a variety of raptors, such as eagles (*Aquila* spp.) and hawks (*Buteo* spp.); and other bird species, including those that nest on the ground, such as the sharp-tailed grouse (*Tympanuchus phasianellus*) and North Dakota's state bird, the western meadowlark (*Sturnella neglecta*). The NPS has documented and confirmed 162 bird species within the Park's boundaries (NPS 1987, 2015b, 2023).

Prairie and grassland habitat types are abundant in the Park and used regularly by both native ungulates as well as livestock. They provide valuable habitat for bison, elk, mule deer, prairie dogs, and predatory mammals like badgers and coyotes. Other small mammals, like rabbits and chipmunks, live in the grassland habitats. The abundance of small mammals also supports a variety of raptors, including eagles, hawks, and falcons (NPS 2015d).

Floodplains are found in each Park unit. The Little Missouri River transects these units and supports a variety of wildlife species. Cottonwood trees along the Little Missouri River provide valuable habitat for white-tailed deer, porcupines, beavers, and a variety of resident and migratory birds, among other species. Birds that can be found in the forested riparian areas include golden eagles, white-breasted nuthatches, and great-horned owls. Floodplains also include large grassy areas that are the preferred habitat type of large mammals, including bison, deer, and elk; the Park's horses and cattle also use these areas.

A variety of amphibians and reptiles also occur in the Park. These include tiger salamander (*Ambystoma tigrinum*), plains spadefoot toad (*Scaphiopus bombifrons*), Great Plains toad (*Bufo cognatus*), Rocky Mountain toad (*Bufo woodhousii*), boreal chorus frog (*Pseudacris nigrita*), and leopard frog (*Rana pipiens*), prairie rattlesnake (*Crotalus viridis*), racer (*Coluber constrictor*), bull snake (*Pituophis catenifer*), plains garter snake (*Thamnophis radix*), western hog nose snake (*Heterodon nasicus*), snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), short-horned lizard (*Phrynosoma hernandesi*), and sage lizard (*Sceloporus graciosus*), among others (NPS 2015c).

Federally listed and candidate species under the Endangered Species Act that may occur in the Park's boundary or surrounding areas are the northern long-eared bat (*Myotis septentrionalis*, endangered), tricolored bat (*Perimyotis subflavus*, proposed endangered), piping plover

(*Charadrius melodus*, threatened), red knot (*Calidris canutus rufa*, threatened), whooping crane (*Grus americana*, endangered), Dakota skipper (*Hesperia dacotae*, threatened), and monarch butterfly (*Danaus plexippus*, candidate) (USFWS 2023). The northern long-eared bat is the only listed species that has been surveyed for in the Park, using acoustic detection techniques that can identify bat calls of specific species. Though some recordings were attributed to the northern long-eared bat, the sample size was small and the recordings could have been from other similar-sounding myotis bats (Licht 2018). Insufficient evidence was found to suggest the species is present, but its absence could not be confirmed and the Park is within its range (Licht 2017). None of the above species are currently known to occur on Park lands, and there is no designated or proposed critical habitat for listed or proposed species in the Park.

### **3.4.1.2 Livestock and Wildlife Interactions**

Interactions between livestock and wildlife such as bison, elk, pronghorn antelope, deer, prairie dogs, and ground-nesting birds are common. Horses and cattle are nonnative species that trample vegetation and compact soil, causing adverse effects on habitat composition and quality. Horse and cattle herds also compete with native wildlife species, such as elk, deer, bighorn sheep, and bison, for food and water resources (Westfall et al. 1993). Changing climate conditions may further limit available resources, making competition more severe and limiting the resource capacity for native species in the Park.

#### **South Unit**

Several studies have evaluated the impacts of horses on wildlife, with many focusing on the impacts of horses on soils and vegetation, with indirect effects on wildlife forage and habitat. Soil impacts from horses on ecological functionality may also adversely influence small mammal populations. Beever and Brussard (2000) investigated the response of small mammal communities in areas where horses were present and where horses were excluded. They found strong differences in vegetation and qualitative differences in small mammal activity between horse-grazed areas and horse exclusion areas; this suggests that impacts on small mammal communities were stronger in horse-grazed locations (Beever and Brussard 2000). Prairie dog towns and other small mammal communities in the South Unit may be vulnerable to impacts from horses.

Other studies also have reviewed the specific impacts of horses on wildlife. Mandema et al. (2013) examined the trampling of artificial nests by horses, then further evaluated nest trampling in relation to the proximity of a water source. The researchers found that nest trampling by horses leads to lower nest success rates in areas where horses are prevalent. They also found that the number of nests trampled by horses increased with proximity to a water source (Mandema et al. 2013). In grasslands and prairie habitats in the South Unit, trampling of nests by ungulates, including horses, poses a risk to ground-nesting birds, such as sharp-tailed grouse and meadowlarks.

Hall et al. (2018) found that pronghorn antelope and mule deer use water sources less frequently where horses also use the water sources. Perry et al. (2015) and Gooch et al. (2017) both documented horses preventing elk and pronghorn antelope from accessing certain water

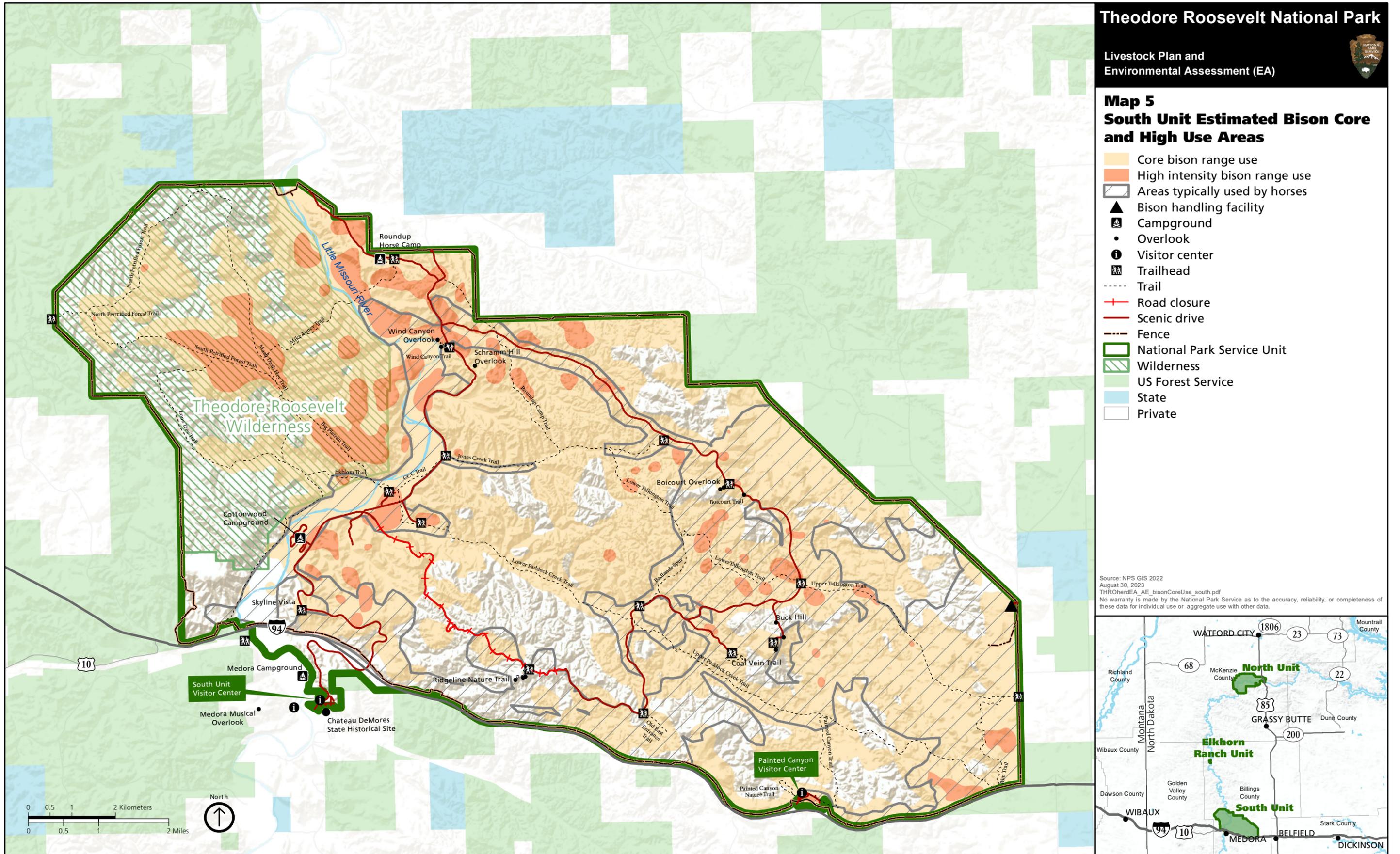
sources. Conversely, a study on the interactions of feral horses and antelope by Meeker in 1979 in Nevada showed a “lack of interference competition between antelope and horses at water or under grazing or moving situations.” It should be noted that in similar studies during the time frame of Meeker’s study, the horse and pronghorn antelope herd sizes were much smaller, and thus impacts may not be reflective of current herd sizes and interactions (Gooch et al. 2017).

As shown on Map 5, there is substantial overlap between bison high intensity and core use areas and known horse use areas. Similar overlap can be seen between elk high intensity and core use areas and known horse use areas (Map 6). Horse herds in the South Unit could constrain water resources and displace native wildlife near water sources, as continued loss of water from competition with horses may adversely impact some native wildlife (Berger 1985).

The horse herd in the South Unit, particularly at higher herd sizes, has the potential to damage fences used for wildlife management, trample or overgraze vegetation used by native wildlife species, contribute to erosion and soil-related impacts such as those described above, and compete for food and water resources. Horse management actions also can affect wildlife in the South Unit. Horse removal activities have the potential to impact wildlife, particularly during helicopter roundups, which may produce temporary startle effects in some individuals, causing them to temporarily leave areas where these activities take place.

The degree to which noise from roundups may disturb wildlife depends on many factors. Wildlife’s responses to noise are known to vary by species based on acoustical factors, such as frequency, intensity, and duration of noise, and non-acoustical factors, such as the life history stage, environmental or behavioral context, and degree of past exposure (Francis and Barber 2013). Noise that is abrupt and unpredictable may be perceived as a threat, potentially triggering a startle response or antipredator behavior (Frid and Dill 2002; Francis and Barber 2013).

Exposure to helicopter use may not be a profound factor in wildlife behavior response for some species in the Park, however, because helicopter use is a relatively common practice. Helicopters within the Park are used for a variety of resource management purposes such as bison roundups, elk net gunning, and aerial spraying for invasive plant control. Helicopters inside and outside the Park are also used for search and rescue operations. Low-level fixed wing flights also occur in and around the Park for survey of wildlife by North Dakota Game and Fish and NPS, and a variety of Unmanned Aerial Systems have also been employed for research, search and rescue, and administrative purposes.

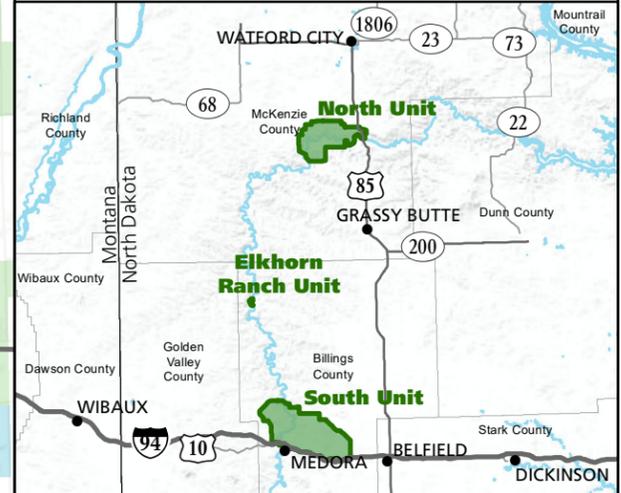


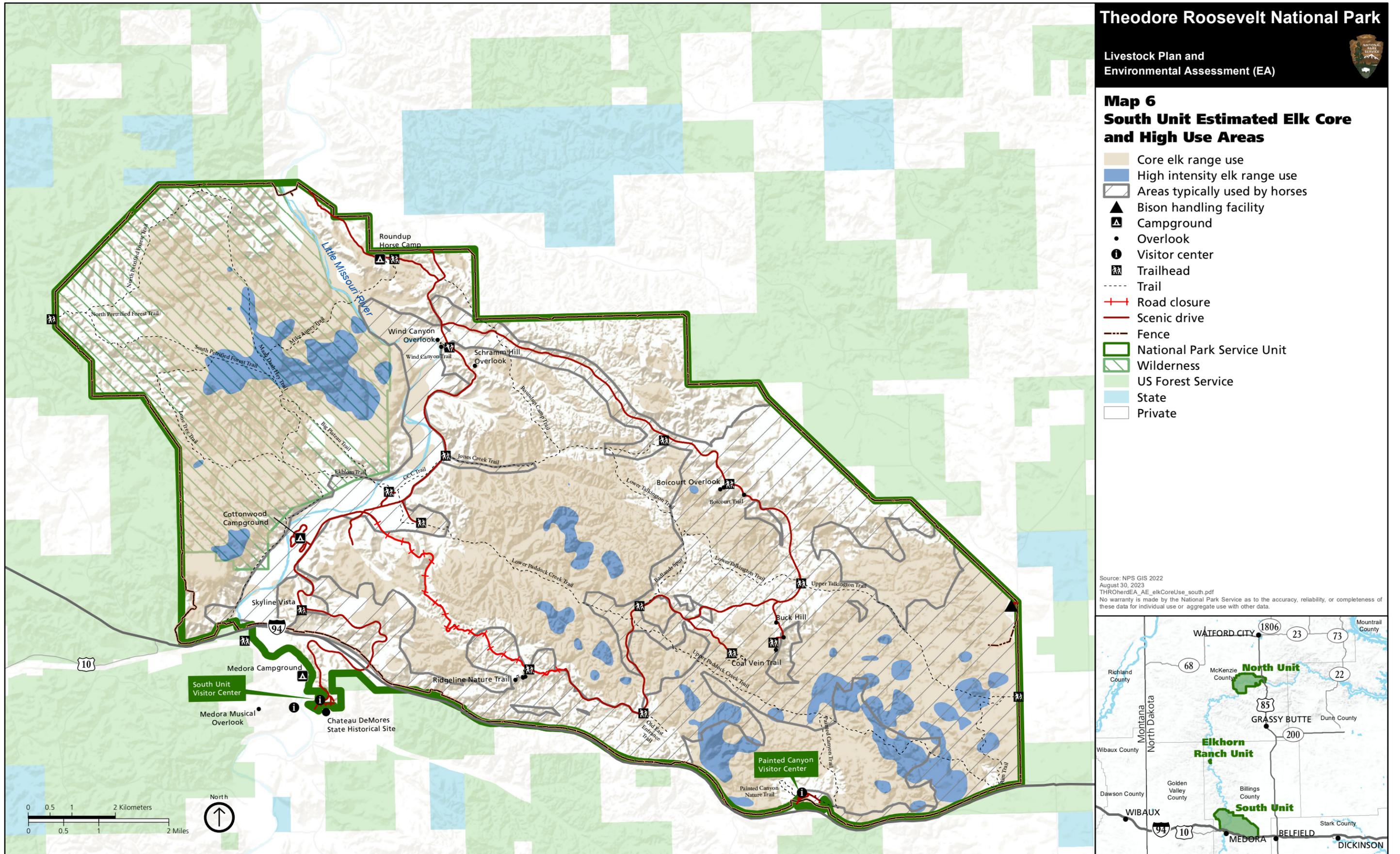
**Theodore Roosevelt National Park**  
 Livestock Plan and Environmental Assessment (EA)

**Map 5**  
**South Unit Estimated Bison Core and High Use Areas**

- Core bison range use
- High intensity bison range use
- Areas typically used by horses
- Bison handling facility
- Campground
- Overlook
- Visitor center
- Trailhead
- Trail
- Road closure
- Scenic drive
- Fence
- National Park Service Unit
- Wilderness
- US Forest Service
- State
- Private

Source: NPS GIS 2022  
 August 30, 2023  
 THROtherdEA\_AE\_bisonCoreUse\_south.pdf  
 No warranty is made by the National Park Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



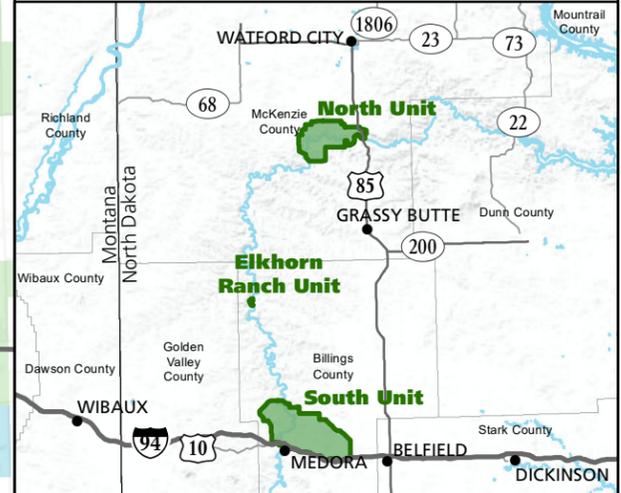


**Theodore Roosevelt National Park**  
 Livestock Plan and Environmental Assessment (EA)

**Map 6**  
**South Unit Estimated Elk Core and High Use Areas**

- Core elk range use
- High intensity elk range use
- Areas typically used by horses
- Bison handling facility
- Campground
- Overlook
- Visitor center
- Trailhead
- Trail
- Road closure
- Scenic drive
- Fence
- National Park Service Unit
- Wilderness
- US Forest Service
- State
- Private

Source: NPS GIS 2022  
 August 30, 2023  
 T:\Theodore\EA\_AE\_elkCoreUse\_south.pdf  
 No warranty is made by the National Park Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



## North Unit

Like horses, cattle are a nonnative species that can affect wildlife in the Park. The magnitude of potential impacts is lessened by the small number of cattle (up to 12) in the North Unit, but interactions are not mitigated by this relationship. Further, there is a growing concern that *Mycoplasma bovis* (*M. bovis*), an emerging pathogen that causes respiratory disease, eye and ear infections, arthritis, and other complications, has the potential to be passed from cattle to bison in the Park (Maunsell et al. 2011). Though existing longhorn cattle are thought to be healthy, they are more prone to direct contact with trespass cattle, or through nose-to-nose interactions through the fence, than bison, and they may serve as an intermediary that passes the disease on to bison at shared watering sites.

Bison infected with *M. bovis* show similar symptoms of pneumonia, or pharyngitis. The difference, however, is *M. bovis* does not produce toxins like the pathogens from pneumonia; therefore, the bison do not show signs of illness in the early stages of infection. As the infection spreads, the bison start to lag behind when the herds move, and eventually the infected bison become weak and die (Sweeney et al. 2013). Not all bison that become infected with *M. bovis* develop symptoms and perish; healthy bison may be carriers and spread the disease to others. In a recent study, researchers found that *M. bovis* can be carried in the upper respiratory tract of healthy bison who have not shown prior indications of infection, suggesting that a large proportion of carriers may not produce detectable antibodies (Register et al. 2021).

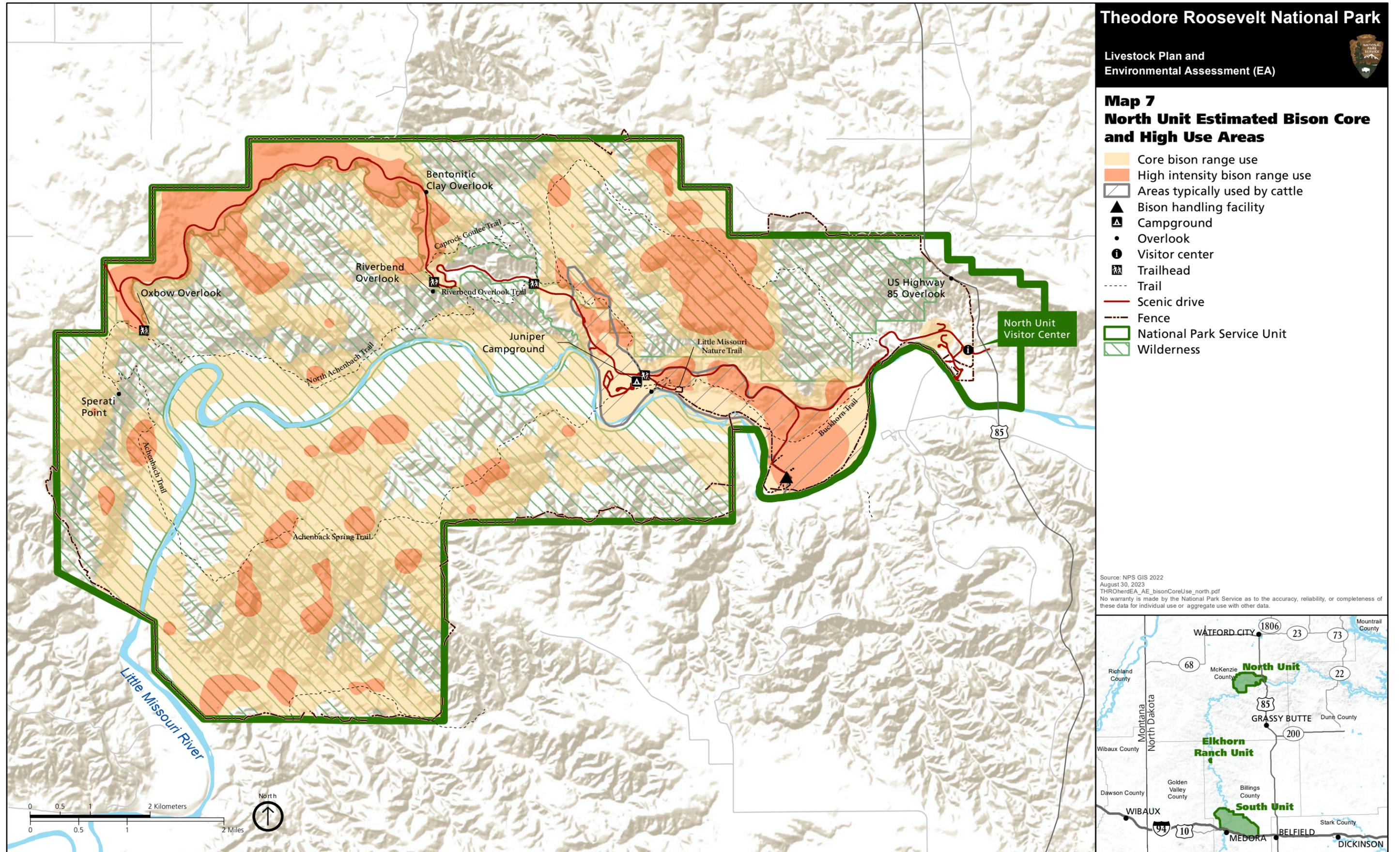
Map 7 shows the overlap between cattle and bison use areas in the Park. While bison tend to use grassy and herbaceous habitats that are farther from water resources than those preferred by cattle, bison circulate throughout the North Unit, with most or all individuals interacting with cattle in the corral areas near the bison handling facility.

### 3.4.1.3 Trends and Planned Actions

Projected increases in visitation resulting from reasonably foreseeable future actions such as the construction of the Theodore Roosevelt Presidential Library near Medora and efforts by the state of North Dakota to promote the Park in tourism literature would increase the potential for impacts on wildlife from increased interactions with visitors and increases in motor vehicle strikes from increased traffic on Park roadways.

Livestock grazing on lands surrounding the North and South Units would continue to have the potential to affect bison herds in both units of the Park through the transfer of *M. bovis* from interactions with trespass cattle that enter Park lands or by infection of bison that escape the boundary fence and then return to the Park.

Trends in climate will likely continue to impact water and food resources for wildlife in the Park. Native grassland forbs are the dominant vegetation type; most grassland forbs depend on temperature for flowering to occur. Changes in climate have led to seasonal shifts in blooms for vegetation and changes in animal behavior, such as shifts in migration and breeding patterns (Fietzek-DeVries 2013). The effects from global climate change on wildlife communities may be



reflected by fundamental shifts in vegetation dynamics, which may result in a significant loss in wildlife species diversity (Fietzek-DeVries 2013). The effects from warmer winters and less snowpack drastically influence mixed prairie grasslands, leading to limited resources, such as forage, nesting, and shelter, for wildlife. Stressors from climate change limit available resources for native wildlife and may amplify competition for resources among wildlife and livestock in the Park.

### **3.4.2 Environmental Consequences**

#### **3.4.2.1 Alternative A: No Action**

##### **South Unit**

Under Alternative A—No Action, current management of the horse herd would continue. Impacts on wildlife and its habitat in the South Unit would not differ from the current conditions described above.

##### *Cumulative Impacts*

Under Alternative A—No Action, the presence of horses in the South Unit would continue, with no new direct impacts on wildlife or its habitat compared with the current conditions and trends described in the Affected Environment: Current Conditions and Trends section above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

##### **North Unit**

Under Alternative A—No Action, current management of cattle would continue. Impacts on wildlife in the North Unit would not differ from the current conditions described above.

##### *Cumulative Impacts*

Under Alternative A—No Action, the presence of cattle in the North Unit would continue to be managed as it is currently, with no new direct impacts on wildlife compared with the current conditions and trends described under Affected Environment: Current Conditions and Trends. Past, present, and reasonably foreseeable actions and their impacts would be as described in the Affected Environment: Current Conditions and Trends section.

#### **3.4.2.2 Alternative B: Expedited Reduction of Herds to No Livestock**

##### **South Unit**

Under Alternative B, reducing the herd to zero horses within approximately two years would remove the potential impacts on wildlife and its habitat described under current conditions once capture and removal activities are complete. Impacts on wildlife and its habitat would be as described under current conditions until the horses are removed from the South Unit.

Under Alternative B, short-term impacts on wildlife from horse removal activities would be as described under current conditions. Due to the expedited nature of horse capture and removal

activities, these effects could occur in a compressed time frame and more frequently per year compared with those under Alternative A—No Action. This would increase the potential for some impacts, such as startle effects, in the short term more than under Alternative A—No Action. Under Alternative B, the short-term impacts related to horse management activities would cease once all horses are removed from the Park.

Removing horses from the South Unit under this alternative would benefit wildlife and its habitat in the long term when compared with Alternative A—No Action.

#### *Cumulative Impacts*

Under Alternative B, the presence of horses and horse management activities would continue to contribute a small adverse incremental impact to the overall cumulative effects on wildlife and its habitat in the South Unit as described in *Affected Environment: Current Conditions and Trends* until the horses were removed from the Park within approximately two years. After removal, this incremental contribution would cease; therefore, there would be no contribution of horses or horse herd management to cumulative impacts on wildlife or its habitat.

### **North Unit**

Under Alternative B, the removal of cattle from the North Unit would remove the potential impacts on wildlife described under current conditions.

Impacts on wildlife and its habitat from cattle removal activities under Alternative B would be minimal. While a full suite of removal actions would be available, cattle would most likely be loaded onto trailers at the corrals and transported out of the North Unit on well-traveled routes, with little to no impact on wildlife resources.

This alternative would benefit wildlife and their habitat in the North Unit in the long term compared with Alternative A—No Action.

#### *Cumulative Impacts*

Under Alternative B, the presence of cattle would contribute a very small potential adverse incremental impact to the overall cumulative impacts on wildlife resources in the North Unit as described in *Affected Environment: Current Conditions and Trends* until the cattle were removed from the Park. After removal, this incremental contribution would cease; therefore, there would be no contribution to cumulative impacts on wildlife resources.

### **3.4.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative C, potential impacts on wildlife and its habitat would decrease over time as the horse herd size decreases in the South Unit. Potential impacts would be similar to those described under current conditions until the number of horses is reduced to below the current plan's herd size objective level, until eventually no potential for impact remains.

Short-term impacts on wildlife from horse removal activities would be the same as described under current conditions during initial roundups. Potential impacts during annual roundups would continue to occur until all horses were contracepted, after which helicopter roundups and potential startle impacts may cease. Impacts would cease once all horses are gone from the Park, which would occur over a period of 10 or more years.

This alternative would benefit wildlife and its habitat in the South Unit in the long term compared with Alternative A—No Action.

#### *Cumulative Impacts*

Under Alternative C, the presence of horses and horse management activities in the South Unit would continue to contribute a small adverse incremental impact to the cumulative effects on wildlife and its habitat described in Affected Environment: Current Conditions and Trends, though at a reduced level, until the horses were entirely removed from the unit. After removal, this incremental contribution would cease and there would be no contribution of horses or horse herd management to cumulative impacts on wildlife resources.

### **North Unit**

Under Alternative C, impacts on wildlife resources from the removal of cattle from the landscape and from removal activities themselves would be the same as described under Alternative B.

#### *Cumulative Impacts*

Cumulative impacts would be the same as described under Alternative B.

## **3.5 VEGETATION**

### **3.5.1 Affected Environment: Current Conditions and Trends**

#### **3.5.1.1 General Vegetation**

The Badlands of the Park are typical of the Great Plains Badlands vegetation complex. The rolling topography spans across approximately 70,500 acres—from sunny and dry, grass-covered south faces, to cooler and sparsely forested north faces—that provide for a diversity of plant life.

The Park's plant list includes 554 plant species, with graminoid species (grasses, sedges, and rushes) constituting the majority (Manuel and Swanson 2019; NPS 2022i). Vegetation monitoring plots were established across the Park's South and North Units starting in 2010, including plots within all dominant vegetation types, such as grasslands, juniper forests, cottonwood galleries, and shrublands. Plots are monitored annually on a rotational basis, where native and exotic species are recorded by ground cover. Additional monitoring is conducted through the NPS Northern Great Plains Fire Ecology Program, which started monitoring plants in the late 1990s; however, use of current methods began in 2010.

Vegetation ground cover in the Badlands is often scarce, but it can be moderate to heavy in areas with shallower slopes. Badlands are characterized by high site potential for erosion and limited topsoil development. They are often dry for much of the growing season due to the steep slopes and lack of persistent precipitation. Infrequent but heavy summer rains can cause notable erosion of the soft soils and contribute substantially to shaping stands of vegetation. In some cases, erosion can remove as much as one inch of sediment per year (Stoffer 2003).

Exotic plant species are common in all areas of the Park, with an average exotic species cover of 24 percent, which is more than twice the management target of 10 percent (Manuel and Swanson 2019). There is a general trend of increasing exotic cover over time in riparian<sup>1</sup> habitat, with exotic plant cover significantly greater near roadways (Ashton and Davis 2017). However, the average number of native species per square foot is within the range found in native prairies in the region (NPS 2019). Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*) comprise most of the exotic species cover in the Park, but other common exotic species include leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*), and sweetclover (*Melilotus officinalis*). Kentucky bluegrass is increasing in all areas of the Park (Ashton and Davis 2017).

Livestock and native ungulates on the landscape can impact vegetation through the ongoing spread of invasive and noxious weeds. In addition, during capture and removals, transport and spread of noxious and invasive weeds can be facilitated by vehicles, livestock, and Park personnel.

Horses and cattle, specifically, are known to ingest noxious weeds and spread viable seeds through their manure (King et al. 2019; Quinn et al. 2008; Wells and Lauenroth 2007). Livestock and native mammals may pick up seeds in their hair while foraging or resting on the ground, and subsequently transfer the seeds during movements across the landscape. The spread of some invasive and noxious weeds, such as common burdock (*Arctium minus*) and hound's tongue (*Cynoglossum officinale*), is facilitated by the movement of animals alone, as seeds (burs) can be captured and spread on the grazers and other species externally (Clerck-Floate 1997). These invasive and noxious species are not desirable and are removed when identified, but they do not currently represent a significant point of concern for the Park's invasive species management priorities. In the Park, efforts to control invasive plants focus on leafy spurge, spotted knapweed (*Centaurea maculosa*), Russian knapweed (*Rhaponticum repens*), Canada thistle, black henbane (*Hyoscyamus niger*), absinth wormwood (*Artemisia absinthium*), and tamarisk/salt cedar (*Tamarix ramosissima*) (NPS 2015e).

No plant species in the Park are currently included or proposed for inclusion on the federal endangered or threatened species lists. Various surveys over recent decades have identified and documented 13 State rare species (Heidel 1990; Manuel and Swanson 2019; see Table 5, below). Of these, *Carex* spp., *Poa* spp., and *Stipa comata* are the most vulnerable to overgrazing (Marlow

---

<sup>1</sup> Riparian zones, or areas, are lands that occur along the edges of rivers, streams, lakes, and other water bodies. Examples include streambanks, riverbanks, and floodplains. They are different from surrounding uplands because their soils and vegetation are shaped by the presence of water.

et al. 1992). Marlow et al. (1992) noted overgrazing near springs, and some rare plants in the Park are associated with such areas (Heidel 1990).

## South Unit

Horses generally occupy and forage on sites with deep and well-drained soils and moderate slopes, usually characterized as upland grasslands, where both grasses and shrubs are present. Common grass and shrub species across the Park's upland grasslands include western wheatgrass (*Pascopyrum smithii*), needlegrasses (*Nassella* sp.), silver sagebrush (*Artemisia cana*), fringed sage (*Artemisia frigida*), western snowberry (*Symphoricarpos occidentalis*), and sedges (*Carex* sp.). Plant life can be limited on upland zones with steeper slopes, with restricted coverage of bunch grasses such as little bluestem (*Schizachyrium scoparium*), blue grama (*Bouteloua gracilis*), and sideoats grama (*Bouteloua curtipendula*). Shrubs like juniper (*Juniperus* sp.), fourwing saltbush (*Atriplex canescens*), and greasewood (*Sarcobatus vermiculatus*) are common, but scattered.

Within draws and valleys of the Badlands, as well as along the Little Missouri River, there are diverse communities composed of plains cottonwood (*Populus deltoides*), Rocky Mountain juniper (*Juniperus scopulorum*), green ash (*Fraxinus pennsylvanica*), willows (*Salix* spp.), and wildrye (*Elymus* spp. or *Leymus* spp.). Quaking aspen (*Populus tremuloides*) occupy the heads of some draws on the Petrified Forest Plateau of the South Unit and some draws in the North Unit.

In the lower grassland bottoms along floodplains adjacent to riparian zones, vegetation cover is dominated by silver sagebrush, western wheatgrass, needle and thread (*Hesperostipa comata*), and blue grama (*Bouteloua gracilis*). Fringed sage, prairie rose (*Rosa arkansana*), and western snowberry may also be found as woody foliage along alluvial deposits. Riparian areas within the Park's boundary are found adjacent to the Little Missouri River, as well as in meandering depressions and drainages, seeps, springs, and river oxbows. In some cases, ponds that were developed for livestock prior to Park establishment now support riparian vegetation.

Horses compete with other native wildlife for forage. Similar to native ungulates, horses typically forage on upland vegetation. Therefore, vegetation in upland zones is experiencing a higher degree of use when compared with valleys and riparian zones. There is limited research on open-range grazing competition among horses and native ungulates. However, horses tend to forage over a wider area than cattle, which have similar grazing preferences to bison (Molle et al. 2022; Nolte et al. 2017). When compared with ungrazed plots, free-roaming horses reduce ground cover, litter cover, herbaceous stubble height, and foliar density of vegetation. When compared with native wildlife and cattle, horses have more negative effects on riparian vegetation through forage consumption, trampling, bank alteration, and erosion of soils (Boyd et al. 2017). However, the impacts on vegetation at the Park by the current herd are difficult to distinguish from the interactions of native herbivores.

Current horse management practices, primarily helicopter roundups, can impact vegetation in the South Unit, through trampling by the movement of horses for roundup. However, similar impacts occur during bison roundups. Herding effects on vegetation would be concentrated along herding pathways and adjacent to the wing fence used to funnel horses into the holding

facility. In addition, vegetation can be trampled or crushed by motor vehicles and trailers used to transport horses from the Park. However, vehicles stay mostly on established roads during roundup activities. Where horses are captured using chemical immobilization, there are localized impacts on vegetation in the immediate capture area from trampling or use of all-terrain vehicles/utility vehicles, sleds, and motor vehicles.

Rotor wash from helicopters used during horse roundups can lead to movement of soils and damage to plants where the helicopter is low to the ground. Similar impacts occur during bison roundups and may occur during helicopter use for other Park management purposes. These ongoing effects are highly localized and short lived. Importantly, roundup of horses and bison typically occur in the fall, after most graminoid and forb species have senesced, mitigating potential to affect growth and flowering stages of these plants.

Eleven State rare species have been documented in the South Unit of the Park (see Table 5; Heidel 1990).

**Table 5. Rare Plant Species Documented in the North and South Units**

Scientific Name	Common Name	Unit
<i>Coryphantha missouriensis</i>	Missouri ballcactus	South Unit
<i>Dalea enneandra</i>	Nine-anthered dalea	South Unit
<i>Oxytropis sericea</i>	White locoweed	South Unit
<i>Physaria brassicoides</i>	Mustard twinpod	South Unit
<i>Populus acuminata</i>	Smoothbark cottonwood	South Unit
<i>Sitanion hystrix</i>	Bottlebrush squirreltail	South Unit
<i>Sporobolus airoides</i>	Alkali sacaton	South Unit
<i>Stephanomeria runcinata</i>	Desert wirelettuce	South Unit
<i>Verbesina encelioides</i>	Golden crownbeard	South Unit
<i>Eriogonum visherii</i>	Visher's buckwheat	South Unit
<i>Euphorbia robusta</i>	Shrubby spurge	South Unit
<i>Orobanche multiflora</i>	Yellow broomrape	North Unit

Source: Heidel 1990

Studies suggest that the presence of rare plants is associated with greater canopy cover of native nurse<sup>1</sup> plants, presumably because a reduced canopy cover indicates more stressed site conditions (Lesica 2020). Rare plants grow under nurse plants because of a favorable microclimate under the nurse plant canopy compared with the interspaces. Nurse plants also provide protection from grazing of fresh or new growth. Within the Park, *Carex* spp., *Poa* spp., and *Hesperostipa comata* are most vulnerable to overgrazing by herbivores (Marlow et al. 1992). Also noted by Marlow et al. (1992) is overgrazing near springs, which have been recorded to be associated with some rare plants (Heidel 1990).

<sup>1</sup> Nurse plants are trees, shrubs, forbs, or other vegetation that has foliage that serves as protection to smaller plants.

## North Unit

Vegetation conditions and ecological sites in the North Unit are similar to those in the South Unit, though the much smaller number of cattle are not foraging near the volume or spatial extent that horses do on the South Unit.

While cattle and bison appear to forage for similar qualities of vegetation, they do exhibit differences in foraging behavior, as cattle tend to spend more overall time foraging (Plumb and Dodd 1993). Cattle can compete with bison and other native wildlife for forage. Grazing by cattle can also reduce the availability of forage for native species and impact vegetation through trampling and erosion of soils.

One State rare plant species has been documented in the North Unit: yellow broomrape (*Orobanche multiflora*; Heidel 1990). Cattle and other wildlife species in the North Unit may have affected rare plant species through trampling, as described for horses and other wildlife in the South Unit. Though no such incidents have been recorded, trampling and browsing impacts on rare plant populations may go undetected.

### 3.5.1.2 Trends and Planned Actions

Vegetation in the Park is sensitive to many ongoing stressors. The distribution and abundance of native plant species in the Park have changed due to many factors, such as herbivore grazing, invasive exotic species presence and management, climate change, and altered fire and grazing patterns. Park management actions, such as prescribed fire, exotic species control, and wildlife management, have had positive impacts on plant communities. The most common disturbances observed during monitoring were the result of animal activity, primarily grazing, game trails, and prairie dog towns (Ashton and Davis 2017). These disturbances would be expected to continue into the future.

Recently conducted rangeland health assessments in the Park have shown that across 12 sites, all units have at least a slight or moderate departure of vegetation from reference conditions (Stoneburner and Spaak 2023). Invasive plants at three sites were rated as a moderate to extreme departure and four sites rated as extreme to total departure (Stoneburner and Spaak 2023).

Ongoing landscape revegetation efforts, such as seedings, cuttings, and transplants, aim to bolster species and gene pools native to the Park's ecology. Ongoing monitoring has indicated that plant community, structure, and composition are trending toward reference conditions with native species composition, based on descriptions of historical conditions and variation, past studies, or management targets (Ashton and Davis 2017). However, monitoring sites in the Park have a high cover of exotic plant species, as over half of surveyed sites had greater than 25 percent exotic cover (Prowatzke and Wilson 2015). This level of exotic plant cover exceeds threshold levels and puts the native community at risk (Wood and Meador 2022). The management of exotic plant species continues to attempt to reduce the risk to the native plant community.

Other trends related to vegetation in the Park can be caused by their interactions between wildlife habitat use and distribution, as well as climate change. Grassland forbs are the dominant habitat type and most grassland forbs depend on temperature for flowering to occur. Changes in climate have led to seasonal shifts in blooms for vegetation and the effects from climate change may result in fundamental shifts in vegetation composition and timing of flowering. The effects of warmer winters and decreased snowpack are likely to continue to influence mixed prairies heavily.

## **3.5.2 Environmental Consequences**

### **3.5.2.1 Alternative A: No Action**

#### **General Vegetation**

##### **South Unit**

Under Alternative A—No Action, the presence of horses on the landscape and horse removal activities would continue to contribute to potential impacts on vegetation described above under current conditions.

##### *Cumulative Impacts*

Under Alternative A—No Action, the cumulative effects on vegetation, noxious weeds and invasive plants, and rare plant species from past, present, and reasonably foreseeable future actions would continue to be as described in the Affected Environment: Current Conditions and Trends section above.

The continued presence of and removal activities for horses in the South Unit would continue to contribute a somewhat small incremental impact on vegetation when considered with the impacts described under the current conditions from other past, present, and reasonably foreseeable future actions, including elk management, bison roundups, invasive species management actions, and disturbances from wildlife species in the Park.

##### **North Unit**

Under Alternative A—No Action, impacts on vegetation from the continued presence of cattle would continue as described under the Affected Environment: Current Conditions and Trends section. Grazing by cattle can reduce the availability of forage and impact vegetation through trampling and erosion of soils; this impact is low given the small number of cattle at the North Unit.

##### *Cumulative Impacts*

The continued presence of cattle in the North Unit would continue to have very small incremental impacts on vegetation when considered along with impacts described under current conditions from other past, present, and reasonably foreseeable future actions. This is due to the low number of cattle in the North Unit.

### 3.5.2.2 Alternative B: Expedited Reduction of Herds to No Livestock

#### General Vegetation

##### South Unit

Under Alternative B, the reduction of horses on the landscape to zero within approximately two years would remove the potential adverse impacts by horses on vegetation from forage consumption, trampling, and soil disturbance, as described under the current conditions.

Short-term impacts on vegetation from horse removal activities would be the same as described under the Affected Environment: Current Conditions and Trends section during initial roundups. These impacts would cease once all horses are removed from the Park. This alternative would benefit vegetation in the South Unit in the long term.

Under Alternative B, the reduction of horses on the landscape to zero within approximately two years would remove the horse herd contribution to the potential to spread noxious and invasive weeds described under Alternative A—No Action. The potential for the introduction of noxious and invasive weeds during roundups would be low, as described under Alternative A—No Action. Impacts would cease once all horses are removed from the Park. This alternative would have slight beneficial impacts on the presence and spread of noxious and invasive weeds in the South Unit in the long term.

Under Alternative B, the removal of horses from the landscape within approximately two years would remove the potential impacts on rare plant species from horses described under the Affected Environment: Current Conditions and Trends section. Potential impacts would cease once all horses are removed from the Park. This alternative would have beneficial impacts on rare plant species by removing the potential for horses to eat or crush vegetation in the South Unit over the long term.

##### *Cumulative Impacts*

Under Alternative B, the cumulative effects on vegetation, noxious weeds and invasive plants, and rare plant species in the South Unit from past, present, and reasonably foreseeable future actions would continue to be as described under current conditions, above. The presence of horses and horse management activities would continue to contribute incrementally to the cumulative adverse effects described in that section until the horses were removed from the Park within approximately two years. After removal, this incremental contribution would cease.

##### North Unit

Under Alternative B, the removal of cattle from the landscape would remove the potential for impacts on vegetation described in the Affected Environment: Current Conditions and Trends section.

Short-term impacts on vegetation from cattle removal activities would be low, as removal would occur in already disturbed areas of the North Unit.

Under Alternative B, the removal of cattle from the North Unit would remove the potential for the spread of noxious and invasive weeds from cattle described in the Affected Environment: Current Conditions and Trends section. The potential for the introduction of weed seeds from hay and trailers brought on-site during cattle removal activities would be low due to the measures taken to prevent such occurrences. This alternative would likely have beneficial impacts on native plants by decreasing the spread of noxious and invasive weeds in the North Unit in the long term.

Under Alternative B, the removal of cattle from the North Unit would remove the potential, though low, to affect rare plant species. This alternative would have beneficial impacts on rare plant species in the North Unit in the long term.

#### *Cumulative Impacts*

Under Alternative B, the cumulative effects on vegetation, noxious weeds and invasive plants, and rare plant species in the North Unit from past, present, and reasonably foreseeable future actions would continue to be as described under current conditions.

The removal of cattle would not contribute a meaningful incremental impact to these effects due to the minimal action needed for this removal. After removal, the minor incremental contribution of impacts on vegetation, noxious weeds and invasive plants, and rare plant species from cattle would cease.

### **3.5.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

#### **General Vegetation**

##### **South Unit**

Under Alternative C, potential impacts on vegetation from horses would decrease over time as the horse herd size decreases in the South Unit. Horses that remain on the landscape would continue to impact vegetation communities through forage consumption, trampling, and soil erosion. Potential impacts would be similar to those described under current conditions. Once all horses are removed from the landscape, impacts on vegetation from horses would cease.

Short-term impacts on vegetation from horse removal activities would be the same as described under Affected Environment: Current Conditions and Trends, above. Potential impacts during annual roundups would continue to occur until all horses were contracepted, after which impacts on vegetation from horse roundups described above would cease. This alternative would have beneficial impacts on vegetation in the South Unit in the long term.

Under Alternative C, the spread of noxious and invasive weeds by horses would continue as described above in the Affected Environment: Current Conditions and Trends section while horses remain on the landscape. These impacts would lessen as horses are removed over time and would cease once no horses remain in the South Unit.

The potential for the introduction of noxious and invasive weeds during initial roundups would be low. Impacts would cease once all horses are removed from the Park. This alternative would

have beneficial impacts for control of noxious and invasive weeds in the South Unit in the long term.

Under Alternative C, horses in the South Unit would continue to affect rare plant species in the Park by trampling and browsing. Trampling and browsing impacts on rare plant populations would be reduced as livestock are removed. However, impacts would continue until all horses are removed from the South Unit. This alternative would have beneficial impacts on rare plants in the South Unit in the long term by removing the potential for horses to trample or feed on rare plants.

#### *Cumulative Impacts*

Under Alternative C, the cumulative effects on vegetation, noxious weeds and invasive plants, and rare plant species from past, present, and reasonably foreseeable future actions, would continue to be as described in the Affected Environment: Current Conditions and Trends section.

The continued presence of and removal activities for horses in the South Unit would contribute incrementally to impacts on vegetation when added to the impacts described under the current conditions from other past, present, and reasonably foreseeable future actions. The incremental contribution to these effects would lessen over time and then cease once all horses were removed from the South Unit.

### **North Unit**

Under Alternative C, impacts on vegetation, rare plants, and noxious and invasive weeds from the removal of cattle from the landscape and from removal activities themselves would be the same as described under Alternative B.

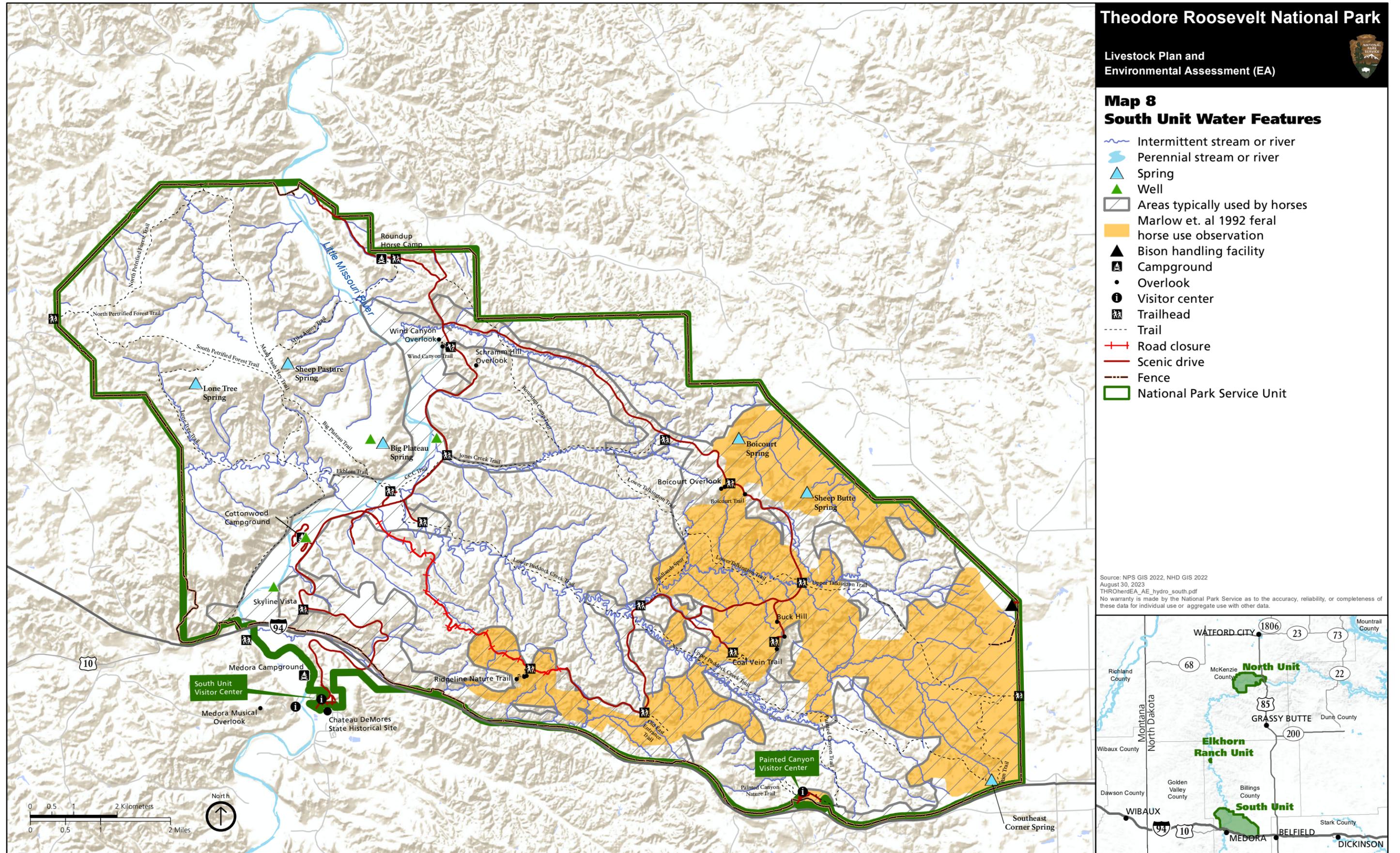
#### *Cumulative Impacts*

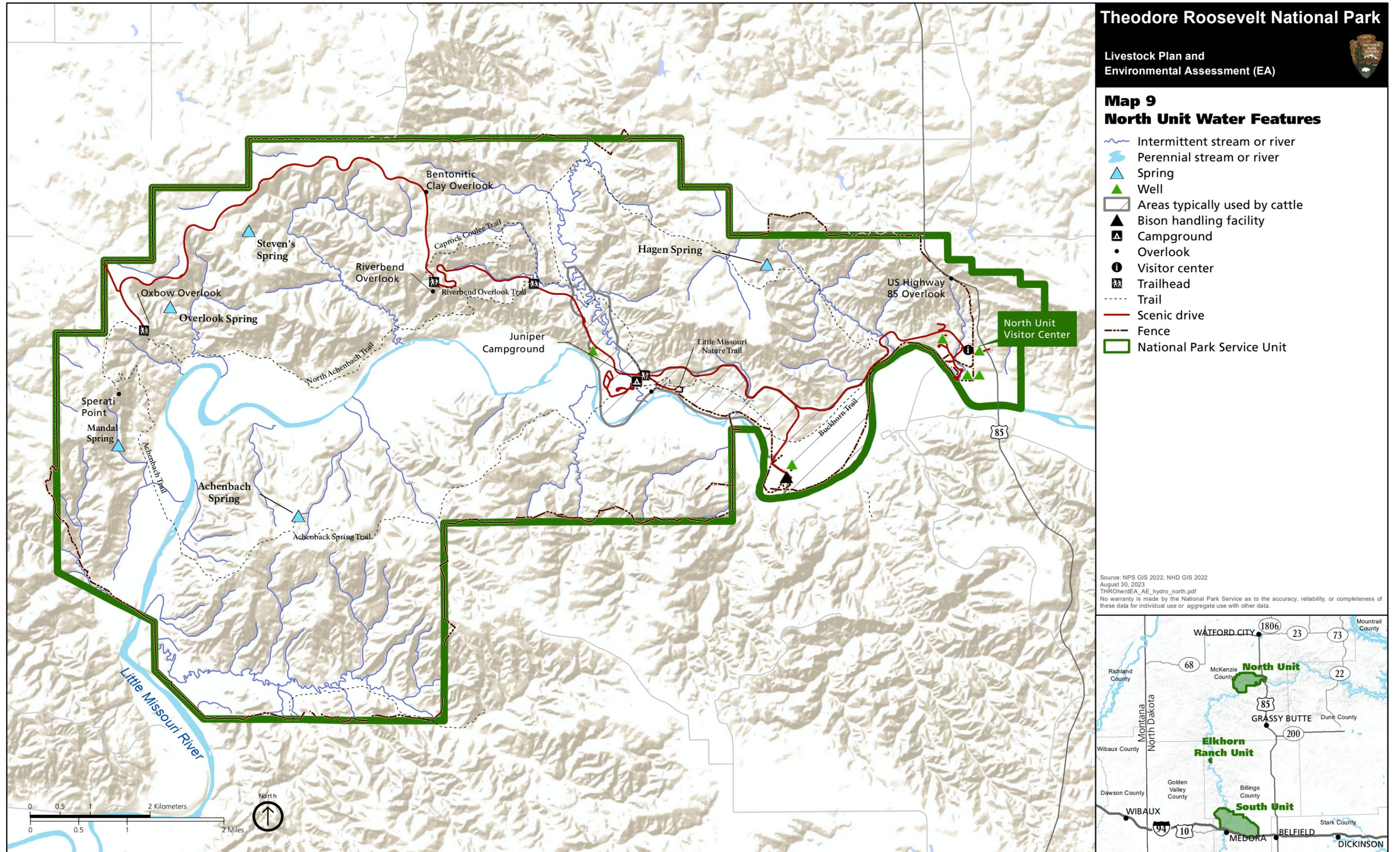
Cumulative impacts on vegetation, noxious weeds and invasive plants, and rare plants species would be as described for Alternative B.

## **3.6 WATER RESOURCES**

### **3.6.1 Affected Environment: Current Conditions and Trends**

The primary water resources in the Park include the Little Missouri River and its tributaries, and many springs and seeps (including known/developed and uninventoried/undeveloped). Developed wells are another source of water to livestock and wildlife. Map 8 and Map 9 show known/developed water features within the Park's South and North Units.

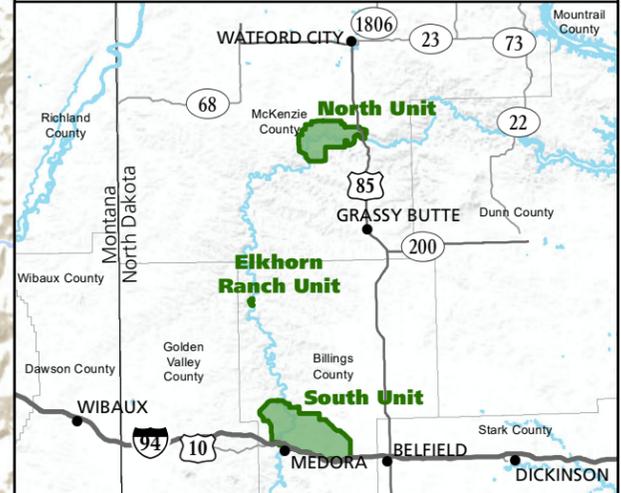




**Theodore Roosevelt National Park**  
 Livestock Plan and Environmental Assessment (EA)

- Map 9**  
**North Unit Water Features**
- Intermittent stream or river
  - Perennial stream or river
  - Spring
  - Well
  - Areas typically used by cattle
  - Bison handling facility
  - Campground
  - Overlook
  - Visitor center
  - Trailhead
  - Trail
  - Scenic drive
  - Fence
  - National Park Service Unit

Source: NPS GIS 2022, NHD GIS 2022  
 August 30, 2023  
 THROtherdEA\_AE\_hydro\_north.pdf  
 No warranty is made by the National Park Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



### 3.6.1.1 Little Missouri River and Tributaries

Approximately 22 miles of the Little Missouri River connects the Park's three geographically separate units (Amberg et al. 2014, NPS 1998b). The Park also contains 267 miles of intermittent streams that feed rain and snowmelt into the river (Amberg et al. 2014). The State of North Dakota has designated the Little Missouri River as a State Scenic River. Thus, diversions and impoundments on the main stem are prohibited (NPS 1987).

As discussed in Section 3.5, Vegetation, riparian zones and wetlands that occur along the edges of water bodies support important habitats that are shaped by the presence of water. Riparian zones and wetlands in the Park are found in riverbanks and streambanks along the Little Missouri River and its tributaries, floodplains, and drainages and depressions associated with seeps and springs. Wetlands and riparian zones also form around developed or naturally occurring springs and seeps, including some that have formed around livestock ponds and wells developed prior to the establishment of the Park (Amberg et al. 2014). Wetlands and riparian zones found in the Park include those that have surface water present for a short period of time (few days to a few weeks) to those that are seasonally flooded (water is present for an extended period but is absent by the end of the growing season most years).

#### South Unit

Both native wildlife resources and horses frequent the surface waters in the South Unit. Horses and other wildlife species such as bison have been observed along the Little Missouri River and along its tributaries (Sheep Creek, Paddock Creek, and Jones Creek), which flow across the eastern portion of the South Unit. With the exception of the Little Missouri River and 1.5 miles of the Knutson Creek, all the other tributaries and streams in the Park are ephemeral (KellerLynn 2007). Horses use the Little Missouri River shoreline and intermittent streams. Knutson Creek is within the wilderness area and generally does not overlap with most areas horses are seen congregating; the exception is the confluence of Knutson Creek with the Little Missouri River. While most horses do not reside in wilderness, one horse is known to live there exclusively, some bands venture there occasionally, and all horses have unrestricted access.

Native animals as well as horses interact with water resources by consuming water and trailing through or congregating near water sources. Depending on their location, horses also may cross through water sources while being herded during horse roundup activities, though such interactions would be short term. Horses require access to substantial amounts of water daily. As such, they can affect water quality at drinking sites through increased suspended sediment and defecation, leading to the introduction of *E. coli* (*E. coli*) and other contaminants (Scanes et al. 2021). Trampling along streambanks can also cause accelerated streambank erosion and widened stream channels (Beschta et al. 2013). Other wildlife in the Park, including bison, also congregate along waterways, with similar potential effects on water resources as described for horses.

A 49-mile segment of the Little Missouri River immediately adjacent to the South Unit is on the North Dakota 2018 Section 303(d) list of waters exceeding total maximum daily loads for *E. coli* bacteria. Data reported by the North Dakota Department of Environmental Quality on surface

waters in the state show that once the Little Missouri River enters the South Unit, it is no longer exceeding standards, and some beneficial uses are attained (Kitzes 2020). Regardless, water from this river is considered unsafe for human consumption without treatment.

## North Unit

Cattle have been observed on a small portion of the eastern side of the North Unit and along the Little Missouri River shoreline and intermittent streams. Most of the land in the North Unit is within the Theodore Roosevelt Wilderness. Cattle have been observed south of the river, across from the campground in wilderness. This portion of the cattle's observed use area that enters the wilderness is along one of the Little Missouri River's tributaries flowing northwest.

Cattle interact with water resources by consuming water and trailing through or congregating near water sources. An 800-pound yearling steer or heifer needs between 9 and 16 or more gallons of water daily, when ambient temperatures are between 60 and 90°F (Premier Longhorns, LLC 2022).

Cattle can impact water quality through increased suspended sediment and defecation. A study on winter grazing and fall grazing and their impacts on water quality reported that bacteria, including *E. coli*, found in cow dung can survive harsh winters (Baker-Ismail 2016). The segment of the Little Missouri River in McKenzie County, including the portion that runs through the North Unit, is on the North Dakota 2018 Section 303(d) list of waters exceeding total maximum daily loads (North Dakota Environmental Quality 2022) for *E. coli*.

### 3.6.1.2 Springs and Seeps

The many springs and seeps in the Park are essential for survival in the region's semiarid climate. Springs are defined as places where water naturally rises from the ground and flows or lies in pools that are continually replenished from below. Seeps are a type of spring in which the water comes not from any definite opening, but from pores in the ground, as groundwater rises to the surface (Bryan 1919; O'Driscoll et al. 2019). Developed wells, which in some cases have higher and more reliable flow rates than developed springs and seeps, also are a source of water for animals. In addition to the developed seeps, springs, and wells, innumerable undeveloped, uninventoried springs and seeps exist in the Park; there are seeps and springs at the head of most canyons and many creeks.

Springs and seeps do not always have water. The amount of groundwater that feeds the springs is tied to the amount of rainfall. During dry years, the springs might diminish, and the water table may drop below the ground surface, causing the spring to go dry. Water from the Park's springs and seeps is considered unsafe for human consumption without treatment. Also, due to high turbidity, the water may be unappealing unless it is filtered before using (Amberg et al. 2014).

## South Unit

Six developed springs have been mapped in the South Unit (Medler and Eldridge 2021). Three springs were identified within the South Unit's eastern half and overlap areas where horses are

commonly found (NPS GIS 2022), though horses do have access to all of the springs in the South Unit. Boicourt and Sheep Butte Spring near the northeastern border of the South Unit are intermittent or seasonal filtration springs that receive water primarily from precipitation, while the Southeast Corner Spring which is a contact spring (recharged by precipitation infiltrating downward until reaching a low-permeability unit) is likely perennial (Medler and Eldridge 2021). Water is available from several developed wells including the Ekblom, Jones Creek, Mike Auney, and Tomamichael wells, and at corral facilities at Peaceful Valley Ranch.

## **North Unit**

Five developed springs occur in the North Unit, all of which are within wilderness and are generally not in locations that cattle frequent (NPS GIS 2022). Cattle have free access to water from a well at the corral facilities.

### **3.6.1.3 Trends and Planned Actions**

Climate change, in particular increases in temperature and changes in the amount or timing of precipitation, can affect water resources in the Park. Annual average temperatures in North Dakota have warmed by about 2.6°F since the start of 20th century, and annual average precipitation amounts have also increased, with rainstorms becoming more intense; these trends are anticipated to continue (Kunkel et al. 2022). Climate datasets specific to the Park over the last 60 years show that average annual minimum air temperatures, average annual precipitation, and soil moisture content increased (Todhunter and DeVries 2021); a significant drying trend over much of this period was offset by historic precipitation at the end of the period that offset the drying trend. Climate change also can result in more dynamic weather patterns with unpredictable disruptive impacts and challenges to ecological systems. Examples of these effects on water resources include increased erosion, which can increase water turbidity and decrease water quality, or reduced water availability during periods of extended drought.

Oil and gas development and production in the Little Missouri River watershed increased beginning in 2006, when development of hydrologic fracturing—or “fracking”—technology led to the Bakken oil boom (NPS 2014). Production peaked in 2014. While production has shown a downturn and continues to slow down gradually, subject to fluctuations and market conditions of supply and demand over time (North Dakota State Government 2022), existing oil and gas operations have the potential to affect water resources in the Park. Oil and gas development includes waste saltwater injection wells, storage and treatment facilities, and oil and gas pipelines, including pipelines buried under the Little Missouri River bed. Seepage of crude oil into the river and its tributaries upstream and downstream, broken pipelines, and spills along roadways all have been reported to the North Dakota Department of Environmental Quality (North Dakota Department of Environmental Quality 2023). Most historic breaks have occurred upstream, contaminating some creeks that feed the river. Park managers have expressed concern regarding water resources related to potential pollution of streams and underground aquifers from oil and gas development and chemical transportation (Valseth 2021).

## **3.6.2 Environmental Consequences**

### **3.6.2.1 Alternative A: No Action**

#### **South Unit**

Under Alternative A—No Action, current management of the horse herd would continue. Impacts on water resources from the presence of horses on the landscape would be as described under the current conditions described above.

#### *Cumulative Impacts*

Under Alternative A—No Action, the presence of horses in the South Unit would continue, with no new direct impacts on water resources compared with the current conditions and trends described above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

#### **North Unit**

Under Alternative A—No Action, current management of the cattle in the North Unit would continue, with no new direct impacts on water resources compared with the current conditions and trends described above.

#### *Cumulative Impacts*

Under Alternative A—No Action, the presence of cattle in the North Unit would continue to be managed as it is currently, with no new direct impacts on water resources compared with the current conditions and trends described under the Affected Environment: Current Conditions and Trends. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

### **3.6.2.2 Alternative B: Expedited Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative B, the impacts on water resources described under current conditions, above, would lessen and then cease upon removal of horses within approximately two years.

Short-term impacts from horse removal activities would be the same as those described under current conditions for the initial roundups; impacts would cease once all horses are relocated from the Park.

This alternative would have long-term beneficial impacts on water resources in the South Unit.

#### *Cumulative Impacts*

Under Alternative B, the presence of horses and horse management activities would continue to contribute incrementally to the cumulative adverse effects on water resources in the South Unit

as described in *Affected Environment: Current Conditions and Trends* until the horses were removed from the Park within approximately two years. After removal, this incremental contribution would cease; therefore, there would be no contribution of horses or horse herd management to cumulative impacts on water resources.

### **North Unit**

Under Alternative B, the removal of cattle from the North Unit would remove the potential impacts on water resources described under current conditions above.

Impacts on water resources from cattle removal activities under Alternative B would be minimal, as none of the areas where activities would occur would overlap with any identified water resources.

This alternative would benefit wildlife and their habitat in the North Unit in the long term.

#### *Cumulative Impacts*

Under Alternative B, the presence of cattle would contribute a minor adverse incremental cumulative impact on water resources in the North Unit as described in *Affected Environment: Current Conditions and Trends* until the cattle were removed from the Park. After removal, this incremental contribution would cease; therefore, there would be no contribution to cumulative impacts on water resources.

### **3.6.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative C, potential impacts on water resources from the presence of horses on the landscape would decrease over time as the horse herd size decreases in the South Unit. Potential impacts would be similar to those described under current conditions until the number of horses is reduced to below the current plan's herd size objective level, until eventually no potential for impact remains.

Short-term impacts from horse removal activities would be the same as those described under current conditions for the roundups; impacts would cease once all horses are relocated from the Park over approximately 10 years or more.

This alternative would have beneficial impacts on water resources in the South Unit in the long term.

#### *Cumulative Impacts*

Under Alternative C, the presence of horses and horse management activities would continue to contribute incrementally to the cumulative adverse impacts on water resources in the South Unit described in *Affected Environment: Current Conditions and Trends*, though at a reduced level, until the horses were entirely removed from the unit. After removal, this incremental

contribution would cease and there would be no contribution of horses or horse herd management to cumulative impacts on water resources.

### **North Unit**

Under Alternative C, impacts on water resources from the removal of cattle from the North Unit and from removal activities would be the same as described under Alternative B.

#### *Cumulative Impacts*

Cumulative impacts would be the same as described under Alternative B.

## **3.7 SOCIOECONOMICS**

### **3.7.1 Affected Environment: Current Conditions and Trends**

The area analyzed for potential socioeconomic impacts includes Billings and McKenzie Counties in western North Dakota. These two counties collectively contain the three units of the Park. Billings County contains the South Unit and Elkhorn Ranch Unit and McKenzie County contains the North Unit. Map 10 shows the Park's location with respect to nearby towns and communities.

#### **3.7.1.1 Tourism Economy and Gateway Communities**

Features of the Park that attract visitors include the native wildlife, wilderness access, natural and historical resources, scenic vistas, and recreational opportunities. The tourism industry, including outdoor recreation, is supported by services in gateway communities in the town of Medora in Billings County and Watford City in Mackenzie County.

Medora is located in Billings County and is adjacent to the South Unit of the Park. With a year-round population of approximately 130 residents, the town hosts thousands of tourists a year, promoting its old American West-themed attractions, including saloon-style restaurants, the North Dakota Cowboy Hall of Fame, Theodore Roosevelt impersonators, and the popular *Medora Musical*. The outdoor recreation and services industry contributes to Billings County's economy (Billings County 1998). In 2022, travel and tourism represented 26 percent of total employment in Billings County, more than twice the 12 percent reported in North Dakota (Headwaters Economics 2022b).

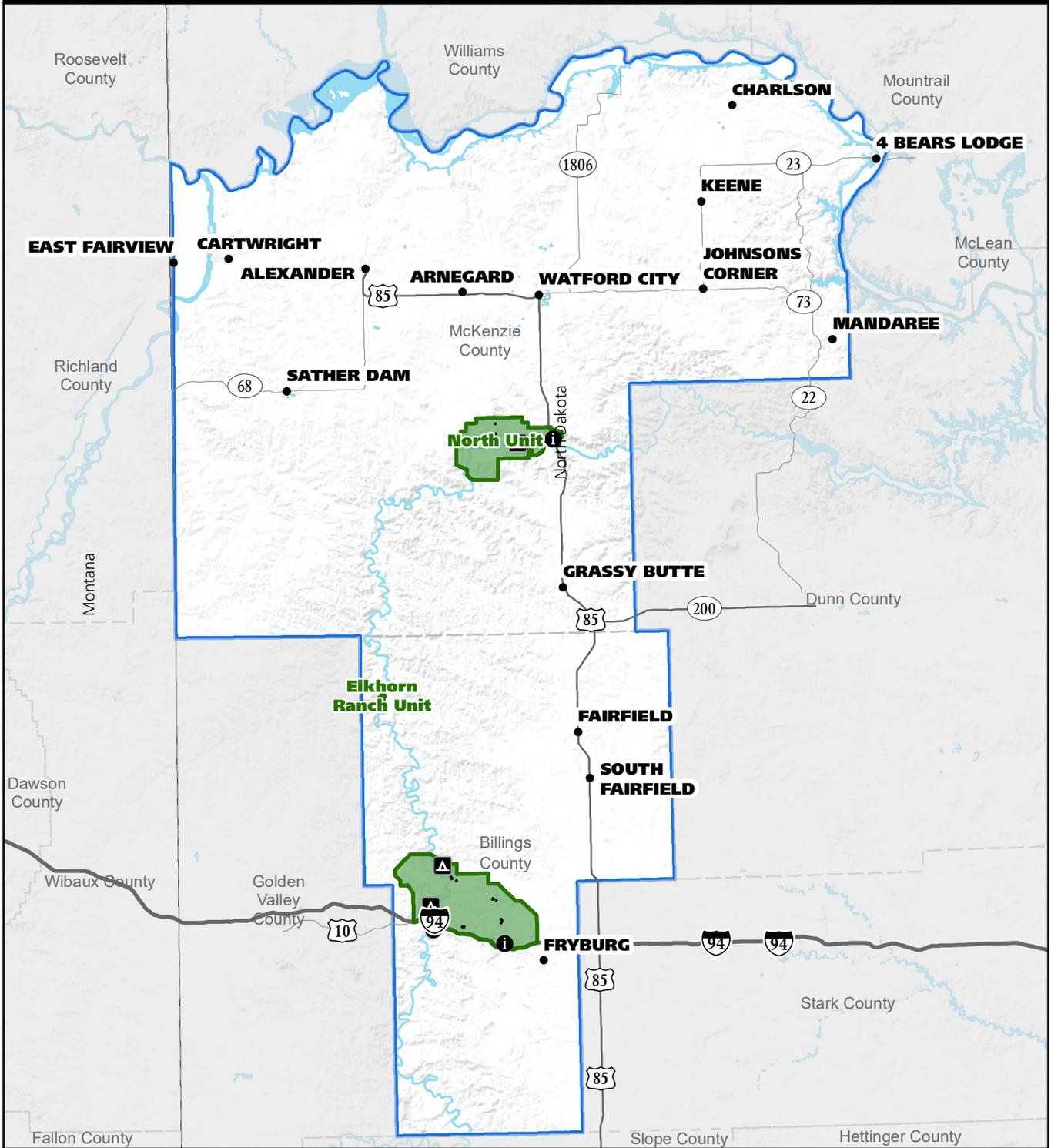
Watford City, in McKenzie County, is located 15 miles north of the North Unit of the Park. Watford City is home to about 7,000 residents; the population has tripled since the beginning of the Bakken oil boom in 2006 (Joyner et al. 2019). In 2022, only nine percent of total employment in McKenzie County was in the travel and tourism industry (Headwaters Economics 2022b).

Dickinson, outside of the socioeconomic study area, represents another gateway community. Dickinson is located 30 miles east of the South Unit. It is a full-service residential community with a population of 23,000 people with schools, museums, libraries, healthcare, recreation centers, and an airport (see Map 10).



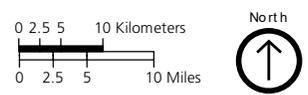
# Theodore Roosevelt National Park

## Livestock Plan and Environmental Assessment (EA)



**Map 10**  
**Socioeconomic Study Area**

- Socioeconomic study area
- National Park Service Unit
- ▲ Campground
- Overlook
- i Visitor center



Source: NPS GIS 2022  
August 30, 2023  
THROherdEA\_AE\_socio.pdf  
No warranty is made by the National Park Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

### 3.7.1.2 The Park's Economic Contributions

Visitors to NPS sites spend money in local gateway areas, and these expenditures generate and support economic activity within these local economies. To provide supplies to local businesses to produce their goods and services, suppliers must purchase inputs from other industries, thus creating additional indirect effects of visitor spending within the economy. Additionally, employees of directly affected businesses and input suppliers use their income to purchase goods and services in the local economy, generating further induced effects of visitor spending. The sums of the direct, indirect, and induced effects give the total economic effect of visitor spending in a local economy.

Economic effect is measured in term of jobs (full and part time jobs supported by visitor spending), labor income (including employee wages, salaries, and payroll benefits, as well as the incomes of proprietors that are supported by NPS visitor spending), and economic output (a measure of the total estimated value of the production of goods and services supported by NPS visitor spending).

In 2021, 796,000 visitors spent an estimated \$56.2 million while visiting the Park. These expenditures supported 675 jobs, \$20.1 million in labor income, and \$62.2 million in economic output in local gateway economies surrounding the Park (NPS 2022f).

#### South Unit

The majority of visitation occurs in the South Unit in Billings County (NPS 2022c; see Section 3.2, Visitor Use and Experience for details). To access the South Unit, visitors enter through the main entrance adjacent to the town of Medora. As described in Section 3.2, visitors come to the Park to participate in a wide variety of opportunities and experiences. Although the Park does not collect data on specific economic contributions related to each opportunity or experience, there is visitor interest in the horse herd at the Park. According to a 2020 survey, 49 percent of the 1,474 visitors interviewed supported the ongoing presence of the horse herd in the South Unit (Brownlee et al. 2020). There are different vendors in the South Unit that take visitors on tours to photograph horses. The number of vendors fluctuates from year to year depending on which renew their annual commercial use authorization (CUA). It is a requirement of the CUA to report number of days entering the Park and the annual revenue that Park-based operations generated. In 2021, there were 16 days of photography tours in the Park with reported revenue of approximately \$12,000. Thus, the number of annual tour participants is reportedly low. One of the companies providing horse photography tours indicated that only 1 percent of its revenue was from photography tours of the Park.<sup>1</sup>

#### North Unit

Similar to the discussion of horses above, there are insufficient data to provide estimates for visitation trends and economic contributions associated specifically with cattle viewing in the North Unit. Based on a 2020 visitor survey, 43 percent of the 1,474 visitors surveyed supported or strongly supported the ongoing presence of the cattle herd (Brownlee et al. 2020). Watford

---

<sup>1</sup> Park staff direct communication

City uses cattle as a potential source of attraction in some of its tourism and recreational materials (such as a billboard and some websites). However, only about 15 percent of visitors to the Park visited the North Unit. The current herd size is nine cattle, compared with approximately 300 bison, and the cattle are not always in areas where they are easily viewed by visitors. Most visitors to the North Unit never see the cattle. This indicates that viewing cattle is not likely to be a primary driver of visitation and associated economic contributions from the North Unit.

### 3.7.1.3 Trends and Planned Actions

The Park is the most popular tourist destination in North Dakota and attracts visitors from across the country. Tourism can lead to more spending in local businesses, job creation, and overall economic growth. Therefore, an attraction such as the Park can have major economic benefits for nearby communities.

The socioeconomic study area has experienced a significant population growth over the last two decades. Once a remote region, characterized by vast stretches of mixed-grass prairie and occasional farms, the area surrounding the Park has been experiencing a rapid oil and gas boom that began in 2006. By 2014, North Dakota became the second-largest producer of oil and gas (after only Texas), with nearly 10 percent of all US production. Billings and McKenzie Counties housed 25 percent of all producing wells in North Dakota in 2014. The Bakken oil boom led to more jobs, rapid population growth, and increased development in the area (NPS 2014). Table 6, below, shows the population growth for Billings County, McKenzie County, and North Dakota between 2000 and 2020.

**Table 6. Socioeconomic Study Area Population 2000–2020**

Year	Geographic Area		
	Billings County	McKenzie County	North Dakota
2000	888	5,737	642,200
2010	897	6,004	659,858
2020	886	13,836	760,394
% change 2000–2010	1%	5%	3%
% change 2010–2020	-1%	130%	15%

Sources: US Census Bureau 2000; Headwater Economics 2022a

### South Unit

Billings County, where the South Unit is located, does not have trade centers; therefore, the county has not experienced the rapid population changes associated with the rise and decline of energy activities (Billings County 1998). Between 2012 and 2021, Billings County’s unemployment rates remained low. At the peak of unemployment during 2020, Billings County experienced a 3.6 percent unemployment rate, which was lower than the state’s rate at 5.1 percent (BLS 2022). Population levels in Billings County have remained fairly constant over the last two decades (see Table 6). Reasonably foreseeable actions, particularly the 2026 scheduled opening of the Theodore Roosevelt Library, is expected to drive increased visitation in Medora and to the Park and increased tourism-based economic contributions.

## North Unit

In McKenzie County, where the North Unit is located, the population growth due to the area's oil and gas development is evident. Here, the population more than doubled between 2010 (6,004 people) and 2020 (13,836 people). This is a significant growth compared with North Dakota's 15 percent increase between 2010 and 2020 (US Census Bureau 2000; Headwater Economics 2022a). Between 2012 and 2021, the unemployment rate in McKenzie County followed a similar general fluctuation pattern as North Dakota's unemployment rate; both experienced a small increase in 2016 and a larger increase in 2020 (BLS 2022). At the peak of unemployment during 2020, McKenzie County's unemployment rate was 7.6 percent, which was higher than the state's rate at 5.1 percent (BLS 2022).

The trends described above are expected to continue in Billings County, while in McKenzie County the population growth rate is not expected to continue at the same rapid rate that has been associated with the initial oil and gas boom, unless it booms again. In addition to the oil and gas industry, industries that depend on natural resources such as tourism, agriculture, and grazing would continue to contribute to the area's economic base (Billings County 1998; McKenzie County 2016).

### 3.7.2 Environmental Consequences

#### 3.7.2.1 Alternative A: No Action

##### South Unit

Under Alternative A—No Action, the NPS anticipates that the visitor experience, levels, and associated economic contributions would not vary substantially from levels described under current conditions.

##### *Cumulative Impacts*

Under Alternative A—No Action, trends in socioeconomic conditions would continue as described under Affected Environment: Current Conditions and Trends, above. While socioeconomic contributions from oil and gas development may fluctuate over time based on market conditions and other factors, current and reasonably foreseeable actions related to tourism opportunities in the study area would continue. The continued presence of horses in the South Unit would have only a small relative incremental contribution on the cumulative regional economic conditions given the other visitor opportunities at the Park and nearby attractions.

##### North Unit

There would be no change in regional economic contributions from the continued presence of cattle in the North Unit.

### *Cumulative Impacts*

Under Alternative A—No Action, trends in socioeconomic conditions would continue as described under Affected Environment: Current Conditions and Trends, above. The continued presence of cattle in the North Unit would likely only have a very small incremental contribution to regional economic conditions due to the low number of cattle and other visitor opportunities in the Park.

### **3.7.2.2 Alternative B: Expedited Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative B, specific impacts on visitation numbers and corresponding economic contributions from the expedited removal of horses cannot be estimated due to a lack of available information on current contributions. Based on available information on CUA and visitor activities reported, long-term impacts on the regional economy are likely to be minimal. This is due to the low level of economic contributions from horse related activities compared to the overall regional economy.

### *Cumulative Impacts*

Under Alternative B, trends in socioeconomic conditions would continue as described under Affected Environment: Current Conditions and Trends, above. Current and reasonably foreseeable actions related to tourism opportunities in the study area would continue. The expedited removal of horses from the South Unit is expected to have little incremental effect on regional economic conditions given the other visitor opportunities available at the Park and nearby.

#### **North Unit**

Under Alternative B, specific impacts on visitation numbers and corresponding economic contributions from the removal of cattle cannot be estimated due to a lack of available information on current contributions. Most Park visitors (86 percent based on Brownlee et al. 2020) reported wildlife as the primary activity of interest, especially visitors to the North Unit. Therefore, it can be expected that a decrease in visitation numbers as a result of cattle removal from the North Unit would likely not occur or would be negligible. Socioeconomic impacts from removal activities would be negligible due to the low level of economic contributions from cattle-related activities compared with the overall regional economy.

### *Cumulative Impacts*

Under Alternative B, trends in socioeconomic conditions would continue as described under Affected Environment: Current Conditions and Trends, above. The removal of cattle in the North Unit would have little measurable incremental impact on regional economic conditions due to the low number of cattle and other visitor opportunities in the unit.

### **3.7.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

#### **South Unit**

Under Alternative C, the impacts from removal of horses from the South Unit would be the same as those described under Alternative B once no more horses remain.

#### *Cumulative Impacts*

Under Alternative C, trends in socioeconomic conditions would continue as described under Affected Environment: Current Conditions and Trends, above. Current and reasonably foreseeable actions related to tourism opportunities in the study area would continue. The phased removal of horses from the South Unit would have little to no incremental impact on regional economic conditions given the other visitor opportunities available at the Park.

#### **North Unit**

Under Alternative C, the impacts from removal of cattle from the North Unit would be the same as those described under Alternative B.

#### *Cumulative Impacts*

Cumulative effects would be the same as described for Alternative B.

## **3.8 WILDERNESS**

### **3.8.1 Affected Environment: Current Conditions and Trends**

#### **3.8.1.1 Wilderness Character**

The Theodore Roosevelt Wilderness areas in the Park contain the heart of the scenic North Dakota Badlands, with multicolored formations spanning the landscape. Congressionally designated wilderness areas are preserved for their qualities of naturalness, untrammeled and undeveloped character, solitude or primitive and unconfined types of recreation experiences, and other features of value. Naturalness recognizes the importance of healthy, intact ecosystems. The untrammeled and undeveloped qualities of wilderness are free from intentional actions of modern human control, including development of structures or use of motorized equipment, while opportunities for solitude recognize that recreation opportunities are appropriate and compatible with wilderness character.

The Park's fundamental resources and values include the Theodore Roosevelt Wilderness and the wilderness qualities throughout the Park (NPS 2014). Protecting the wilderness values is central to the Park's purpose. Just as the opportunities for solitude and adventure drew Roosevelt to the Badlands in the 1880s, these still draw visitors to the Park today.

The Theodore Roosevelt Wilderness was designated in 1978 and spans 29,920 acres across the Park's South and North Units (Table 7).

**Table 7. Wilderness Acreages in the Park's North and South Units**

Unit	Wilderness Acreage	Unit Acreage	Percent of Unit
South Unit	10,510	46,158	23
North Unit	19,410	24,070	81

Source: NPS GIS 2022

**South Unit**

Approximately 23 percent of the South Unit is designated wilderness (Map 3). While most horses do not reside in wilderness, one horse is known to live there exclusively, some bands venture there occasionally, and all horses have unrestricted access. Horses are a nonnative species that, when they are in the wilderness, detract from the naturalness and untrammelled nature of the wilderness by congregating on and trampling riparian areas, polluting sources of water, spreading noxious and invasive weeds, and competing for forage with native herbivores. Viewing livestock in the wilderness is a human impact by allowing once domesticated animals to reside there. Roundups could take place in the wilderness when animals targeted in capture operations are found there.

Current management activities for horses and wildlife such as bison and elk include the use of helicopters that can impact wilderness character through elevated noise levels, visual intrusion, and disruptions to solitude. These activities, though short term, can detract from the wilderness experience during operational periods. Additionally, traffic noise from the highway vehicles on Interstate 94 and the scenic loop may be heard and seen in some areas of the wilderness. While these activities would continue to mostly occur outside of wilderness, by their nature they could affect the experience of visitors who are recreating in the wilderness.

**North Unit**

Approximately 81 percent of the North Unit is designated wilderness (see Map 4). While cattle in the North Unit spend most of their time outside of the wilderness, they can access and have been observed crossing into the wilderness on occasion. Like horses, cattle are nonnative species and can detract from the naturalness of the wilderness by congregating on and trampling riparian areas, polluting sources of water, spreading noxious and invasive weeds, and competing for forage with native herbivores.

Cattle management activities require the presence of humans and unnatural sounds. The effects on wilderness are generally low due to the small number of cattle, the minimal management activities required to manage the herd, and the minimal amount of activity that occurs in wilderness. However, these activities do have the potential to occasionally impact wilderness character and detract from the wilderness experience as described for the South Unit, above.

**3.8.1.2 Trends and Planned Actions**

Because protecting the wilderness values of Theodore Roosevelt Wilderness is central to the Park's purpose, current and reasonably foreseeable actions within the wilderness are limited. Ongoing actions outside of wilderness that can detract from the wilderness experience include annual bison roundups and invasive weed management, all of which require the use of

helicopters or other motorized equipment. The activities are projected to continue in both units of the Park, with helicopter use for elk culling also occurring in the South Unit. Activities adjacent to the North and South Units, including oil and gas development, livestock grazing operations, and other land management uses also produce noise that can detract from the wilderness experience.

### **3.8.2 Environmental Consequences**

#### **3.8.2.1 Alternative A: No Action**

##### **South Unit**

Under Alternative A—No Action, current management of the horses in the South Unit would continue. The impacts on wilderness and the visitor experience would not differ from current conditions described above.

##### *Cumulative Impacts*

Under Alternative A—No Action, the presence of horses and horse management activities in the South Unit would continue, with ongoing adverse incremental impacts on wilderness and the visitor experience as described under current conditions and trends above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

##### **North Unit**

Under Alternative A—No Action, current management of the cattle in the North Unit would continue. The impacts on wilderness and the visitor experience would not differ from current conditions described above.

##### *Cumulative Impacts*

Under Alternative A—No Action, the presence of cattle in the North Unit would continue, with ongoing adverse incremental impacts on wilderness and the visitor experience as described under current conditions and trends above. Past, present, and reasonably foreseeable actions and their impacts would be the same as those described in the Affected Environment: Current Conditions and Trends section.

#### **3.8.2.2 Alternative B: Expedited Reduction of Herds to No Livestock**

##### **South Unit**

Under Alternative B, the removal of horses from the landscape within approximately two years would remove the potential impacts on wilderness described under Alternative A—No Action.

Short-term impacts from horse removal activities could include temporary impacts on wilderness through elevated noise levels and disruptions to solitude. This would detract from the wilderness experience during these periods, though impacts would be short term. These impacts on wilderness would cease once all horses are relocated from the Park.

This alternative would benefit wilderness character in the long term compared with Alternative A—No Action.

*Cumulative*

Under Alternative B, the presence of horses and horse management activities would continue to contribute adverse incremental impacts on wilderness in the South Unit as described in Affected Environment: Current Conditions and Trends until the horses were removed from the Park within approximately two years. After removal, this incremental contribution would cease; therefore, there would be no contribution of horses or horse herd management to cumulative impacts on wilderness.

**North Unit**

Under Alternative B, the removal of cattle from the landscape would remove the potential impacts on wilderness described under Alternative A—No Action.

Cattle removal activities would have minimal impacts on wilderness, as capture would be short term and would most likely take place at the bison handling facility that is outside the wilderness in the North Unit.

*Cumulative Impacts*

Under Alternative B, the presence of cattle and cattle management actions would contribute an adverse incremental impact on wilderness in the North Unit as described in Affected Environment: Current Conditions and Trends until the cattle were removed from the Park. After removal, this incremental contribution would cease; therefore, there would be no contribution to cumulative impacts on wilderness.

**3.8.2.3 Alternative C: Phased Reduction of Herds to No Livestock**

**South Unit**

Under Alternative C, potential impacts on wilderness from the presence of horses on the landscape would decrease over time as the horse herd size decreases; once all horses were removed, the impacts on wilderness described under Alternative A—No Action would cease.

Short-term impacts on wilderness from capture activities would be the same as described under current conditions until horses were fully removed from the Park.

This alternative would benefit wilderness character in the long term compared with Alternative A—No Action.

*Cumulative Impacts*

The removal of horses in the South Unit under Alternative C would have a minor incremental adverse impact on wilderness. Horse management actions when considered along with other past, present, and reasonably foreseeable future actions would be as described under Affected

Environment: Current Conditions and Trends. The incremental contribution of impacts from horses on wilderness would cease once horses no longer remain in the unit.

**North Unit**

Impacts on wilderness would be the same as described under Alternative B.

*Cumulative Impacts*

Cumulative effects would be the same as described for Alternative B.

## CHAPTER 4: LIST OF AGENCIES, TRIBES, AND PERSONS CONSULTED

The NPS consulted with various agencies, Tribal Nations, organizations, and interested persons in preparing this document. The process of consultation and coordination is an important part of this project. A list of the federal agencies, state agencies, and Tribal Nations that were consulted is provided below.

- Senator John Hoeven
- Senator Kevin Cramer
- Representative Kelly Armstrong
- North Dakota Governor Doug Burgum
- North Dakota State Historic Preservation Office (SHPO)
- Tribal Nations:
  - Chippewa Cree Tribe of the Rocky Boy's Reservation
  - Crow Tribe of Montana
  - Fort Peck Assiniboine and Sioux Tribes
  - Spirit Lake Tribe of Fort Totten
  - Standing Rock Sioux Tribe
  - The Blackfeet Nation
  - Three Affiliated Tribes (Mandan, Hidatsa, and Arikara Nation)
  - Turtle Mountain Band of Chippewa

Tribal Nations were consulted as part of the project as follows:

- Annual Project Scoping (including the Livestock Plan) letters were sent to Tribal Historic Preservation Officers (THPOs) on February 22, 2022
- Follow up emails were sent to THPOs on March 9, 2022
- Virtual meetings were held on March 14 and April 7, 2022
- Letters and the Civic Engagement Newsletter was sent by email and hard copy mailings to chairpersons and THPOs at the eight affiliated Tribal Nations on May 9, 2022
- Multiple phone calls and emails were exchanged between the Park and THPOs during May – July 2022
- A site visit was conducted by the Standing Rock Sioux Tribe THPO on July 18, 2022

- An email with a letter inviting discussion was sent from the Park to the chairpersons and THPOs of the affiliated Tribal Nations on November 28, 2022
- An email and hard copy mailings of the Scoping Newsletter were sent to chairpersons and THPOs at the eight affiliated Tribal Nations on December 8, 2022
- The Standing Rock Sioux Tribe THPO met virtually with Park staff on December 16, 2022
- A letter was received on January 24, 2023 from Jon Eagle, THPO Standing Rock Sioux Tribe (cc'd to Secretary of the Interior, the NPS Washington Office Native American Affairs Liaison, and Regional Tribal Relations Program Coordinator)
- A letter was received on February 3, 2023, from the United Tribes of North Dakota (Sisseton-Wahpeton Sioux, Spirit Lake, Standing Rock Sioux, Three Affiliated Tribes, and Turtle Mountain Band of Chippewa)
- Annual Project Scoping letters were sent February 22, 2023 (including the Livestock Plan among other projects) and virtual meetings were held on March 23 and 27, 2023

Tribal consultation feedback was included in the development of draft alternatives during the pre-NEPA and NEPA phases of this project. Input from Tribal Nations will continue to be incorporated in the planning process.

The Civic Engagement and Scoping Newsletters were sent to the SHPO in March and December 2023, respectively. Based on feedback from the NPS Midwest Region Cultural Resources Management Team in June 2023, a National Historic Preservation Act (NHPA) Section 106 determination of “no adverse effect” is expected with a Standard 4-step consultation process. The Park will continue consultation with the SHPO and will request concurrence with the NPS effect determination under Section 106 of the NHPA.

In compliance with Section 7 of the Endangered Species Act, the project was entered into the US Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) project planning tool on July 31 and August 1, 2023. The following determinations were made and documented in response letters from the USFWS:

Species	Listing Status	Determination
Dakota Skipper ( <i>Hesperia dacotae</i> )	Threatened	No effect
Piping Plover ( <i>Charadrius melodus</i> )	Threatened	Not likely to adversely affect
Red Knot ( <i>Calidris canutus rufa</i> )	Threatened	Not likely to adversely affect
Whooping Crane ( <i>Grus americana</i> )	Endangered	Not likely to adversely affect
Northern Long-eared bat	Endangered	No effect

Coordination with the agencies and Tribal Nations will continue, as needed, prior to and during implementation of the EA.

## **LIST OF APPENDIXES**

Appendix A: References

Appendix B: Comparison of Alternatives

Appendix C: Impact Topics Considered but Dismissed From Further Analysis

Appendix D: Alternatives Considered but Dismissed From Further Analysis

## APPENDIX A: REFERENCES

- Amberg, S., K. Kilkus, M. Komp, A. Nadeau, K. Stark, L. Danielson, S. Gardner, et al. 2014. Theodore Roosevelt National Park: Natural Resource Condition Assessment. Natural Resource Report NPS/THRO/NRR—2014/776. National Park Service, Fort Collins, Colorado.
- Ashton, I. W. and C. J. Davis. 2017. Plant community composition and structure at Theodore Roosevelt National Park: 2011-2016 summary report. Natural Resource Report NPS/NGPN/NRR—2017/1497. National Park Service, Fort Collins, Colorado.
- Baker-Ismail, Samar, “Survival and overland transport of fecal coliform under Canadian prairie conditions.” Master’s thesis, University of Regina, Regina, SK, 2016, Internet website: [https://ourspace.uregina.ca/bitstream/handle/10294/7680/Baker-Ismail\\_Samar\\_200237995\\_PHD\\_EVSE\\_Spring2017.pdf](https://ourspace.uregina.ca/bitstream/handle/10294/7680/Baker-Ismail_Samar_200237995_PHD_EVSE_Spring2017.pdf).
- Beever, Erik A., and Peter F. Brussard. 2000. “EXAMINING ECOLOGICAL CONSEQUENCES OF FERAL HORSE GRAZING USING EXCLOSURES.” *Western North American Naturalist* 60, no. 3 (2000): 236–54. <http://www.jstor.org/stable/41717041>.
- Benayas, J. M. R, A. C. Newton, A. Diaz, and J. M Bullock. 2009. “Enhancement of biodiversity and ecosystem services by ecological restoration: A meta-analysis.” *Science* 325(5944):1121–4.
- Berger, J. 1985, Interspecific Interactions and Dominance among Wild Great Basin Ungulates, *Journal of Mammalogy*, Volume 66, Issue 3, 9 August 1985, Pages 571–573. Internet website: <https://doi.org/10.2307/1380939>.
- Beschta, R. L., D. L. Donahue, D. A. DellaSala, J. J. Rhodes, J. R. Karr, M. H. O'Brien, T. L. Fleischner, and C. Deacon Williams. 2013. Adapting to Climate Change on Western Public Lands: Addressing the Ecological Effects of Domestic, Wild, and Feral Ungulates. *Environmental Management* 51: 474-491. Internet website: <https://doi.org/10.1007/s00267-012-9964-9>.
- Billings County. 1998. Comprehensive Land Use Plan. Internet website: <https://www.billingscountynod.gov/DocumentCenter/View/60/Land-Use-Plan-PDF?bidId=>.
- BLS (Bureau of Labor Statistics). 2022. Local Area Unemployment Statistics for Billings County, North Dakota, McKenzie County, North Dakota, and the State of North Dakota. 2012–2021. Internet website: <https://www.bls.gov/data>.
- Boyd C. S., K. W. Davies, and G. H. Collins. 2017. Impacts of Feral Horse Use on Herbaceous Riparian Vegetation within a Sagebrush Steppe Ecosystem. *Rangeland Ecology & Management* 70, No. 4 (2017): 411-417.

- Brownlee, M. T., R. Sharp, M. Blacketer, M. Brunson, J. Nettles, and E. Perry. 2020. Visitor Use and Associated Thresholds at Theodore Roosevelt National Park 2016–2018. Clemson University and Kansas State University.
- Bryan, K. 1919. Classification of Springs. US Geological Survey, Washington DC.
- Clerck-Floate, D. 1997. “Cattle as dispersers of hound’s-tongue on rangeland in southeastern British Columbia.” *Journal of Range Management* 50(3): 239–243.
- Daughtry, C. S., W.A. White, M. N. Zedeño. 2016. Ethnographic Overview and Assessment Theodore Roosevelt National Park. Bureau of Applied Research in Anthropology, the University of Arizona. Tucson, Arizona.
- Davis, C. 2018. Chapter 12: Effects of Climate Change on Cultural Resources in the Northern Rockies Region. Forest Service RMRS-GTR-374.
- Douglas, M. and L. Wandsnider. 2012. Fragmentation Resistant Measures of Chipped Stone Abundance and Size: Results of an Experimental Investigation of the Impact of Cattle Trampling in Surface Chipped Stone Scatters. *Plains Anthropologist*, 50(224), 353–365. doi:10.1179/pan.2012.025.
- Ewers, John C. 1955. The Horse in the Blackfoot Indian Culture. Washington DC: Bureau of American Ethnology.
- Fiege, M., J. Ore, and J. Orsi. 2017. Theodore Roosevelt National Park, North Dakota: Historic Resource Study. Completed by the Public Lands History Center at Colorado State University, Fort Collins, Colorado.
- Fietzek-DeVries, R. 2013. “Historical hydroclimatic change at Theodore Roosevelt National Park: 1895–2011.” Master’s thesis, University of North Dakota, Grand Forks, 2013.
- Francis, C. D., and J. R. Barber. 2013. “A framework for understanding noise impacts on wildlife: An urgent conservation priority.” *Frontiers in Ecology and the Environment* 11: 305–313 (DOI: 10.1890/120183).
- Frid, A. and L. Dill. 2002. “Human-caused disturbance stimuli as a form of predation risk.” *Conservation Ecology* 6(1): 11. Internet website: <http://www.ecologyandsociety.org/vol6/iss1/art11/inline.html>.
- Gifford-Gonzales, D. P., D. B. Damrosch, D. R. Damrosch, J. Pryor, and R. L. Thunen. 1985. “The third dimension in site structure: An experiment in trampling and vertical dispersal.” *American Antiquity* 50(4): 803–818.
- Gooch, A. M. J., S. L. Petersen, G. H. Collins, T. S. Smith, B. R. McMillan, and D. L. Egget. 2017. The impact of free-roaming horses on pronghorn behavior at water sources. *Journal of Arid Environments* 138: 38–43.

- Hall, L. K., R. T. Larsen, R. N. Knight, and B. R. McMillan. 2018. Feral horses influence both spatial and temporal patterns of water use by native ungulates in a semi-arid environment. *Ecosphere An ESA Open Access Journal*. January 29, 2018. internet website: <https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2096>
- Harmon, David. 1986. *At the Open Margin: The NPS's Administration of Theodore Roosevelt National Park*. Theodore Roosevelt Nature & History Association. Medora, North Dakota.
- Headwater Economics. 2022a. Economic Profile System. Demographics for McKenzie and Billings Counties, North Dakota. Population data based on US Census American Community Survey 2016–2020 and 2006–2010 data. Internet website: <https://headwaterseconomics.org/apps/economic-profile-system/38053+38007>.
- \_\_\_\_\_. 2022b. Profile of Tourism for McKenzie and Billings Counties, North Dakota. Internet website: <https://headwaterseconomics.org/apps/economic-profile-system/38053+38007>.
- Heidel, B. 1990. Inventory of Rare Plant Species in Theodore Roosevelt National Park, Billings and McKenzie Counties, North Dakota. Natural Heritage Inventory. North Dakota Parks and Recreation Department, Bismarck, North Dakota.
- Holder, Preston. 1970. *The Hoe and Horse on the Plains: A Study of Cultural Development among North American Indians*. Lincoln: University of Nebraska Press.
- Irby, L. R., J. E. Norland, J. A. Westfall Jr., and M. A. Sullivan. 2002. "Evaluation of a forage allocation model for Theodore Roosevelt National Park." *Journal of Environmental Management* 64(2):153–169.
- Jabro, J. D, W. M. Iversen, R. G. Evans, B. L. Allen, and W. B. Stevens. 2014. Repeated Freeze-Thaw Cycle Effects on Soil Compaction in a Clay Loam in Northeastern Montana. *Soil Science Society of America Journal*, Volume 78, Issue 3, pages 737-744, June 10, 2014.
- Joyner, L., N. Qwynne Lackey, and K. S. Bricker. 2019. "Community engagement: An appreciative inquiry case study with Theodore Roosevelt National Park gateway communities." *Sustainability* 11: 7147.
- KellerLynn, K. 2007. Theodore Roosevelt National Park Geologic Resource Evaluation Report. Natural Resource Report NPS/NRPC/GRD/NRR—2007/006. National Park Service, Denver, Colorado.
- King, S. R., K. A. Schoenecker, and D. J. Manier. 2019. "Potential spread of cheatgrass and other invasive species by feral horses in western Colorado." *Rangeland Ecology & Management* 72(4): 706–710.
- Kitzes, E. W. 2020. E. Coli Bacteria TMDL for Little Missouri River in Billings, Golden Valley and Slope Counties, North Dakota. North Dakota Department of Environmental Quality, Division of Water Quality, Bismarck, North Dakota.

- Kunkel, K. E., R. Frankson, J. Runkle, S. M. Champion, L. E. Stevens, D. R. Easterling, B. C. Stewart, A. McCarrick, and C. R. Lemery (Eds.). 2022. State Climate Summaries for the United States 2022. NOAA Technical Report NESDIS 150. NOAA/NESDIS, Silver Spring, MD.
- Lesica, P. 2020. “Feral horses are associated with a decline in a rare semi-arid grassland plant.” *Journal of Arid Environments* 179. 104180. 10.1016/j.jaridenv.2020.104180.
- Lewis, S. T. 1998. “Evaluation of habitat use by a transplanted bighorn sheep herd in Theodore Roosevelt National Park.” Doctoral dissertation, Montana State University-Bozeman, College of Letters and Science, 1998.
- Licht, D. S. 2018. Acoustic Surveys of Bats at Northern Great Plains Parks and Preliminary Results from 2014-16. Natural Resource Report NPS/NGPN/NRR—2018/1588. National Park Service, Fort Collins, Colorado
- Lopinot, N. and J. Ray. 2007. Trampling Experiments in the Search for the Earliest Americans. *American Antiquity*, 72(4), 771-782. doi:10.2307/25470445.
- Mandema, F. S., J. M. Tinbergen, B. J. Ens, and J. P. Bakker. 2013. Livestock grazing and trampling of birds’ nests: an experiment using artificial nests. *Journal of Coastal Conservation*, 17(3), pp. 409-416.
- Manuel, R. M., and D. J. Swanson. 2019. Plant Community Composition and Structure Monitoring at Theodore Roosevelt National Park: 2019 Data Report. Natural Resource Data Series NPS/THRO/NRDS—2019/1250. National Park Service, Fort Collins, Colorado.
- Maunsell, F. P., A. R. Woolums, D. Francoz, R. F. Rosenbusch, D. L. Step, D. J. Wilson, and E. D. Janzen. 2011. “Mycoplasma bovis infections in cattle.” *Journal of Veterinary Internal Medicine* 25(4): 772–783.
- Marlow, C., L. Gagnon, L. Irby, and M. Raven. 1992. Feral Horse Distribution, Habitat Use and Population Dynamics in Theodore Roosevelt National Park. Denver, Colorado: National Park Service, Final Report, Contract 1200-9-C818, p. 36.
- McKenzie County. 2016. 2025 McKenzie County Comprehensive Plan (Policy Document). SRF Consulting, Inc. Internet website:  
<https://county.mckenziecounty.net/usrfiles/McKenzieCountyComprehensivePlan-FINAL.pdf>.
- McLaughlin, C. 1989. The history and status of the wild horses of Theodore Roosevelt National Park. Theodore Roosevelt Nature and History Association.

- Medler, C. J. and W. G. Eldridge. 2021. Spring types and contributing aquifers from water-chemistry and multivariate statistical analyses for seeps and springs in Theodore Roosevelt National Park, North Dakota, 2018: US Geological Survey Scientific Investigations Report 2020–5121. Internet website: <https://doi.org/10.3133/sir20205121>.
- Meeker, J. O. 1979. Interactions between pronghorn antelope and feral horses in northwestern Nevada. University of Nevada, Reno.
- Molle, G., A. Cannas, and P. Gregorini. 2022. A review on the effects of part-time grazing herbaceous pastures on feeding behaviour and intake of cattle, sheep, and horses. *Livestock Science*, p. 104982.
- Nexflow. 2022. Table 3. Internet website: <https://www.nexflow.com/blog/what-does-dba-mean/>. Accessed on September 25, 2022.
- Nolte, S., C. van der Weyde, P. Esselink, C. Smit, S. E. van Wieren, and J. P. Bakker. 2017. Behaviour of horses and cattle at two stocking densities in a coastal salt marsh. *Journal of Coastal Conservation*, 21(3), pp. 369-379.
- Norland, J. E. “Habitat use and distribution of bison in Theodore Roosevelt National Park.” Doctoral dissertation, Montana State University-Bozeman, College of Agriculture, 1984.
- North Dakota Environmental Quality. 2022. Surface Water Quality Data For North Dakota. Interactive map. Internet website: [https://deq.nd.gov/WQ/3\\_Watershed\\_Mgmt/SWDataApp/viewer/index.html](https://deq.nd.gov/WQ/3_Watershed_Mgmt/SWDataApp/viewer/index.html).
- \_\_\_\_\_. 2023. Environmental incident reports: North Dakota Department of Environmental Quality, Spill Investigation Program. Internet website: <https://northdakota.hazconnect.com/ListIncidentPublic.aspx>.
- North Dakota State Government. 2022. Historical monthly Bakken oil production statistics. Internet website: <https://www.dmr.nd.gov/oilgas/stats/historicalbakkenoilstats.pdf>.
- North Dakota Tourism Division. 2023. North Dakota Travel Guide. Internet website: <https://www.medialibrary.nd.gov/assetbank-nd/assetfile/76305.pdf>.
- NPS (National Park Service). 1970. Theodore Roosevelt National Park North Unit, Management Plan for Longhorn Cattle. Watford City, North Dakota.
- \_\_\_\_\_. 1976. Resource Management Plan Theodore Roosevelt National Park. January 1976. Medora, North Dakota.
- \_\_\_\_\_. 1978. Theodore Roosevelt National Park Feral Horse Reduction Environmental Assessment. April 1978. Medora, North Dakota.
- \_\_\_\_\_. 1984. Theodore Roosevelt National Park Natural Resources Management Plan and Environmental Assessment. July 1984. Medora, North Dakota.

- 
- \_\_\_\_\_. 1987. General Management Plan, Development Concept Plans for Theodore Roosevelt National Park, North Dakota. US Department of the Interior, National Park Service, Medora, North Dakota. June 1987.
- \_\_\_\_\_. 1994. Theodore Roosevelt National Park Resource Management Plan. December 1994. Medora, North Dakota.
- \_\_\_\_\_. 1998a. NPS-28: Cultural Resource Management Guideline, Release No. 5. Chapter 10, Management of Ethnographic Resources. Internet website: <https://irma.nps.gov/DataStore/DownloadFile/673586>.
- \_\_\_\_\_. 1998b. Water Resources Program. FY 1998. US Department of the Interior. National Park Service. Water Resources Division, Fort Collins, Colorado. Internet website: <http://npshistory.com/publications/water/water-resources-program-1998.pdf>.
- \_\_\_\_\_. 2004. Theodore Roosevelt: Administrative History (Chapter 9). US Department of the Interior, National Parks Service. Internet website: [https://www.nps.gov/parkhistory/online\\_books/thro/adhi9.htm](https://www.nps.gov/parkhistory/online_books/thro/adhi9.htm).
- \_\_\_\_\_. 2006. Management Policies. Internet website: [https://www.nps.gov/subjects/policy/upload/MP\\_2006.pdf](https://www.nps.gov/subjects/policy/upload/MP_2006.pdf).
- \_\_\_\_\_. 2010. Final Elk Management Plan/Environmental Impact Statement Theodore Roosevelt National Park. Internet website: <https://parkplanning.nps.gov/document.cfm?parkID=167&projectID=10833&documentID=32640>.
- \_\_\_\_\_. 2011a. Theodore Roosevelt National Park Superintendent's Compendium Of Designations, Closures, Permit Requirements and Other Restrictions Imposed Under Discretionary Authority Internet website: Superintendent's Compendium - Theodore Roosevelt National Park (US National Park Service) ([nps.gov](http://nps.gov)).
- \_\_\_\_\_. 2011b. Theodore Roosevelt National Park Long-Range Interpretive Plan. Medora, North Dakota.
- \_\_\_\_\_. 2014. Foundation Document Theodore Roosevelt National Park, North Dakota. US Department of the Interior. April 2014. THRO 387/124075.
- \_\_\_\_\_. 2015a. NPS NEPA Handbook Supplemental Guidance. September 2015. Internet website: [https://www.nps.gov/subjects/nepa/upload/SupplemntalGuidance\\_Impact-Analysis\\_Final\\_9-2015\\_accessible.pdf](https://www.nps.gov/subjects/nepa/upload/SupplemntalGuidance_Impact-Analysis_Final_9-2015_accessible.pdf).
- \_\_\_\_\_. 2015b. Theodore Roosevelt National Park North Unit Visitor Center. Environmental Assessment. April 2015. Internet website: <https://parkplanning.nps.gov/document.cfm?parkID=167&projectID=48245&documentID=66118>.
- \_\_\_\_\_. 2015c. Theodore Roosevelt National Park. Animals. Internet website: <https://www.nps.gov/thro/learn/nature/animals.htm>.

- 
- \_\_\_\_\_. 2015d. Theodore Roosevelt National Park. Natural Features and Ecosystems. Internet website: <https://www.nps.gov/thro/learn/nature/naturalfeaturesandecosystems.htm>.
- \_\_\_\_\_. 2015e. Nonnative Species, Theodore Roosevelt National Park, North Dakota. Internet website: [https://www.nps.gov/thro/learn/nature/nonnativespecies.htm?eid=175156&root\\_aId=440](https://www.nps.gov/thro/learn/nature/nonnativespecies.htm?eid=175156&root_aId=440).
- \_\_\_\_\_. 2017. Initial Bison Herd Reduction Environmental Assessment. Grand Canyon National Park, Arizona.
- \_\_\_\_\_. 2018. Theodore Roosevelt National Park. Bison Management. Internet website: <https://www.nps.gov/thro/learn/nature/bison-management.htm>.
- \_\_\_\_\_. 2019. Plan Community Monitoring at Theodore Roosevelt National Park. US Department of the Interior, National Park Service, Medora, North Dakota. November 2019. Internet website: <https://www.nps.gov/articles/plant-community-monitoring-thro.htm>.
- \_\_\_\_\_. 2022a. Theodore Roosevelt National Park. Hiking and Trail Information. Internet website: <https://www.nps.gov/thro/planyourvisit/hiking-and-trail-information.htm>.
- \_\_\_\_\_. 2022b. Recreational Visitor Statistics, 10-year trends. Theodore Roosevelt National Park. Internet website: <https://irma.nps.gov/STATS/Reports/Home>.
- \_\_\_\_\_. 2022c. Recreational Visitor Statistics for 2021. Theodore Roosevelt National Park. Internet website: <https://irma.nps.gov/STATS/Reports/Home>.
- \_\_\_\_\_. 2022d. Monthly Public Use Report for August 2021. Theodore Roosevelt National Park. Internet website: <https://irma.nps.gov/STATS/Reports/Home>.
- \_\_\_\_\_. 2022e. Recreational Visitor Statistics, 5-year visitation trends for North and South Units. Theodore Roosevelt National Park. Internet website: <https://irma.nps.gov/STATS/Reports/Home>.
- \_\_\_\_\_. 2022f. 2021 National Park Visitor Spending Effects Economic Contributions to Local Communities, States, and the Nation. Internet website: <https://www.nps.gov/subjects/socialscience/vse.htm>.
- \_\_\_\_\_. 2022g. Photographs of Theodore Roosevelt National Park, from publicly available datasets. Internet websites: <https://www.nps.gov/thro/learn/historyculture/cultural-history.htm> and <https://www.nps.gov/media/photo/gallery.htm?pg=3126142&id=026B2B3B-155D-4519-3EB8C73325EC3B8E>, and <https://www.nps.gov/media/photo/gallery-item.htm?pg=3079974&id=020B51A4-155D-4519-3EE4B07053A2B970&gid=0269A9CD-155D-4519-3E71E6BA81D4A67E>.

- \_\_\_\_\_. 2022h. Communication between Angie Richman, Blake McCann, Maureen McGee-Ballinger, and Bret Morton, Theodore Roosevelt National Park with Holly Prohaska Amy Cordle and Andy Spellmeyer, EMPSi. October 11–13, 2022. Medora, North Dakota.
- \_\_\_\_\_. 2022i. Theodore Roosevelt National Park Facility Revitalization Plan. Medora, North Dakota.
- \_\_\_\_\_. 2023. NPS Species, Information on Species in National Parks. Theodore Roosevelt National Park. Internet website: <https://irma.nps.gov/NPSpecies/Search/SpeciesList>.
- NPS GIS (National Park Service, geographic information systems). 2022. GIS data published or provided by the National Park Service for the Theodore Roosevelt National Park.
- NRCS (Natural Resources Conservation Service). 2022. Custom Soil Resource Report for McKenzie County, North Dakota. United States Department of Agriculture. September 18, 2022.
- O’Driscoll, M., D. DeWalle, C. Humphrey Jr., and G. Iverson. 2019. “Groundwater seeps: Portholes to evaluate groundwater’s influence on stream water quality.” *Journal of Contemporary Water Research & Education* 166(1):57–78.
- Olsen, S. L. and P. Shipman. 1988. Surface Modification on Bone: Trampling versus Butchery. *Journal of Archaeological Science*, 15, 535-553. Internet website: [https://doi.org/10.1016/0305-4403\(88\)90081-7](https://doi.org/10.1016/0305-4403(88)90081-7).
- Olivera, J., L. A. Rocha, V. Rotger, and M. Herrera. 2011. “Acoustic pollution in hospital environments.” *Journal of Physics: Conference Series*. 332. 012003. 10.1088/1742-6596/332/1/012003.
- Pargeter, J. and J. Bradfield. 2012. The Effects of Class I and II Sized Bovids on Macrofracture Formation and Tool Displacement: Results of a Trampling Experiment in a Southern African Stone Age Context: *Journal of Field Archeology*, 37(3), 238-251. doi:10.1179/0093469012z.00000000022.
- Perry, N. D., P. Morey, and G. S. Miguel. 2015. Dominance of natural water source by free-roaming horses. *Southwestern Naturalist* 60: 390–393.
- Pimentel, David. 2007. Environmental and Economic Costs of Vertebrate Species Invasions into the United States. *Managing Vertebrate Invasive Species*. 38. Internet website: <https://digitalcommons.unl.edu/nwrcinvasive/38>.
- Plumb, G. E. and J. L. Dodd. 1993. Foraging ecology of bison and cattle on a mixed prairie: implications for natural area management. *Ecological Applications*, 3(4), pp. 631-643.

- Premier Longhorns, LLC. 2022. Longhorn Tips. From the Oklahoma State University Master Cattleman Program, REI Bovine Reproduction School and the Shared Voice of Experience. Internet website: <http://www.premierlonghorns.com/INFORMATION-LINKS.html>.
- Prowatzke, M. and S. K. Wilson. 2015. Plant Community Composition and Structure Monitoring for Theodore Roosevelt National Park: 2014 Annual Report. Natural Resource Data Series NPS/NGPN/NRDS—2015/763. National Park Service, Fort Collins, Colorado.
- Register, K. B., L. C. Jones, W. D. Boatwright, T. K. Shury, M. Woodbury, R. G. Hamilton, J. Treanor, N. Dyer, and P. Nol. 2021. Prevalence of *Mycoplasma* spp. in the respiratory tract of healthy North American Bison (*Bison bison*) and comparison with serum antibody status. *Journal of Wildlife Diseases*, 57(3), pp. 683-688.
- Quinn, L. D., M. Kolipinski, V. R. Coelho, B. Davis, J. M. Vianney, O. Batjargal, M. Alas, et al. 2008. "Germination of invasive plant seeds after digestion by horses in California." *Natural Areas Journal* 28(4): 356-362.
- Salcido, C. J., P. Wilson, J. S. Tweet, B. E. McCann, C. A. Boyd, and V. L. Santucci. 2022. Theodore Roosevelt National Park: Paleontological resource inventory (public version). Natural Resource Report NPS/THRO/NRR—2022/2385. National Park Service, Fort Collins, Colorado. Internet website: <https://doi.org/10.36967/nrr-2293509>.
- Scanes, P., A. McSorley, and A. Dickson. 2021. Feral horses (*Equus caballus*) increase suspended sediment in subalpine streams. CSIRO Publishing. Marine and Freshwater Research, 2021, 72, 1290-1302. Internet website: <https://doi.org/10.1071/MF20353>.
- Stoffer, P. W. 2003. Geology of Badlands National Park: A preliminary Report. US Geological Survey Report 2003-35. US Department of the Interior, US Geological Survey.
- Stoneburner, A., and J. Spaak. 2023. Rangeland Health Assessment of Theodore Roosevelt National Park. Nature Resource Report NPS/THRO/NRR – 2023/XXXX. National Park Service. Fort Collins, CO (In press, not yet final).
- Stoops, Richard Wayne Jr. An Experimental Examination of Trampling Effects on the Lateral Movement of Surface Artifacts. Master's Thesis, The University of Tennessee, Knoxville 1989. Internet website: [https://trace.tennessee.edu/utk\\_gradthes/4162/](https://trace.tennessee.edu/utk_gradthes/4162/).
- Sweeney, S., R. Jones, K. Patyk, and C. LoSapio. 2013. *Mycoplasma bovis*-an emerging pathogen in ranched bison. *ARS USDA Submissions*.
- Thompson, Melissa Amy. 2022. Genetic Breed Association And Contraceptive Response GWAS of The Feral Horses (*Equus Caballus*) of Theodore Roosevelt National Park. Theses and Dissertations. 4297. Internet website: <https://commons.und.edu/theses/4297>.

- Todhunter, P. E. and R. DeVries. 2021. "Climate Change Assessment using Spatial Climate Datasets: Theodore Roosevelt National Park (South Unit), 1895–2019." *Climate Research* 85: 91–106. Internet website: <https://doi.org/10.3354/cr01672>.
- TRPL (Theodore Roosevelt Public Library). 2022. Theodore Roosevelt Public Library, Our Progress. Internet website: <https://www.trlibrary.com/the-project/our-progress/>.
- Census Bureau (US Census Bureau). 2000. Decennial Census. Table DP1. Internet website: [https://data.census.gov/cedsci/table?q=population&g=0400000US38\\_0500000US38007,38053&y=2000&tid=DECENNIALDPSF22000.DP1](https://data.census.gov/cedsci/table?q=population&g=0400000US38_0500000US38007,38053&y=2000&tid=DECENNIALDPSF22000.DP1).
- USFWS (US Fish and Wildlife Service). 2023. IPaC - Information for Planning and Consultation. Database access. Internet website: <https://ipac.ecosphere.fws.gov/location/index>. IPaC from August 1<sup>st</sup>, 2023.
- Valseth, K. J. 2021. Vulnerability assessment in and near Theodore Roosevelt National Park, North Dakota: US Geological Survey Scientific Investigations Map 3479. Prepared in cooperation with the Inland Oil Spill Preparedness Project. Internet website: <https://doi.org/10.3133/sim3479>.
- Wells, F. H. and W. K. Lauenroth. 2007. "The potential for horses to disperse alien plants along recreational trails." *Rangeland Ecology & Management* 60(6): 574–5.
- Westfall, J. A. "The ecology of reintroduced elk in Theodore Roosevelt National Park, North Dakota." Doctoral dissertation, Montana State University-Bozeman, College of Letters and Science, 1989.
- Westfall Jr., J. A., L. R. Irby, and J. E. Norland. 1993. A forage allocation model for four ungulate species in Theodore Roosevelt National Park. Montana State University, Bozeman, Montana.
- Wildesen, L. E. 1982. "The study of impacts on archaeological sites." *Advances in Archaeological Method and Theory* 5: 51–96.
- Wilson, R. 2019. North Dakota Game and Fish Department. Rebuilding Bighorn Sheep in the Southern Badlands. Internet website: <https://gf.nd.gov/magazine/2020/feb/rebuilding-bighorn-sheep-southern-badlands>.
- Wood, C. W., and B. A. Meador. 2022. Identifying Structural Thresholds in Annual Grass–Invaded Rangelands, *Rangeland Ecology & Management*, Volume 83, 2022, Pages 1–9, ISSN 1550-7424. Internet website: <https://doi.org/10.1016/j.rama.2022.02.010>.

## APPENDIX B: COMPARISON OF ALTERNATIVES

Management Component	Alternative A No Action Alternative (Current Management)	Alternative B Expedited Reduction of Herds to No Livestock	Alternative C Phased Reduction of Herds to No Livestock
<b>Herd Size Objective</b>			
Horses	35–60 horses, as stated in the 1978 EA; the NPS may periodically introduce horses from outside sources to ensure genetic variation (NPS 1984)	Zero	Zero
Cattle	Up to 12 cattle, as described in the 1970 Management Plan for Longhorn Cattle (NPS 1970)	Zero	Zero
<b>Capture</b>			
Horses	<ul style="list-style-type: none"> <li>• Park staff would use active capture (for example, helicopter or wrangler roundup, tranquilizer darting, low-stress herding, and trapping)</li> <li>• To meet herd size objectives, there would be an initial, weeklong roundup during the fall</li> <li>• Helicopter roundups would be approximately every four years after initial roundups, with other capture techniques used in other years</li> <li>• When helicopter roundups do not occur, tranquilizer darting, wrangler roundups, low-stress herding (e.g. waving flags), and trapping could take place throughout the year</li> </ul>	<p>In addition to the techniques described under Alternative A, under Alternative B:</p> <ul style="list-style-type: none"> <li>• Most horses would be removed from the Park during the initial phase of roundups</li> <li>• Roundups using helicopters or other tools would continue to occur in an expedited manner following the initial roundup, until all horses were removed</li> <li>• The NPS would seek to remove all horses from the Park over a span of two years, though logistical, operational, and environmental circumstances may dictate that the effort could take longer</li> </ul>	<p>In addition to the techniques under Alternative A, under Alternative C:</p> <ul style="list-style-type: none"> <li>• Following the initial roundup phase, additional captures would occur annually until all horses are removed or contracepted</li> <li>• A representative subset of nonreproductive horses would be returned to the Park to live out their lives</li> </ul>

Management Component	Alternative A No Action Alternative (Current Management)	Alternative B Expedited Reduction of Herds to No Livestock	Alternative C Phased Reduction of Herds to No Livestock
Cattle	<ul style="list-style-type: none"> <li>Low-stress herding and baiting when necessary</li> </ul>	<ul style="list-style-type: none"> <li>Low-stress herding and baiting; helicopter roundups, wranglers on horseback, and tranquilizer darting as secondary options</li> </ul>	Same as Alternative B
<b>Fertility Control</b>			
Horses	The NPS would use chemical and surgical contraceptive methods on some segment of the herd	Not applicable	The NPS would use all methods available. Any horses returned to the Park would be contracepted via chemical or surgical methods
Cattle	Not applicable	Same as Alternative A	Same as Alternative A
<b>Veterinary Services</b>			
Horses	Only after capture, as needed for health certification and to maintain health of animals while in captivity	Same as Alternative A	Same as Alternative A
Cattle	Basic veterinary care provided as needed (anytime an issue is apparent)	Only after capture	Same as Alternative B
<b>Placement of Excess Livestock After Capture</b>			
Horses	From holding corrals, the horses would be transferred to other authorized entities or sold through a GSA auction	In addition to the techniques described under Alternative A, under Alternative B: <ul style="list-style-type: none"> <li>Tribal Nations and other tribal entities would be provided with the first opportunity to receive horses</li> <li>Horses could be transferred to other authorized entities</li> </ul>	Same as Alternative B
Cattle	Not applicable	From holding corrals, the cattle would be transferred to other authorized entities or sold through a GSA auction	Same as Alternative B

Management Component	Alternative A No Action Alternative (Current Management)	Alternative B Expedited Reduction of Herds to No Livestock	Alternative C Phased Reduction of Herds to No Livestock
<b>Euthanasia</b>			
Horses	Euthanasia only of individual horses that exhibit the following conditions: <ul style="list-style-type: none"> <li>• Horses affected by a chronic or incurable disease, injury, lameness, or serious physical defect that would not allow them to maintain an acceptable quality of life for the foreseeable future</li> <li>• Horses posing a danger to visitors, threatening Park resources, or presenting a nuisance</li> <li>• Horses that the NPS is unable to sell or place</li> </ul>	Same as Alternative A	Same as Alternative A
Cattle	Euthanasia of individual cattle that exhibit the following conditions: <ul style="list-style-type: none"> <li>• Cattle affected by a chronic or incurable disease, injury, lameness, or serious physical defect that would not allow it to maintain an acceptable quality of life for the foreseeable future</li> <li>• Cattle posing a danger to visitors, threatening Park resources, or presenting a nuisance</li> <li>• Cattle that the NPS is unable to sell or place</li> </ul>	Same as Alternative A	Same as Alternative A

## **APPENDIX C: IMPACT TOPICS CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS**

The impact topics below were considered but dismissed from detailed analysis because the NPS interdisciplinary team determined that the potential environmental impacts to the resources or values would not be significant, are not central to the decision, or a detailed analysis of these impacts was not necessary to make a reasonable choice between alternatives. The reason for dismissing the topic from further analysis is provided.

### **AIR QUALITY**

The 1963 Clean Air Act, as amended (42 United States Code 7401 et seq.), requires federal land managers to protect air quality and to meet all federal, state, and local air pollution standards. The Park is subject to federal, state, and local air pollution standards. The US Environmental Protection Agency has established national ambient air quality standards. Current standards are set for: sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, particulate matter equal to or less than 10 microns in size, fine particulate matter equal to or less than 2.5 microns in size, and lead.

National parks are designated as Clean Air Act Class I areas, and they are afforded the highest level of protection from air quality impacts. In addition to the health-based national ambient air quality standards that protect ambient air quality, the Clean Air Act provides Class I areas with special protection for air quality and air quality-related values, including visibility. Large powerplants in Montana and North Dakota, nearby oil and gas well fields, and agriculture are significant sources of airborne nitrogen and sulfur in the Park (NPS 2018). While sulfur emissions from regional sources are projected to decrease because of requirements under the Clean Air Act, nitrogen emissions, particularly from oil and gas production, are projected to increase over time.

#### **South Unit**

Horses in the Park have a negligible impact on air quality. Removal activities would have a short-term effect on air quality from vehicle, helicopter, and equipment operations during roundup activities. The use of vehicles and aircraft would result in a small increase of air pollutant emissions in the project area, including an increase in equipment exhaust emissions and fugitive dust during roundups. The use of various types of equipment, vehicles, and helicopters during roundups would produce emissions that would be small relative to those produced from visitors' travel throughout the Park. The use of motor vehicles and helicopters would make an inconsequential contribution to the Park's overall emissions profile. Any increase in emissions would cease once roundups would be completed; therefore, no lasting effects would be expected.

#### **North Unit**

Like horses, cattle in the Park have a negligible impact on air quality. Short-term effects on air quality from removal would have impacts that are similar to those described for the South Unit,

but at a much smaller magnitude. This is because much less equipment use would be required to remove the cattle.

For the reasons outlined above, this topic has been dismissed from further analysis.

## **SOILS**

### **South Unit**

While soils in the project area are highly erodible and they may be impacted by the movement of horses, the annual freezing of soils during the winter and the subsequent thawing during spring can counteract the compaction from horses or native species (Jabro et al. 2014). Any impacts on soils from the presence of horses in the South Unit are not readily distinguishable from the impacts that would be caused by bison or native ungulates.

Horse removal activities would remove vegetation in limited areas, thereby exposing soils to erosion by wind and water, and compacting the soils. Examples of this are driving and congregating livestock and using vehicles. The impacts on soils would be concentrated along drive trails and adjacent to the capture wing fence and holding facility. The disturbances would be temporary and intermittent during the capture phase. Most of the existing drive trails and the holding facility would be on already disturbed sites, reducing the new disturbance footprint.

### **North Unit**

Impacts on soils from cattle in the North Unit would be similar to those described for the South Unit, but they would occur in a smaller area and at a lesser magnitude due to the limited number of cattle.

Because the impacts on soils would be minor, not distinguishable from the impacts of native species and not distinguishable across alternatives, this topic has been dismissed from further analysis. Indirect effects from disturbance of soils and the impact on vegetation and water resources are analyzed in detail under those topic areas.

## **ENVIRONMENTAL JUSTICE**

### **South and North Unit**

Environmental justice effects result when project-related actions have a disproportionately high and adverse effect on minority or low-income populations, in accordance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Proposed federal projects are required to comply with the provisions of Title VI of the Civil Rights Act of 1964, as amended by Title VIII of the Civil Rights Act of 1968. Title VI of the 1964 Civil Rights Act provides that no person will, on the grounds of race, color, religion, sex, national origin, marital status, disability, or family composition, be excluded from participation in, be denied the benefits of, or be otherwise subject to discrimination under a program of the federal, state, or local government. Title VIII of the 1968 Civil Rights Act guarantees each person equal opportunity in housing.

Upon review of these laws and the proposed alternatives associated with this EA, no person would be excluded from, or discriminated against in, the proposed alternatives considered in this EA. Additionally, minority or low-income populations would be treated the same way as other groups under the alternatives considered in this EA. Also, the alternatives would not have a disproportionately high or adverse effect on a minority or low-income population or community. Therefore, this topic was dismissed from further analysis.

## **HUMAN HEALTH AND SAFETY**

### **South and North Unit**

There are minimal interactions between livestock and visitors at the Park. Horses usually stay at a distance from visitors. There have been some instances of livestock in the campgrounds, but there have been minimal recorded impacts on health and safety. There also would be no expected visitor health and safety impacts during capture. This is because visitors would not be allowed to access the capture facility or trails during an active capture. Worker safety would be addressed by project design and NPS policy. Therefore, the human health and safety topic has been dismissed from detailed analysis.

## **INDIAN TRUST RESOURCES**

### **South and North Unit**

Indian trust resources are assets held in trust by the United States for American Indians. The Department of the Interior Environmental Compliance Memorandum 97-2, Departmental Responsibilities for Indian Trust Resources and Indian Sacred Sites on Federal Lands, requires that any anticipated impacts on Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights. It represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native Tribal Nations. No Indian trust resources have been identified in consultation with Tribal Nations in the Park; therefore, this topic was dismissed from further analysis.

## **PALEONTOLOGICAL RESOURCES**

The Park's noteworthy geological features and landforms include: large concretions, caprocks, glacial erratics, aeolian deposits, river oxbows and terraces, and erosional surfaces called pediments. Precipitation in the region comes as sudden showers; this sudden influx of precipitation causes runoff and rapid erosion of poorly consolidated sediments, forming a highly dissected badlands topography. Seasonally, small tributaries flow down the steep valley sides along the Little Missouri River, cutting into the strata of the Fort Union Group; these strata include: shales, clays, sandstones, silts, and lignite of the Bullion Creek and Sentinel Butte formations (KellerLynn 2007).

Petrified wood and freshwater mollusks in the Bullion Creek and Sentinel Butte formations are the most abundant fossils in the Park (KellerLynn 2007). Most trees were probably conifers

(Salcido et al. 2022). Remains of freshwater mollusks (snails and small snail opercula, mussels, and pill clams) are also abundant, and ostracods (small bivalve crustaceans) are present.

### **South Unit**

The presence of animals, including horses, on the landscape could impact paleontological resources that are surficial or exposed through the erosion of soils or changes in fluvial geomorphology. If paleontological resources are exposed or contained in near-surface formations, they can be damaged via direct physical impacts, like trampling. Also, they can be impacted by increased rates of erosion and changes in fluvial geomorphology (the movement and change of rivers over time) due to vegetation removal, soil disturbance, and disturbance of streambanks and riparian areas by horses. At present there are no scientifically meaningful or unique paleontological resources that have been identified as being exposed and at risk, therefore this impact topic was not carried forward for more detailed analysis.

### **North Unit**

The cattle in the North Unit also could impact paleontological resources similarly to horses as described in the South Unit, but in a much smaller area. In the North Unit, roundup activities of cattle would have negligible impacts on paleontological resources due to the small number of cattle, therefore this impact topic was not carried forward for more detailed analysis.

## APPENDIX D: ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The project planning team considered the following alternative methods for removing livestock, but dismissed them from further consideration, as described below.

**Nonreproductive Herds Permanently Maintained in the Park**—This alternative would manage nonreproductive herds of horses and cattle in various locations in the Park (North Unit, South Unit, or Elkhorn Ranch Unit). This would require gathering and selling young horses (3 years of age or younger) and implementing fertility control of the remaining horses, whether they are pastured or released to roam the full extent of the South or Elkhorn Ranch Units. Cattle would be placed in a new pasture in the North Unit or Elkhorn Ranch Unit, separate from bison, and replaced with additional cattle as older cattle die. The NPS would need to construct and maintain infrastructure, such as fencing and water pipelines, to implement this alternative in all units. The NPS also would need to provide forage and water.

This alternative would continue management not in alignment with NPS priorities to maintain the native prairie ecosystem. This alternative also would not meet the project's purpose and need, because it would not address the livestock's impacts on natural and cultural resources or comply with relevant laws, regulations, and policies. Therefore, it was not brought forward for further analysis.

**Reproductive Herds Maintained in the Park**—This alternative would require gathering and selling some young horses (three years of age or younger), fertility control of a subset of the herd, maintaining a representative group of reproductive horses, and release to the Park's South Unit. The number would be maintained at 30–70 horses through reproduction and introduction of new reproductive horses. Cattle would be placed in a new pasture in the North Unit, separate from bison; the number would be maintained at 15–40 cattle by introducing additional reproductive cattle over time. The NPS would need to construct and maintain infrastructure, such as fencing and water pipelines, to implement this alternative in both units. The NPS would also need to provide forage and water in both units. A genetic management plan would need to be developed for both species in both units.

This alternative would continue management not in alignment with NPS priorities to maintain the native prairie ecosystem. This alternative would not meet the project's purpose and need, because it also would not address the livestock's impacts on natural and cultural resources or comply with relevant laws, regulations, and policies. Therefore, it was not brought forward for further analysis.

**Allow for a Minimum of 150 Horses in the Herd to Maintain Genetic Diversity**—A decision was made in the 1960s to limit herd sizes in the Park to approximately 40 horses in the South Unit. Based on the analysis of impacts from horses in the Park, the 1978 EA selected an alternative to maintain the horse herd at 35–60 head (NPS 1978). An alternative to manage for a herd of 150 horses would not fall within the allowable numbers of horses identified in the EA. There is no cattle component to this alternative. This alternative would continue management

that is out of alignment with NPS priorities to maintain the native prairie ecosystem. It also would not meet the project's purpose and need, because it would not address livestock's impacts on natural and cultural resources or comply with relevant laws, regulations, and policies. Therefore, it was not brought forward for further analysis.

**Manage a Reproductive and Nonreproductive Herd in Separate Areas**—This alternative would require infrastructure to separate reproductive and nonreproductive herds of horses and cattle in both the South and North Units, as described above. It would continue management not in alignment with NPS priorities to maintain the native prairie ecosystem. It also would not meet the project's purpose and need, because it would not address the livestock's impacts on natural and cultural resources or comply with relevant laws, regulations, and policies. Therefore, it was not brought forward for further analysis.

**Manage a Herd for Historical and Cultural Significance**—Horses and cattle existed on the landscape during the time that Theodore Roosevelt resided at Elkhorn Ranch. While horses and cattle are identified as part of the area's cultural history, there is no NPS statute, regulation, or policy requiring the Park staff to manage horses or cattle at the ranch. This alternative would continue management out of alignment with NPS priorities to maintain the native prairie ecosystem. This alternative also would not meet the project's purpose and need, because it would not address the livestock's impacts on natural and cultural resources or comply with relevant laws, regulations, and policies. Therefore, it was not brought forward for further analysis.

**Manage a Nonreproductive Herd at Elkhorn Ranch**—This alternative suggested having nonreproductive herds of horses or cattle at the Elkhorn Ranch Unit. This would solve some of the management issues, such as eliminating the need for roundups, while keeping herds on the landscape to fulfill the interpretive and historic vision of having cattle on the landscape, as when Theodore Roosevelt resided at Elkhorn Ranch. This Unit is highly forested with juniper, and only about 150 acres are available for forage. This alternative would require supplemental feed for cattle, and it would not be conducive to horses. In addition, there are currently no horses, cattle, or necessary facilities at Elkhorn Ranch. The Park staff would have to move livestock and build infrastructure, which would continue management not in alignment with NPS priorities, to maintain the native prairie ecosystem. The alternative would also add impacts on resources where infrastructure is built (parking, fencing, bathrooms, hay storage, etc.). Because this alternative would not meet the project's purpose and need to address NPS priorities to maintain the native prairie ecosystem, it was not brought forward for further analysis.