DRAFT
Environmental Impact Statement

National Elk Refuge

Bison and Elk Management Plan

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August 28, 2026

U.S. Department of the Interior
Fish and Wildlife Service
Region 6 (Mountain-Prairie Region)
National Elk Refuge
Jackson, Wyoming

Executive Summary

The U.S. Fish and Wildlife Service (Service) is proposing to update the Bison and Elk Management Plan (BEMP) for the National Elk Refuge (Refuge) in Jackson, Wyoming. The BEMP seeks to address newly available scientific information and changed conditions since adoption of the original management plan in 2007. New conditions include the detection of Chronic Wasting Disease (CWD) on the Refuge and in the greater Jackson area. The updated BEMP will also set new desired conditions, management goals, objectives, and strategies to guide future management of bison and elk on the Refuge.

This environmental impact statement (EIS) examines the reasonably foreseeable effects of the proposed action and a reasonable range of alternatives. It has been prepared pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), the U.S. Department of the Interior NEPA (DOI) NEPA Regulations (43 CFR 46), the DOI Handbook of NEPA Implementing Procedures (516 DM 1), the Service policy (550 Service Manual, or FW), and other applicable Federal and State laws and regulations.

The EIS evaluates four alternatives that represent a range of strategies for managing bison and elk on the Refuge. As described in the EIS, these alternatives differ primarily in how they phase out or continue supplemental feeding, how they influence elk and bison distribution on the landscape, and how they balance ecological health with social and economic considerations. Collectively, these alternatives illustrate the tradeoffs between short-term stability and long-term herd sustainability.

Alternative A, the no-action alternative, continues the existing approach of providing supplemental winter feed to elk and bison indefinitely. This maintains current elk and bison population levels in the short term and limits human–wildlife conflicts on adjacent private lands. However, continued high concentrations of elk on feedgrounds accelerate the spread of CWD, leading to the largest long-term declines in the Jackson elk herd. This alternative results in the lowest adverse economic effects on private lands but the highest projected CWD prevalence, the greatest habitat degradation from persistent over-browsing, and the highest long-term management costs.

Alternative B phases out supplemental elk feeding once CWD prevalence reaches 3%, or after year seven, while continuing bison feeding as necessary to avoid human-bison conflict. In the early years, ending feeding results in elevated elk winter mortality and temporary increases in human–wildlife conflict as animals disperse in search of winter forage. Over the long term, however, elk numbers stabilize at the highest projected level of any alternative, CWD prevalence remains substantially lower than under Alternative A, and habitat conditions improve as browsing pressure decreases. Hunting participation is expected to increase in the short term under this alternative, generating higher tag sales, outfitting revenue, and associated local economic benefits; however, there will also be greater economic impacts on agriculture as elk disperse off the Refuge. This alternative also offers the greatest long-term management cost savings once feeding operations conclude.

Alternative C reduces elk feed rations immediately and ends supplemental feeding for both elk and bison after five years. This approach causes the most pronounced short-term impacts across the alternatives, including higher winter mortality for elk and increased human–wildlife conflict as elk and bison move more broadly onto the landscape. Despite short term economic impacts to hunting, outfitting and agriculture, this alternative produces some of the earliest ecological benefits, with riparian vegetation beginning to recover quickly once browsing intensity declines. Long-term elk numbers stabilize slightly below those projected under Alternative B, while bison populations remain lower than in all other alternatives. Management costs decrease considerably over the planning horizon once feeding concludes.

Alternative D employs an adaptive management framework with cooperating agencies to reduce the number of elk overwintering on the Refuge to approximately 5,000 over a 10-year period through a combination of potential management and feeding adjustments, as well as targeted hunter-harvest strategies. Annual coordination with cooperating agencies would inform decisions on whether supplemental feeding continues, based on observed CWD trends, herd dynamics, and winter severity. Early implementation years feature the highest hunter-harvest of elk across all alternatives, reducing short-distance migrant elk in the herd and decreasing browse pressure and private-land conflicts. Long-term outcomes vary depending on when feeding ends: if feeding stops once CWD reaches 3–7%, long-term herd size and disease prevalence approximate those seen under Alternative B; if feeding continues for longer periods, outcomes trend toward those under Alternative A. This approach provides substantial flexibility while minimizing adverse economic effects on hunters, outfitters, and private landowners.

Taken together, the alternatives depict a continuum of management responses—from maintaining the status quo to fully eliminating supplemental feeding—each with distinct implications for herd health, disease dynamics, habitat conditions, public use opportunities, and local economic effects. The analysis reflects the Service's responsibilities to apply the best available science and evaluate a reasonable range of approaches to ensure the long-term conservation of bison, elk, and Refuge habitats while considering the needs of surrounding communities and cooperating agencies. The Service has also considered but dismissed several alternatives from further consideration at this time for reasons discussed further in the EIS.

The following resources were analyzed in the EIS: elk, bison, other wildlife (including threatened and endangered species), vegetation, habitat, soils, water resources, cultural and historic resources, hunting, visitor use and experience, public health and safety, private lands, other public lands, economics, and management and operations (see Chapter 4: for more information). Several other resources were initially considered by the Service but were ultimately dismissed from further analysis because neither the proposed action nor its alternatives would have the potential to result in measurable effects to these resources.

The draft EIS is available for public comment from August 28, 2026, to October 12, 2026.

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Glossary and Abbreviations

°F: degrees Fahrenheit

APHIS: Animal and Plant Health Inspection Service

AUMs: animal unit months**;** a unit used to estimate how much forage is eaten by a specific animal in a month. In range and pasture management related to beef production, AUM is often defined as the approximate amount of forage that a 1,000-pound cow will eat in a month.

BEMP: Bison and Elk Management Plan

BLM: Bureau of Land Management

Bridger-Teton: Bridger-Teton National Forest

CCP: Comprehensive Conservation Plan; a document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the National Wildlife Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the National Wildlife Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (602 FW 1, Exhibit 1).

CFR: Code of Federal Regulations

conservation easement: a voluntary legal agreement between a landowner and a government agency or qualified conservation organization that restricts the type and amount of development that may take place on a property in the future. Conservation easements aim to protect habitat for birds, fish and other wildlife by limiting residential, industrial or commercial development. Contracts may prohibit alteration of the natural topography, conversion of native grassland to cropland, drainage of wetland and establishment of game farms. Easement land remains in private ownership.

CT: Census Tract; a geographic region defined for the purpose of taking a census. It is designed to contain a relatively stable population size and is used to collect and analyze demographic data, including income, population, and housing information.

CWD: chronic wasting disease

DSA: Designated Surveillance Area

EA: environmental assessment

fire management plan: a plan that identifies and integrates all wildland fire management and related activities in the context of approved land/resource management plans. Such a plan defines a program to manage wildland fires (wildfire and prescribed fire). It is supplemented by operational plans, including preparedness plans, preplanned dispatch plans, prescribed fire burn plans, and prevention plans. Fire management plans ensure that wildland fire management goals and components are coordinated.

forbs: Flowering plants (excluding grasses, sedges, and rushes) that do not have a woody stem and die back to the ground at the end of the growing season

goal: A goal is a descriptive, open-ended, and often broad statement of desired future condition(s) that conveys a purpose but does not define measurable units (602 FW 1, Exhibit 1).

GPS: global positioning system

Grand Teton: Grand Teton National Park

GYA: Greater Yellowstone Area

GYE: Greater Yellowstone Ecosystem

LDME: long distance migratory elk

NPS: National Park Service

NTU: nephelometric turbidity unit; An NTU is unit used to measure how clear a liquid is, or how much light scatters off suspended particles in a liquid.

NWR: National Wildlife Refuge

NWRS: National Wildlife Refuge System

objective: an objective is a concise statement of what we want to achieve, how much we want to achieve, and when and where we want to achieve it. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Objectives are specific, measurable, achievable, results-oriented, and time-fixed (SMART) descriptions about how we will accomplish conservation (602 FW 1, Exhibit 1).

phenology: the study of the timing of recurring biological events, the causes of their timing regarding biotic and abiotic forces, and the interrelation among phases of the same or different species (Leith 1974).

prescribed fire: Any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific objectives.

NWRS: National Wildlife Refuge System

riparian area: long strips of vegetation adjacent to streams, rivers, lakes, reservoirs, and other inland aquatic systems that affect or are affected by the presence of water. This vegetation contributes to unique ecosystems that perform a large variety of ecological functions.

SDME: short distance migrant elk

SDM: structured decision making

seroprevalence: the percentage of animals that test positive for having been exposed to the disease via a blood sample, but do not necessarily harbor an active infection.

Service: U.S. Fish and Wildlife Service

SIR: Scientific Investigations Report

strategy: a strategy is a specific action, tool, technique, or combination of actions, tools, and techniques used to meet objectives (602 FW 1, Exhibit 1).

TCD: Teton Conservation District

USDA: U.S. Department of Agriculture

DOI: U.S. Department of the Interior

USFS: U.S. Forest Service

USGS: U.S. Geological Survey

visitor experience: everything that happens to visitors while visiting the refuge, including what visitors do, learn, feel, and perceive.

visitor use: information on visitor activity during the refuge visit, including how many people visit the refuge, their travel origin, when they arrive, and how long they stay.

WDEQ: Wyoming Department of Environmental Quality

WYDOT: Wyoming Department of Transportation

WGFD: Wyoming Game and Fish Department

WLSB: Wyoming Livestock Board

Yellowstone: Yellowstone National Park

Chapter 1: Introduction

1.1. Background

Mission, Purposes, and Other Guiding Laws

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Federal laws and executive orders, U.S. Fish and Wildlife Service (Service) policy and international treaties. Relevant guidance includes, but is not limited to, the National Wildlife Refuge Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act, 16 United States Code [U.S.C.] 668dd et seq.), the Refuge Recreation Act of 1962, selected portions of the Code of Federal Regulations and the Service manual.

The mission of the NWRS, as outlined by the Improvement Act, is:

"... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The Improvement Act directs the Secretary of the Department of the Interior (DOI) to ensure that refuges are fulfilling the intended mission of the refuge system and the purposes of individual refuges (16 U.S.C. 668dd(5)(a)(3) (A–M)).

The National Elk Refuge (Refuge) was established by various Acts of Congress, executive orders, and other establishing legislation to provide, preserve, restore, and manage lands for wintering elk, other big game animals, birds, and the general conservation of fish and wildlife:

- The Refuge was established in 1912 as a "winter game (elk) reserve" (37 Statute [Stat.] 293, 16 U.S.C. 673).
- In 1913, the U.S. Congress designated the area "a winter elk refuge" (37 Stat. 847).
- In 1921, all lands included in the Refuge or that might be added in the future were reserved and set apart as "refuges and breeding grounds for birds" (Executive Order 3596), which was affirmed in 1922 (Executive Order 3741).
- In 1927, the Refuge was expanded to provide "for the grazing of, and as a refuge for, American elk and other big game animals" (44 Stat. 1246, 16 U.S.C. 673a).

Over the years, several parcels have been added to the Refuge specifically for the conservation of fish and wildlife (Fish and Wildlife Act of 1956), opportunities for recreational development oriented to fish and wildlife, the protection of natural resources, and the conservation of threatened or endangered species (Refuge Recreation Act of 1962, 16 U.S.C. 460k–l).

Location of the Refuge and Role in the Landscape

The 24,778-acre Refuge is nestled in the valley known as Jackson Hole in northwestern Wyoming and lies right at the edge of the town of Jackson, Wyoming. The Refuge represents one of the last undeveloped low-elevation areas in Jackson Hole. The Refuge is 6 miles at its widest point and 10 miles from southwest to northeast; elevations range from 6,200 to 7,200 feet.

The northern half of the Refuge consists of steep rolling hills. The southern half is glacial outwash material, with one resistant formation (Miller Butte) rising approximately 500 feet above the valley floor. The town of Jackson borders the Refuge on the south, and the town of Kelly lies near its northern boundary. Lands to the south and west are mostly privately owned. Lands east of the Refuge are administered as part of the Bridger-Teton National Forest (Bridger-Teton), administered by the U.S. Forest Service (USFS), including the nearby Gros Ventre Wilderness. Grand Teton National Park (Grand Teton), administered by the National Park Service (NPS), borders the Refuge on the north and northwest.

Jackson Hole is characterized by long, cold winters with deep snow accumulations, and short, cool summers. January is the coldest month with an average daily maximum temperature of 24 degrees Fahrenheit (°F) and an average minimum temperature of 1°F at low elevations. Temperature extremes vary from summer highs of 92°F to 98°F to winter lows of −40°F to −63°F. Precipitation levels are relatively steady throughout the year, with a total average annual accumulation of 15.2 inches in Jackson Hole. Average monthly precipitation levels range between 1 and 2 inches, with May and December being wettest, and July and February driest. Jackson Hole averages 90 inches of snowfall per year, accounting for 60% of annual precipitation. Snowfall varies considerably throughout the area of the Jackson elk herd. On the Refuge, average peak winter snowpack ranges from 6 to 18 inches at the southern end up to 48 inches at the northern end.

The Refuge lies centrally in the Greater Yellowstone Ecosystem (GYE), a mosaic of Federal, State, and private lands totaling 18 million acres that encompass the largest concentration of wild ungulates (hoofed mammals) and large carnivores in the lower 48 States. The Jackson bison and elk herds make up one of the largest concentrations of free-ranging ungulates in North America. Currently, these herds number about 538 bison and 9,870 elk based on 2025 winter counts. The herds migrate across several jurisdictional boundaries, including Grand Teton, southern Yellowstone National Park (Yellowstone), Bridger-Teton, Bureau of Land Management (BLM) resource areas, and State and private lands, before they winter primarily on the Refuge.

The Refuge is the terminus of seasonal migrations for four celebrated large mammal species. Part of the Jackson bighorn sheep herd spends the winter on the Refuge on Miller Butte and around Curtis Canyon and migrates to the summer range in the Gros Ventre Mountains. Portions of the Jackson elk herd migrate from their summer range in Yellowstone and other areas to winter on the Refuge. The Refuge hosts the Jackson bison herd during the winter months, one of the few remaining free-roaming wild bison herds in North America. Pronghorn summer on the Refuge and winter south of Pinedale, Wyoming, making one of the longest mammal migrations in the Western Hemisphere.

For more information on the background, history, environment and management of the Refuge, please see the Refuge's Comprehensive Conservation Plan (CCP).

History of Bison and Elk Management on the Refuge

Winter feeding of elk in Jackson Hole began in 1910 and was originally initiated to reduce winter mortality of elk and minimize depredation of livestock hay and forage. According to

historical reports, before Euro-American settlement some Jackson elk wintered in the southern portion of Jackson Hole (present location of the Refuge and town of Jackson) and may have used areas outside Jackson Hole, including the Green River and Wind River basins to the south and east, respectively, and the Snake River basin to the southwest in what is now eastern Idaho (Barnes 1912, Sheldon 1927, Allred 1950, C. Anderson 1958, Blair 1987). Radio-collar studies have documented small numbers of Jackson elk wintering in each of these areas in recent times as well (Refuge and Grand Teton unpublished data). Over time, changes in land use and development, over hunting, and establishment of feeding grounds probably reduced the Jackson elk herd's range.

By the end of the 19th century, the Jackson elk herd was believed to be largely confined to Jackson Hole and the immediate surrounding area, where wintering conditions are often harsh. Significant numbers of elk died during several severe winters in the late 1800s and early 1900s. The primary reasons for these mortality events included the loss of available winter range in Jackson Hole due to new ranching operations and an expansion of the town of Jackson. The expansion prompted local citizens and organizations, as well as State and Federal officials in Jackson Hole, to begin feeding elk in the winter of 1910–1911. Congress heeded the appeals for assistance, and on August 10, 1912, appropriated $45,000 for the purchase of lands and maintenance of a "winter game (elk) reserve" (37 Stat. 293). The first winter census in the area was conducted in 1912 and showed about 20,000 elk residing in Jackson Hole and the Hoback River drainage (the latter is not within the Jackson elk herd's range). The Refuge's supplemental feeding program is a direct result of this history.

Today, the Jackson elk herd experiences reduced access to significant parts of their native winter range, loss of historic migration patterns, and behavioral conditioning of elk to winter feeding which has shaped the distribution of elk on the landscape. For example, the Jackson elk herd now consists of long-distance and short-distance migrant elk. Long-distance migrant elk (LDME) migrate further throughout the GYE, are a food source for predators, desired by recreational hunters, and a critical ecological component of the GYE, all of which provide benefit to local and state economies through hunting and wildlife viewing. Short-distance migrant elk (SDME) typically spend the winter on the Refuge and spend the summer in the Snake River corridor between the towns of Wilson and Moose, WY. Based on their distribution and migratory patterns, SDME are more likely than LDME to cause conflicts on private land, and more likely to commingle and spread disease with livestock. SDME do not provide substantial hunting opportunity and compete with LDME for winter range resources. See Figure 3 for the migration routes of the SDME and LDME.

Bison are native to Jackson Hole, as evidenced by the prehistoric bison remains throughout the valley but were hunted to near-extinction outside Yellowstone by the mid-1880s. In 1948, 20 bison from Yellowstone were reintroduced to the 1,500-acre Jackson Hole Wildlife Park near Moran, Wyoming. A population of 15–30 bison was maintained in a large enclosure there until 1963, when brucellosis was discovered in the herd, likely transferred with the original 20 animals from Yellowstone. At that time, all the adult animals were destroyed, but four yearlings and five calves were vaccinated and retained. In 1964, twelve certified brucellosis free bison from

Theodore Roosevelt National Park were added to the herd. In 1968, the small herd escaped the confines of the Jackson Hole Wildlife Park, and a year later, the decision was made to allow them to range freely. The expansion of Grand Teton in 1950 encompassed the Jackson Hole Wildlife Park and allowed the bison to range freely consistent with NPS wildlife management policy. The herd remained small and wintered mostly in the Snake River bottoms in Grand Teton until 1975, when it followed the winter environmental gradient to the Refuge and began wintering there. The use of standing forage by bison on the Refuge was viewed as natural behavior and acceptable to managers. In 1980, bison discovered and utilized supplemental feed provided to elk in winter. They have continued to do so ever since, resulting in rapid population growth.

The Jackson bison herd was identified in the 2017 International Union for Conservation of Nature Red List Assessment as one of only two American plains bison herds fully functioning as wild in the lower 48 United States, along with a third herd identified in Canada. Key criteria for the Assessment included "range area and resources can sustain and minimum viable population or larger population without supplementation." (Aune, Jorgensen and Gates 2017).

Planning History

The original BEMP (2007 BEMP) was finalized in April 2007 after a 9-year public process (June 6, 2007, 72 Federal Register [FR] 31339) that included representatives from the NPS, USFS, the Animal and Plant Health Inspection Service (APHIS), the BLM, and the Wyoming Game and Fish Department (WGFD). The 2007 BEMP provided desired future conditions, management goals, objectives, and strategies for managing the Jackson bison and elk herds on the Refuge and Grand Teton over a 15-year timeframe. The purpose of the 2007 BEMP was to "provide managers with goals, objectives, and strategies for managing bison and elk on the Refuge and in Grand Teton for the next 15 years". The plan will contribute to the "mission and management policies of the U.S. Fish and Wildlife Service and the NP Service" (U.S. Fish and Wildlife Service 2007, v). One of the main goals of the 2007 BEMP was to "contribute to elk and bison populations that are healthy and able to adapt to changing conditions in the environment and that are at reduced risk from the adverse effect of non-endemic disease" (U.S. Fish and Wildlife Service 2007, 127). Two main objectives in meeting this goal were to reduce the bison population to 500 and the elk population wintering on the Refuge to 5,000, in part to reduce the risk to these populations from disease. Except for reducing the bison herd objective to 500 animals, we have not been successful at meeting these goals or objectives since finalization of the 2007 BEMP.

In December 2019, the Service finalized the "Bison and Elk Management Step-down Plan" (Step-down Plan) to provide further guidance to adaptively manage bison and elk herds to try and meet the goals and objectives outlined in the 2007 BEMP. Specifically, the Step-down Plan had the objective of reducing the numbers of elk wintering on the Refuge to 5,000. The Step-down Plan attempted to do this by reducing reliance on supplemental feeding through reducing feed season length. However, since beginning implementation in 2019 of reducing feed season length, the number of elk wintering on the Refuge or relying on supplemental feeding has not decreased.

The first case of Chronic Wasting Disease (CWD) in the Jackson elk herd was confirmed in 2020, the first occurrence since adoption of the 2007 BEMP. While the presence of CWD in the herd is currently less than 1%, the best available science suggests that CWD will have significant negative effects on the Jackson elk herd over time, and that supplemental feeding will exacerbate these effects (USGS Scientific Investigations Report, Appendix C). The original BEMP and Step-down Plan were set to expire on December 31, 2024. Given conditions have changed over the past 20 years since the original BEMP was finalized the Service determined an update of the BEMP was necessary and extended implementation of the Step-down Plan until December 31, 2025, to allow sufficient time to finalize the new BEMP.

The Structured Decision-Making (SDM) Process

In 2022, the U.S. Geological Survey (USGS) began facilitating an SDM process with the Service that was intended to develop and evaluate initial alternative plans for providing supplemental food to bison and elk. That process led to important insights into management actions that may be available as well as the metrics useful to evaluate them; and led to the formation of three distinct science teams that included members from the Service, WGFD, USFS, and NPS. These science teams used the guidance provided by the SDM process to assess how alternative plans for providing supplemental food, given likely invasion of CWD, would influence: elk and bison numbers; disease prevalence; redistribution of elk (to private property, browsing sensitive vegetation); harvest through hunting; and other economic effects. The SDM process modeled the outcomes of five different management strategies:(1) continued feeding of elk and bison; (2) stop feeding when 3% CWD prevalence was detected in the herd; (3) reduce feeding ration to 5,000 elk a year for 5 years and then stop feeding; (4) increase harvest of elk to reduce the population; and (5) stop feeding immediately.

USGS scientists, in close collaboration with members of the science teams, developed and used a combination of models and expert panels to assess how those management alternatives may affect Service objectives. This work was supported by many years of previous research by USGS, its partners, and collaborators. The resulting report provides much of the best available science related to the environmental consequences of various bison and elk management strategies and is cited throughout this draft EIS. The full report, "Scientific Investigations Report 2024–5119: Decision Analysis in Support of the National Elk Refuge Bison and Elk Management Plan" (USGS SIR) is in Appendices B–F:

- **Appendix B:** Chapter A: Decision Framing Overview and Performance of Management Alternatives for Bison and Elk Feedground Management at the National Elk Refuge in Jackson, Wyoming
- **Appendix C:** Chapter B: Predictions of Elk and Chronic Wasting Disease Dynamics in the National Elk Refuge in Jackson, Wyoming, and Surrounding Areas
- **Appendix D:** Chapter C: Evaluating Elk Distribution and Conflict Under Proposed Management Alternatives at the National Elk Refuge in Jackson, Wyoming
- **Appendix E:** Chapter D: Bison Population Dynamics, Harvest, and Human Conflict Potential Under Feedground Management Alternatives at the National Elk Refuge in Jackson, Wyoming

- **Appendix F:** Chapter E: Estimating the Social and Economic Consequences of Proposed Management Alternatives at the National Elk Refuge in Jackson, Wyoming

The SDM process and report provided a foundation for the management alternatives developed in this EIS; however, the alternatives outlined in this EIS have been modified from these five initial SDM alternatives based on potential outcomes analyzed in the USGS SIR, feedback from stakeholders, and coordination with WGFD, USFS, and the NPS (cooperating agencies) to alternatives that better meet the Service's purposes and need and address the concerns of the public and cooperating agencies. Therefore, to further support the development of this EIS, the Service requested the USGS provide some additional supplementary analysis of management strategies not addressed in the original USGS SIR, particularly analysis of different management scenarios that could unfold under Alternative D. This supplemental analysis (Chapter F: Predictions of Elk, Chronic Wasting Disease Dynamics, and Socioeconomics Under Alternative D at the National Elk Refuge in Jackson, Wyoming, and Surrounding Areas) is in **Appendix G** and is cited throughout the draft EIS. Alternative D, like the other alternatives outlined in this EIS, has been modified since USGS conducted the supplemental analysis; however, this analysis remains useful in understanding the potential impacts of different adaptive strategies that may be implemented under Alternative D.

Current BEMP and EIS Planning Process

On August 1, 2023, the Service published a Notice of Intent to prepare an updated BEMP and EIS, beginning a formal scoping period where the Service held three public meetings: one virtual meeting, one meeting in Jackson, Wyoming, and one meeting in Pinedale, Wyoming. During the scoping period, the Service received 18 written submissions regarding the BEMP. Many commenters expressed concerns about wildlife disease such as CWD. Some commenters recommended phasing out supplemental feeding, while others recommended continuing feeding. Commenters also expressed concerns about the impact of bison and elk management on other wildlife and habitat of the Refuge. The scoping report can be found in Appendix H.

In April and May of 2024, the Service contracted the Langdon Group—a consultancy firm who specializes in public involvement, facilitation, mediation, and conflict management—to conduct interviews with a wide diversity of stakeholders in the Jackson community, including private landowners, guides and outfitters, local government officials, and non-profit organizations. The Langdon Group was also contracted to facilitate two workshops held in Jackson, Wyoming, with those stakeholders to gain a better understanding of their concerns, ensure the Service developed the best alternatives to bring forward into the EIS, and that the BEMP and EIS responded to and analyzed the issues the public is concerned about. On October 30, 2024, the Service an in-person "leaders meeting" in Jackson, WY with leaders of key agencies associated with managing elk, bison and habitat near and surrounding the Refuge, facilitated by the Langdon Group. The purpose of this meeting was to share data from the SDM process and the stakeholder interviews and workshops, as well as review and discuss the most recent revisions to the proposed alternatives for the draft EIS. The reports on the "leaders meeting" and the stakeholder interviews and workshops can be found in Appendix I.

The development of the proposed action, the range of alternatives, and the analysis of environmental consequences presented below have been directly informed, refined, and expanded based on insights gained through the SDM process, as well as feedback received from public comments, stakeholder interviews and workshops, and the leaders meeting.

1.2. Proposed Action

The Service is proposing to update the 2007 BEMP for managing bison and elk herds on the Refuge. As part of this updated plan, the Service has identified several management alternatives for stewarding the Jackson bison and elk herds, including "Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed", which the Service has identified as the proposed action, for detailed analysis in this Draft EIS.

Under NEPA, a proposed action is the initial management approach or alternative put forward by the agency for environmental review. The proposed action serves as a starting point for analysis and public engagement, but it is not a final decision. During the NEPA process, the proposed action may be refined, modified, or replaced as the agency develops and analyzes a range of reasonable alternatives, receives feedback from the public, Tribes, and other agencies, and incorporates new information.

A preferred alternative is the alternative that the agency believes best fulfills the purpose and need for action, considering the environmental analysis and public input. The preferred alternative may be the same as the proposed action, a modified version of it, or a different alternative altogether. The preferred alternative is typically identified in the Final EIS, after the public comment period and further evaluation.

Therefore, the final action selected for implementation may differ from the proposed action identified in this Draft EIS. No decision to implement any alternative will be made until the NEPA process is complete, all substantive comments have been considered, and a Record of Decision is issued at the conclusion of the environmental review process.

1.3. Purpose and Need for Action

The purpose of the BEMP is to provide the Service with long term management objectives and strategies for ensuring healthy and sustainable populations of bison and elk on the Refuge in compliance with the purposes of the Refuge, the mission of the NWRS, the goals of the CCP, and other applicable laws and policies, and that meet the following needs for bison and elk management on the Refuge:

- Attain sustainable populations of fish, wildlife and plants, and associated habitat on the Refuge
- Maintain the genetic diversity of the bison and elk herds
- Maintain ecosystem fluctuations and processes associated with bison and elk in the GYE
- Manage populations of bison and elk to reduce long term effects of disease, such as CWD, brucellosis, bovine tuberculosis, *Mycoplasmopsis bovis*, septicemic pasteurellosis, scabies, and other diseases as they may arise

- Reduce the risk of invasive species introduction associated with bison and elk management activities on the Refuge and surrounding land and allow the implementation of controls for minimizing current infestations
- Protect and restore the chemical, physical, and biological quality of water resources on the Refuge
- Maintain opportunities for wildlife-dependent recreation
- Minimize human-wildlife conflicts in the area
- Reduce long term cost of bison and elk management activities for the Service and other cooperating agencies
- Maintain, where possible, local economic benefits associated with bison and elk presence on the Refuge and surrounding lands
- Maintain opportunities for Tribes to engage in activities related to their buffalo culture

Additionally, the new plan is needed to address current and changing conditions that impact the management of the Jackson elk herd and bison herd on the Refuge now and in the future. Conditions have changed significantly over the past 20 years on the Refuge and in the GYE, in which these species reside, such as an increasing human population, higher visitation, and changing wildlife migration patterns. Additionally, the presence and threat of an increasing prevalence of CWD and other diseases in the Jackson elk Herd, along with emerging disease threats to the bison herd, require that the Service re-evaluate how it manages bison and elk on the Refuge. Finally, management of bison and elk on the Refuge greatly impacts habitat and other wildlife, the community of Jackson, Wyoming, and financial resources for the Service, other Federal and State agencies, adjacent landowners, and others. Therefore, this plan and this associated EIS will ensure the Service understands and transparently conveys the potential consequences of its management decisions as they affect the Refuge and the greater landscape.

Chapter 2: Involvement, Coordination and Consultation

2.1. Public Involvement

This draft EIS will be available for public review and comment for 45 days from August 28, 2026, to October 12, 2026. Members of the public will be notified of the availability of the draft documents through a press release, individual outreach to stakeholders, through the plan's website at https://www.fws.gov/NER-BEMP, and through the Environmental Protection Agency's weekly Notice of Availability of EISs in the Federal Register. The draft document will also be available at the Refuge Headquarters (675 East Broadway Avenue, Jackson, WY 83001), via email (nerbemp@fws.gov) and can be downloaded from the plan's website listed above. For access to the document in an alternative format, please contact Ella Wagener (ella_wagener@fws.gov; 703-283-2143). Comments may be submitted in writing via email (nerbemp@fws.gov) or by mail to Ella Wagener, Branch of Planning, 1 Federal Center, Building 52, Denver, CO 80225. Any comments, concerns, suggestions or other feedback will be incorporated into the final EIS if a substantive response is required.

Before including your address, phone number, email address or other personal identifying information in your comment, you should be aware that your entire comment, including your

personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

2.2. State and Other Federal Agency Coordination

For decades, the Service has been working closely with WGFD, NPS, and USFS on managing the Jackson bison and elk herds. These partnerships have been formalized since 1958 through the Jackson Hole Cooperative Elk Studies Group. Due to these ongoing partnerships, these agencies are "cooperating agencies" on this EIS. A "Cooperating Agency" in a NEPA process are those Federal, State, Tribal, or local agencies that either have jurisdiction or "special expertise with respect to any environmental issue" (40 Code of Federal Regulations [CFR] 1501.8). As cooperating agencies, these agencies have participated in the planning process by providing technical data, expertise, comment, and review, and generally contributed their subject matter expertise to the development of this EIS and plan. However, their status as a "cooperating agency" does not signify their support for any one of the alternatives outlined below. Each agency has independent decisions to be made related to their contribution to the conservation of the bison and elk management based on their unique roles and responsibilities.

Given the wide range of authorities and interests, the Service has used, and will continue to use, a cooperative approach to management planning involving all associated Federal agencies and the WGFD. For more information on the specific agency's roles and responsibilities for managing the bison and elk herds, please see the draft Bison and Elk Management Plan (Appendix A).

2.3. Tribal Consultation

On March 25, 2024, the Service reached out to twenty-five Tribes that claim historic use of the Jackson Hole area to inform them of our intent to prepare an updated BEMP and EIS for the Refuge and to consult on a Government-to-Government basis.

The Service met with the Eastern Shoshone Tribal Council to discuss the cultural bison hunt on the Refuge and the initiation of the BEMP planning process on February 20, 2024. Another meeting with the Eastern Shoshone and Northern Arapaho Inter-Tribal Business Council, to inform both Tribes of our interest in providing public meetings on the BEMP, was attended by the Service on October 9, 2024. The Council encouraged the Service to host the proposed meetings. The Service held public meetings on the Wind River Reservation on November 12, 2024 (Ethete, Wyoming) and November 13, 2024 (Fort Washakie, Wyoming) to provide information on the background, current issues, and various management alternatives the Service was considering with members of the Eastern Shoshone and Northern Arapahoe Tribes. We have continued to coordinate with Shoshone and Arapaho Fish and Game on this BEMP and bison and elk management more generally.

The Service met with the Shoshone-Bannock Tribal Business Council on February 29, 2024, and April 19, 2024, to discuss the cultural bison hunt and initiation of the BEMP planning process. The Service engaged in formal consultation with the Shoshone-Bannock Tribes on the BEMP on November 14, 2024 (Fort Hall, Idaho) and the Tribes submitted formal requests related to the

Refuge and the BEMP: (1) a section in the BEMP that recognizes the Refuge and surrounding areas as the traditional homelands of the Shoshone-Bannock; (2) objective numbers set for bison and elk in the BEMP draft alternatives be restructured to raise the objective number of bison to allow for higher number of Tribal harvest; and (3) ongoing formal Government-to-Government consultation through the process of finalizing the BEMP and EIS, (letter dated November 25, 2024 , Appendix J). Since these requests were made, a representative of the Shoshone-Bannock Tribes has become part of the interdisciplinary team drafting the BEMP and EIS to assist in drafting, reviewing, and ensuring accuracy of the BEMP and EIS related to the Shoshone-Bannock Tribes and their interests. The Tribes submitted formal comments on an early draft of the EIS provided to the Tribes and other Cooperating Agencies (letter dated December 9, 2025, Appendix J).

The Service is committed to ongoing coordination and consultation with Tribes throughout this planning process and in the future. The ongoing consultation and coordination between the Service and Tribes are in furtherance of Executive Order 13175 Consultation and Coordination with Indian Tribal Governments (November 6, 2000) and Joint Secretarial Order 3403 Fulfilling the Trust Responsibility to Indian Tribes (November 15, 2021).

Chapter 3: Alternatives

3.1. Decision Framework

The Regional Director of the Mountain-Prairie Region (Region 6) of the Service will issue a Record of Decision once this planning process is complete, that will select a final alternative for the Refuge based on the various alternatives and options analyzed in this EIS. The final alternative could be a combination of the various alternatives and options discussed below. The final BEMP will be updated based on this decision.

3.2. Alternatives

Alternative A — Keep Feeding (No Action)

Supplemental Feeding of Elk

Throughout the winter months, the Refuge continues to provide supplemental feed to both bison and elk at its four designated feedgrounds. The decision to initiate feeding is based on two main factors: the availability of natural forage and the potential for elk-related conflicts in the Cache Creek and Spring Gulch areas. These conflicts include elk mingling with livestock, consuming livestock forage (such as stored hay and standing forage), and encroaching into urban areas. Each year, the timing of feeding is coordinated with the Wyoming Game and Fish Department (WGFD) and considers factors such as elk population size, migration patterns, winter temperatures, snow depth, and the accessibility of standing forage. When possible, elk are fed on fresh snow and in clean areas throughout the season. Non-feeding years have been rare and irregular; since the Refuge was established in 1912, only 11 years have lacked supplemental feeding, with the most recent non-feeding year occurring in the winter of 2026.

Biologists assess several factors to determine whether feeding is necessary, as well as when to begin and end feeding. Supplemental winter feeding is initiated when available natural forage

declines to an average of 300 pounds per acre along transects in areas dominated by highly preferred grasses. This assessment accounts for both standing forage and the effects of snow and ice on forage accessibility. Once the 300 lbs./acre threshold is reached and feeding begins, the amount of natural forage is no longer considered when determining supplemental feeding rations. The standard elk feed ration is 8 pounds per animal per day, but this may be increased to as much as 12 pounds per animal during severe winter conditions. Historically, rations above 8 pounds per animal have been provided approximately 25% of the time, coinciding with what are considered severe winters. When feeding begins, the Service starts with a reduced ration and gradually increases it to 8 pounds per animal over about one week to acclimate elk to a richer diet of alfalfa feed pellets. After this acclimation period, daily rations are adjusted based on the number of elk present on the Refuge. For example, if 6,000 elk are present, the Service provides about 48,000 pounds of feed per day (8 pounds per elk). Elk are counted daily throughout the feeding period, and rations are adjusted as needed to match population numbers. Between 1995 and 2026, excluding the non-feeding years of 2018 and 2026, the Service provided supplemental feed to an average of 7,050 elk each winter.

Over the past 20 years, the date feeding begins has ranged from December 30 to March 4, except for 2018 and 2026, when no feeding occurred. The end date for feeding is determined using a snow cover index and a subjective evaluation of available forage and forage greenness. On average, feeding concludes on April 2, with termination dates ranging from March 24 to April 20. Since 1912, the length of the supplemental feeding season has varied from no feeding at all to a maximum of 147 days. From 1995 to 2024 (excluding 2018), the average season length has been 62 days.

The primary objectives of initiating supplemental feeding are: (1) minimizing elk winter mortality, and (2) reducing the commingling of elk with cattle on adjacent private lands. Historic radio telemetry data and observations of elk movements show that when available forage drops below 300 pounds per acre, some elk leave the Refuge and move onto surrounding private lands.

Under Alternative A, the feeding strategies to reduce elk reliance on supplemental outlined in the 2019 step-down plan will not be implemented for the reasons discussed in Section 3.5 "Alternatives Dismissed from Further Analysis."

Supplemental Feeding of Bison

Bison discovered Refuge feeding operations in 1980 and have since been fed each year (other than 1981 and 2018 when no feeding occurred) to minimize disruption to elk feeding operations. Because bison displace elk from feedlines, Refuge staff attempt to feed most bison first in the northernmost Refuge feedground (McBride Feedground) and provide a heavy feed ration (typically 20 lbs. per bison per day) which helps keep them in this area. This strategy prevents bison from mingling with elk while feed is being distributed and prevents bison from moving to areas where conflicts with humans are more likely.

Alternative B — 7 Year Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed with 3% CWD Elk Threshold (7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold)

Under this alternative, the Service would employ several strategies to reduce the number of overwintering elk to 5,000 individuals over a period of seven years. All feeding would then cease after the 7-year period. The Service believes 5,000 elk and 500 bison is the approximate number that the Refuge could sustainably winter on natural forage and support through the Refuge's irrigation program during an average year (some years, depending on weather and forage conditions, the Refuge may support more or less than 5,000 elk and 500 bison) (Hobbs, et al. 2003).

Importantly, if chronic wasting disease (CWD) prevalence reaches 3% in the Jackson elk herd before the seven-year period ends, the Service will immediately stop all supplemental feeding to avoid exacerbating the spread of the disease.

More details about this alternative are outlined below.

Adaptive Management to Reduce Overwintering Elk on the Refuge
The Service will work together with NPS, USFS, and WGFD (cooperating agencies) on several strategies to reduce elk reliance on supplemental feeding, including:

- Increase harvest opportunities
- Modify hunting seasons
- Adjust the timing of feeding (start and end dates)
- Redistribute elk across the surrounding landscape

These actions will be implemented in coordination with the Wyoming Game and Fish Commission (WGFC) and aligned with the population objectives for the Jackson elk herd.

There will be a particular focus on reducing the numbers of SDME in the Jackson elk herd and potentially elk that summer in other areas within Grand Teton. Reducing elk from these areas would facilitate elk population reductions on the Refuge, reduce the need for supplemental feeding, reduce competition for winter habitat with LDME, and reduce elk conflict on private lands. To support these efforts, the Service, NPS, and WGFD are already engaged in an elk collaring project to better understand SDME behavior and movement patterns. The Service will continue to pursue additional monitoring as necessary, and as staff and capacity allow. This information will help guide targeted management actions.

The Service and the WGFD will prioritize hunter-harvest strategies consistent with the Wyoming Feedground Management Plan. This may include changes to hunting opportunities on the Refuge, such as adjusting season length, timing, or areas open to hunting, to better target SDME elk. If hunter harvest alone is not sufficient, the Service will coordinate with WGFD to explore additional strategies, such as management hunts, cooperative harvest agreements with Tribes and other community partners, or other innovative methods.

While not part of the proposed action in this EIS because they are outside the jurisdiction of the Service, WGFD could coordinate with the USFS and NPS to extend or adjust hunting seasons or units within Bridger-Teton and Grand Teton to further target SDME and potentially LDME that summer in Grand Teton National Park. Refuge elk hunting seasons could also be adjusted to

facilitate redistribution of the elk off the Refuge during winter to the north and east of the Refuge.

The current Jackson Elk Herd population objective of 11,000, set by WGFC, may need to be reduced, in concert with implementation of the above strategies, to achieve the goal of 5,000 elk wintering on NER. However, this herd unit population objective is also outside the jurisdiction of the Service.

Objectives of these strategies are to lower the overall population wintering on the Refuge to more sustainable levels, reduce winter starvation by lowering the population through increased harvest, alleviate elk conflict on private lands, and help maintain higher numbers of the LDME that are an important part of the GYE and important for wildlife-dependent recreation, such as hunting, guiding, and wildlife observation.

3% Elk CWD Threshold for Cessation of Supplemental Feeding of Elk
CWD poses a serious threat to the Jackson elk herd. If CWD prevalence reaches 3% (based on samples from harvested elk and reported in WGFD's annual CWD Surveillance Report), the Service will immediately end supplemental feeding, even if the seven-year transition period is not complete. Scientific modeling (USGS SIR, Appendix C) indicates that once CWD prevalence exceeds 3%, the disease is likely to cause greater long-term mortality than the short-term increase in winter starvation that may result from ending feeding. Research also shows that CWD prevalence can rise rapidly—from 3% to 7% within months to a few years—and that a 7% prevalence rate is associated with long-term population declines (Galloway, et al. 2021). Ending feeding at the 3% threshold gives the Service a critical opportunity to slow the spread of CWD and protect the long-term health of the herd.

Supplemental Feeding of Bison to Minimize Human-Bison Conflict
While elk feeding continues, the Refuge will also continue its traditional bison feeding practices. Most bison will be fed first at the McBride Feedground, receiving a heavy ration of approximately 20 pounds per bison per day to prevent them from displacing elk from feed lines. Once elk feeding ends, the Service will continue to feed bison as needed to minimize human-bison conflict and help maintain the WGFD herd objective of approximately 500 bison

The Service anticipates that some bison will remain on the Refuge during winter regardless of feeding. However, without supplemental feed, others may move onto adjacent private lands, where they could damage property, commingle with livestock, and pose risks to public safety Such conflicts could lead to bison being removed from the population (i.e. euthanized), potentially reducing herd numbers over time.

To prevent this, the Service will closely monitor bison movements. If bison begin moving toward private lands—such as crossing Nowlin Road or entering the Nowlin Feedground—they will be hazed back to the McBride Feedground and feeding will begin immediately. Similar actions could be taken if bison move north, east, or west off the Refuge.

The duration of bison feeding will depend on current disease conditions affecting bison (e.g., *Mycoplasmopsis bovis*), cattle, or other wildlife. Feeding will stop when conditions no longer warrant it.

The Service will continue post-mortem disease monitoring of bison through hunter harvest and non-hunting mortality events and will collaborate with land management agencies and conservation partners to conduct additional disease surveillance as needed.

Habitat Restoration
Habitat restoration will continue on the western portion of Nowlin Creek, and the Service would initiate restoration of riparian areas on the remainder of Nowlin, Flat, Sheep and Twin Creeks as logistics and resources allow. Fencing may be utilized to prevent future degradation of stream banks and riparian areas due to continued winter grazing pressure from elk and bison. Additionally, the Service will initiate habitat restoration of former prairie/shrub dominated feedgrounds if deemed possible within the context of continued winter elk grazing pressure. Exclosures or other techniques may be utilized to create localized patches of habitat that benefit other wildlife species. Irrigation will continue to support forage production and grassland habitat for birds and other wildlife.

The main long-term objectives of this alternative would be to: (1) reduce the portion of the Jackson elk herd wintering on the Refuge to approximately 5,000 animals by year seven; (2) restore sustainable populations of fish, wildlife and plants, and associated habitat on the Refuge over the next 20 years; (3) reduce long term costs of managing bison and elk; (5) maintain a minimum of 500 bison in the Jackson bison herd.

Alternative C — 5 Year Supplemental Feeding for 5,000 Elk Before End of Supplemental Feeding Program (5 Year Supplemental Feeding for 5,000 Elk)

Cessation of Supplemental Feeding of Elk
The Refuge will provide a ration sufficient to support 5,000 elk (approximately 40,000 lbs. feed/day) during winter months for the next 5 years to reduce population size prior to stopping supplemental feeding completely at year six. While existing forage should support approximately 5,000 elk during an average year, supplemental feed ensures there are enough rations to support this target number of elk. Elk will only be fed a sufficient ration to support 5,000 elk even if more than 5,000 elk occupy the Refuge. The Service anticipates that the reduced ration will be sufficient to prevent elk from leaving the Refuge, but in most winters, this will likely result in above average winter elk mortality compared to current conditions. After 5 years, the Service will stop supplemental feeding of elk.

Cessation of Supplemental Feeding of Bison
During this five-year period, the Refuge will continue to feed bison as it traditionally has by feeding most bison first in the McBride Feedground and providing a heavy feed ration (typically 20 lbs. per bison per day) to prevent interference with elk feeding. After 5 years, the Service will stop supplemental feeding of bison.

Habitat Restoration
Like Alternative B, habitat restoration will continue the western portion of Nowlin Creek, and the Service would initiate restoration of riparian areas on the remainder of Nowlin, Flat, Sheep and Twin Creeks as logistics and resources allow. Fencing may be utilized to prevent future degradation of stream banks and riparian areas due to continued winter grazing pressure from elk and bison. Additionally, the Service will initiate habitat restoration of former prairie/shrub dominated feedgrounds if deemed possible within the context of continued winter elk grazing pressure. Exclosures or other techniques may be utilized to create localized patches of habitat that benefit other wildlife species. Irrigation will continue to support forage production and grassland habitat for birds and other wildlife.

The main long-term objectives of this alternative would be to: (1) reduce the portion of the Jackson elk herd wintering on the Refuge to approximately 5,000 animals by year five; (2) restore sustainable populations of fish, wildlife and plants, and associated habitat on the Refuge over the next 20 years; and (3) reduce long term costs of managing bison and elk.

Alternative D —Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed (Proposed Action)

Under this alternative, the Service, in collaboration with cooperating agencies, would implement a range of strategies to reduce the number of elk overwintering on the Refuge to approximately 5,000 animals over a 10-year period. The Service will continue to use the best available science and consider new information or changing conditions to guide decisions about supplemental feeding in future years.

Each year (or more frequently if necessary), the Service will meet with cooperating agencies to evaluate progress toward reducing the overwintering elk population and to review data on chronic wasting disease (CWD) prevalence in the Jackson elk herd. These meetings will also assess other relevant factors (described below) to determine whether supplemental feeding remains appropriate. Based on these evaluations, the Service and its partners may adjust management strategies as needed.

More details about this alternative are provided below.

Adaptive Management Approach to Reduce the Overwintering Elk on the Refuge
Like Alternative B, to reduce elk reliance on supplemental feeding, the Service and cooperating agencies will work together to:

- Increase harvest opportunities
- Modify hunting seasons
- Adjust the timing of feeding (start and end dates); and/or
- Redistribute elk across the surrounding landscape

These actions will be implemented as the Wyoming Game and Fish Commission (WGFC) Jackson elk herd population objective allows.

As in Alternative B, efforts will focus on reducing the SDME and a portion of the Grand Teton LDME segments of the Jackson herd. Most harvest pressure will target SDME, with a lesser focus on Grand Teton elk, to help reach the goal of 5,000 elk wintering on the Refuge.

The Service and the WGFD will prioritize hunter-harvest strategies consistent with the Wyoming Feedground Management Plan. This may include changes to hunting opportunities on the Refuge, such as adjusting season length, timing, or areas open to hunting, to better target SDME elk.

If hunter harvest alone is not sufficient, the Service will coordinate with WGFD to explore additional strategies, such as management hunts, cooperative harvest agreements with Tribes and other community partners, or other innovative methods.

Although not part of the proposed action in this EIS due to jurisdictional limits, the Service supports coordination among WGFD, the USFS, and the NPS to extend or adjust hunting seasons or units in Bridger-Teton and Grand Teton. These efforts would help further reduce SDME and Grand Teton elk numbers and encourage redistribution of elk away from the Refuge during winter. The current Jackson Elk Herd population objective of 11,000, set by WGFC, may need to be reduced, in concert with implementation of the above strategies, to achieve the goal of 5,000 elk wintering on NER. This herd unit population objective is also outside the jurisdiction of the Service.

Because the success of this alternative is dependent on approval by the WGFC and the actions of our cooperating agencies outside the control and jurisdiction of the Service, this alternative will use adaptive management strategies to ensure we are meeting the BEMP's goals and objectives. As such, the Service and WGFD, and other cooperating agencies will continue to implement monitoring efforts (described further below) to assess the success of our cooperative efforts as related to overall population, herd segment sizes, and CWD prevalence trends in the Jackson elk herd and make additional management decisions based on the results of the monitoring. Ability to carry out these monitoring efforts will be dependent on the Service's and other cooperating agencies' staff capacity and funding.

Adaptive Management Approach to Supplemental Feeding of Elk

Unlike Alternative B, the Service will not have a specific CWD prevalence rate or year that it will stop supplemental feeding of elk. Instead, the Service will meet annually (or more frequently if changing conditions necessitate more frequent meetings) with cooperating agencies to evaluate:

- all available CWD prevalence rate data in the Jackson elk herd, and adjacent herd units, and other cervids.
- current best available science on CWD and its impacts on elk in current and future years, an assessment of CWD as a source of additive mortality within the herd if empirically feasible.
- data and best available science on other diseases (e.g. brucellosis, *Mycoplasmopsis bovis*) related to elk and bison health

- the population size, trend, and demographics (e.g., survival, calf ratios) of the Jackson elk herd relative to the WGFC objectives, including proportion of SDME and LDME within the herd, and summer classification data specific to the SDME and LDME segments if available.
- the number of elk still reliant on supplemental feeding on the Refuge.
- availability of overwintering range outside the Refuge
- potential elk damage to private property, disease transmission to livestock, and negative economic impacts to livestock producers in the area
- WGFD progress in implementing their Jackson Elk Feedground Management Action Plan and adherence to the WGFC Feedground Management Plan Sideboards
- Cooperating Agency progress in how respective management actions are meetings their respective goals and objectives
- Any new or emerging issues

The purpose of these meetings is to assess the effectiveness of cooperative management strategies and any adjustments or new management strategies needed to manage healthy populations of the Jackson bison and elk herds, as well as whether continued feeding in the Refuge is appropriate, given the status of the topics outlined above for evaluation. The findings will help guide Service in determining whether to end supplemental feeding by the next feeding season.

Supplemental Feeding of Bison

The Refuge will continue to feed bison as it traditionally has while the Refuge continues to feed elk by feeding bison first in the McBride Feedground and providing a heavy feed ration (typically 20 lbs. per bison per day) to prevent interference with elk feeding. As outlined in Alternative B, feeding of bison will continue if the feeding of elk stops as necessary to prevent human-wildlife conflict and maintain the WGFD population objective of (currently, approximately 500 bison).

Habitat Restoration

Like Alternative B, habitat restoration will continue the western portion of Nowlin Creek, and the Service would initiate restoration of riparian areas on the remainder of Nowlin, Flat, Sheep and Twin Creeks as logistics and resources allow. Fencing may be utilized to prevent future degradation of stream banks and riparian areas due to continued winter grazing pressure from elk and bison. Additionally, the Service will initiate habitat restoration of former prairie/shrub dominated feedgrounds if deemed possible within the context of continued winter elk grazing pressure. Exclosures or other techniques may be utilized to create localized patches of habitat that benefit other wildlife species. Irrigation will continue to support forage production and grassland habitat for birds and other wildlife.

Minimizing Negative Outcomes from Reduced Reliance on Supplemental Feed
As part of this adaptive management approach, the Service and cooperating agencies will further evaluate how these adaptive management strategies affect private lands and human-wildlife conflict in the landscape. Some strategies the Service could consider include: (1) changing

hunting seasons for both elk and bison in response to arising human-wildlife conflict or disease transmission concerns between wildlife and livestock and/or humans as authorized by WGFD; (2) constructing/improving fences to ensure wildlife are not migrating into the town of Jackson; or (3) if the Service stops supplemental feeding of elk, implementing emergency feeding operations on or off the Refuge when absolutely necessary in severe winters to reduce massive starvation events. Some of these strategies (if they constitute a major Federal action) will require further analysis and compliance with NEPA and other applicable laws before being implemented. The Service further supports cooperating agencies and other partners in the community in their work to develop strategies to reduce human-wildlife conflict, ensure human health and safety, and the continuation of sustainable Jackson bison and elk herds.

The main objectives of this alternative would be to: (1) reduce the portion of the Jackson elk herd wintering on the Refuge to approximately 5,000 individuals by year ten; (2) minimize elk starvation during winter by focusing on reducing the population on the Refuge through hunter-harvest, redistribution, and continued enhancement of natural forage through the irrigation program; (3) moderate the prevalence and spread of CWD in the Jackson elk herd by reducing the reliance of the Jackson elk herd on supplemental feed on the Refuge; (4) utilize adaptive strategies and leverage partnerships to minimize human-wildlife conflict and damage to private lands and the risk of disease transmission to livestock in the area; (5) provide supplemental feed to bison utilizing the Refuge to ensure WGFD population objective can be maintained in the Jackson bison herd (6) restore sustainable populations of fish, wildlife and plants, and associated degraded habitat on current elk feedgrounds on the Refuge over the next 20 years; (7) reduce the Service's long term costs of managing bison and elk; and (8) support WGFD's Jackson elk herd management plan.

The draft BEMP, provided in Appendix A, is built around Alternative D. This plan details how bison and elk would be managed on the Refuge under Alternative D and describes actions that are common to all action alternatives described further below. The BEMP will be updated based on the agency's final selected alternative after public review and comment.

Measures Common to All Action Alternatives

There are other aspects to bison and elk management that are ongoing that the Service would continue to implement under all alternatives. Brief descriptions of these efforts are listed below, with more details in the draft BEMP or the plans identified below.

- **Reducing Feed Season Length—**The feed season length will be reduced by ending feeding two weeks earlier than the annually calculated traditional end date. Ending feeding earlier in the spring reduces elk contact rates (W. M. Janousek, et al. 2021) and potentially reduces brucellosis transmission in elk (Cross, Cole, et al. 2010, Cotterill, Cross, et al. 2018). As demonstrated during implementation of the 2019 BEMP Step-down Plan, ending the feed season earlier does not result in higher elk mortality or increased elk movements to surrounding private land (Cole and Warren 2024).
- **Forage Production—**The Refuge will continue to irrigate approximately 4,500 acres of grassland on the south half of the Refuge as staff, capacity, and water availability allow,

consistent with usual irrigation operations on the Refuge (e.g., no loss of irrigation options).

- **Hazing—**Refuge staff will continue to work with WGFD staff to haze elk and/or bison when practical if they represent a disease threat to livestock; present human health and safety concerns; or to increase forage production in the Refuge.
- **National Elk Refuge CWD Response Strategy—**The Service will continue to implement the National Elk Refuge Response Strategy for the Presence of Chronic Wasting Disease in the Jackson Elk Herd (updated in 2026) that includes the following:
    - Continue to sample any elk that die on the Refuge due to hunting or natural causes for CWD. This effort results in high sample sizes that should allow the Service to detect changes in CWD prevalence over time. Elk hunters on the Refuge are required to participate in a CWD sampling program by submitting the animal's head at a designated collection barrel or allowing a biologist to gather samples in the field. Currently, CWD testing by the WGFD Wildlife Health Laboratory is free for animals harvested in Wyoming.
    - Euthanize and sample any elk that exhibits CWD symptoms.
    - Incinerate carcasses from elk that die on the Refuge to prevent the carcasses from contaminating the ground with CWD prions.

  Invasive Species Control—The Refuge will continue their partnership and funding agreement with Teton County Weed and Pest to treat invasive plant species in accordance with the Refuge's 2015 CCP and the Intra-Service Section 7 Biological Evaluation for Integrated Pest Management (2024).
- **Prescribed Fire—**The Refuge will continue to use prescribed fire, in accordance with the Fire Management Plan for the Refuge and Jackson National Fish Hatchery (as updated when necessary), and the Refuge's CCP, as a habitat management tool to mimic natural processes to maintain a naturally functioning ecosystem and increase resiliency of the landscape. When appropriate, prescribed fire will be used to reduce excessive litter layers and stimulate the production of natural forage that can be utilized by elk, bison and other ungulates and wildlife species.

3.3. Other Non-Service Actions Related to Bison and Elk Management

The Service recognizes that the conservation of bison and elk in the GYE reaches far beyond the Refuge's boundary and successful conservation of these herds requires coordination, communication, and collaboration with not only the other cooperating agencies, but also private landowners, guides and outfitters, Tribes, community members, and non-profit organizations. The Service plans to continue to strengthen these partnerships as we implement the BEMP. We want to acknowledge some of the main non-Service actions that are ongoing or plan to be explored further in the future for management of these bison and elk herds. Because the Service is not the lead on any of these actions, they are not covered by this EIS. Service involvement in any of these actions in the future would require further compliance with NEPA and other applicable laws.

- **Private Lands Partnerships—**There are many ways to reduce the effects of elk and bison on private lands, including targeted fencing, long term leases or "elk occupancy

agreements" (e.g., removing cattle from certain areas during the winter and spring when they may be particularly vulnerable to brucellosis transmission), conservation easements, or direct compensation to support certain actions. The Service and its partners will continue to explore these and other ways to partner with private landowners in management of bison and elk in the Jackson Hole landscape.

- **Restoration of Kelly Hayfields—**The NPS will continue its work to restore 4,500 acres of previously irrigated and cultivated grasslands in Grand Teton to improve wildlife forage and habitat.
- **Opportunities for Expanding Elk's Winter Range—**In partnership with the other cooperating agencies, local landowners, and other local government officials and partners, explore options outside of the Refuge boundaries for winter forage habitat for the elk.
- **Outreach and Education—**In partnership with the other cooperating agencies, non-governmental organizations and partners explore opportunities to increase information available to the public concerning bison and elk ecology and management, living with bison and elk and wildlife diseases.

3.4. Monitoring Common to All Alternatives

Under all alternatives, the Service, in partnership with other agencies, will continue to monitor the following (as staff capacity and funding allows) to understand current and future conditions of the bison and elk herds, as well as evaluate the effectiveness of any management actions taken:

- Proportion of the Jackson Elk Herd wintering on the Refuge
- Proportion of elk that winter on the Refuge and summer on the South Snake River and other summering segments of interest,
- Elk and bison winter distribution and use of private lands
- Number of wolf packs in the Jackson elk herd unit
- Estimated total wolf numbers in the Jackson elk herd unit
- Estimated number of wolves using the Refuge in winter
- Estimated total herbaceous forage biomass on the Refuge
- Elk and bison winter mortality on the Refuge
- Snow depth and cover
- Availability and accessibility of preferred forage, as historically used to guide decisions on initiating supplemental feeding (if applicable)
- Refuge feeding records and daily feeding ground estimates of elk and bison (if applicable)
- Summary of Refuge feeding (start date, end date, amount fed to elk and bison, elk and bison fed days, elk and bison feed rate)
- Gros Ventre Feedgrounds feed start date or understanding what influences elk movements from the Gros Ventre to the Refuge
- Elk harvest by Hunt Area
- Annual CWD prevalence and CWD prevalence trends for the Jackson elk herd

These monitoring efforts, including sources and methods of data collection, are further described and in alignment with the Refuge's Inventory and Monitoring Plan and the efforts of the Jackson Hole Cooperative Elk Studies Group. The Jackson Hole Cooperative Elk Studies Group was established in 1958 to coordinate research and monitoring of the Jackson elk herd by WGFD, NPS, USFS, and the Refuge. A technical team of biologists identifies key research needs and provides summary information to help guide management of the Jackson elk herd.

3.5. Alternatives Dismissed from Further Consideration

Emergency Feeding in Severe Winters

The Service thoroughly examined the potential of emergency winter feeding in response to stakeholder concerns about preventing major elk starvation events during severe winters. Even though the Service solicited stakeholders and the cooperating agencies for ideas at workshops and through follow-up emails, none of the proposed strategies adequately addressed the needs of this plan to mitigate the long-term effects of CWD and other diseases in the elk herd.

While implementing emergency feeding may seem like a viable short-term solution—potentially reducing immediate starvation risks and keeping elk from encroaching on private lands—it ultimately fosters an environment that further jeopardizes the health of the elk population. By encouraging elk to congregate in close quarters during their most vulnerable periods, this approach would heighten the risk of disease transmission. This strategy would lead to a decline in population viability, resulting in a smaller, less healthy Jackson elk herd over time. This option would also result in continued suppression and degradation of Refuge habitat by promoting elk numbers that exceed the carrying capacity of the landscape. Finally, this option is difficult to implement operationally, as we would have to retain a ready supply of feed (which degrades nutritionally over time), equipment, and trained staff to implement emergency feeding, resulting in increased costs to the Service.

Ultimately, as discussed in Alternative D, the Service remains open to future ideas for how to implement emergency feeding in severe winters that would meet our purpose and need for bison and elk management on the Refuge in a manner that would not further exacerbate the spread and prevalence of CWD in the Jackson elk herd. Any such alternative would require further analysis and compliance with NEPA and other applicable laws and policies before being implemented.

Slow Step-Wise Reduction in Rations

The Service explored the option of annual, stepwise reductions of feed rations under both Alternatives B and D. Under this strategy, the Service would reduce the number of elk the Service provides rations for by a certain amount each year. So, for example, the Service would only provide rations for 6,500 elk even if 7,000 elk were overwintering on the Refuge. The original goal of this strategy was to reduce the elk population and, therefore, the number of elk relying on supplemental feed, more slowly before the Refuge stops feeding. The desired outcome of this strategy would be to avoid a potential large-scale, severe winter die-off event that could occur if the Service stops feeding elk when the elk population/number of elk relying on supplemental feed is still high. However, after careful thought and analysis, the Service determined that this strategy is unlikely to be successful. The strategy would only work to lower

the elk population in severe winters, which only occur 25% of the time or one in every four winters. Therefore, this strategy would not be effective at slowly reducing the overwinter population on the Refuge or reducing large-scale, severe winter die-offs once the Refuge stops supplemental feeding. The Service has, therefore, proposed other strategies to reduce the population overwintering on the Refuge under Alternatives B and D and dismissed this strategy from further consideration.

Immediate Cessation of Feeding

Due to the trace levels of CWD detected in the Jackson elk herd currently, and the lack of time this alternative would provide cooperating agencies, the community of Jackson, and the Service to prepare to mitigate the effects of stopping feeding on the local economy, public safety, and local landowners, we have dismissed it from further consideration. An immediate cessation of feeding would cause many elk to disperse off the Refuge in the winter and create significant human-wildlife conflict that the local community has not had time to prepare for. This strategy could also result in an immediate large-scale starvation event for the Jackson elk herd, which the Service is hoping to mitigate through strategies proposed in the other alternatives. While it may reduce the spread and prevalence of CWD in herd, it would not meet the purpose and need for managing bison and elk on the Refuge because it would not minimize human-wildlife conflicts in the area.

Continued Implementation of the 2019 Bison and Elk Management Step-down Plan

After evaluating the results of implementing this 5-year Step-down Plan, we have determined that it was not successful at meeting our purpose and need for managing bison and elk on the Refuge. Although we reduced feed season length by 19%, the number of elk wintering on the Refuge remained unchanged during implementation of the Step-down Plan. Ultimately, the Step-down Plan failed to make any notable progress towards reducing elk numbers wintering on the Refuge to 5,000. For these reasons, the environmental consequences of this alternative would not be notably different than implementing "Alternative A — Keep Feeding (No Action Alternative)" and would require more staff time and resources to coordinate and determine feeding dates, so it has been dismissed from further consideration.

Increasing Supplemental Feeding

The Service did receive requests from the public to consider an alternative to increase supplemental feeding. However, this alternative would further increase the disease risk of the elk herd, as well as damage vegetation, habitat, and water resources of the Refuge, and increase long term costs of managing the elk herd on the Refuge, it does not meet the purpose and need and so it has been dismissed from further consideration.

Increasing Bison Population

The Service received a request from the Shoshone-Bannock tribe to consider a "bison tolerant alternative" that raises the population objective numbers of the Jackson bison herd to allow for a higher number of Tribal harvests. While we appreciate this request from the Tribe and have left open the potential for the Service to manage a bison population that is higher than today, the

State of Wyoming sets the overall Jackson bison herd population objective not the Service, and so setting the bison population objective is not part of the purpose and need of this plan. Therefore, we have dismissed this alternative from further consideration in this EIS. We will continue to have conversations with the Tribe and the State of Wyoming regarding the Tribe's request.

Chapter 4: Affected Environment and Environmental Consequences

The affected environment describes those portions of the natural and human environment that could be affected with the implementation of any of the management alternatives. This section is organized by affected resource categories. Each affected resource discusses both (1) the existing environmental or socioeconomic baseline in the action area, and (2) the reasonably foreseeable effects of the alternatives on each resource. The terminology "reasonably foreseeable effects" is used throughout and refers to effects that are sufficiently likely to occur and that encompass both the direct and indirect effects of the action as well as effects of the action when combined with other potential past, present, and future effects.

The following impact topics were dismissed from further consideration because either there would be no reasonably foreseeable effects, or effects would be negligible or not detectable: air quality, sound and noise, topography, geology, hydrology, and environmental shifts. The reasonably foreseeable effects of changing ecological conditions on the affected resources are discussed below where appropriate. The following terminology is used throughout this section and the EIS to help describe the reasonably foreseeable effects of the proposed action and the reasonable range of alternatives:

- Beneficial effect: those impacts to the human environment that provide desirable situations or outcomes.
- Adverse effect: those impacts to the human environment that provide an undesirable situation or outcome.
- Short-term effect: a known or potential effect of limited duration, relative to the proposed alternative and the resource impacted. For the purposes of this analysis, these impacts may last anywhere from 1-10 years.
- Long-term effect: a known or potential effect of extended duration, relative to the proposed alternative and the resource impacted. For the purposes of this analysis, these improvements or disruptions to a given resource would last approximately 10 years or longer.

Effects that are speculative (i.e., there is a remote possibility that the impact would occur, but no meaningful information exists on which to base a prediction) or indefinite will not be included.

The following map (Figure 1) shows the area the Service has analyzed for reasonably foreseeable effects from implementation of an updated BEMP.

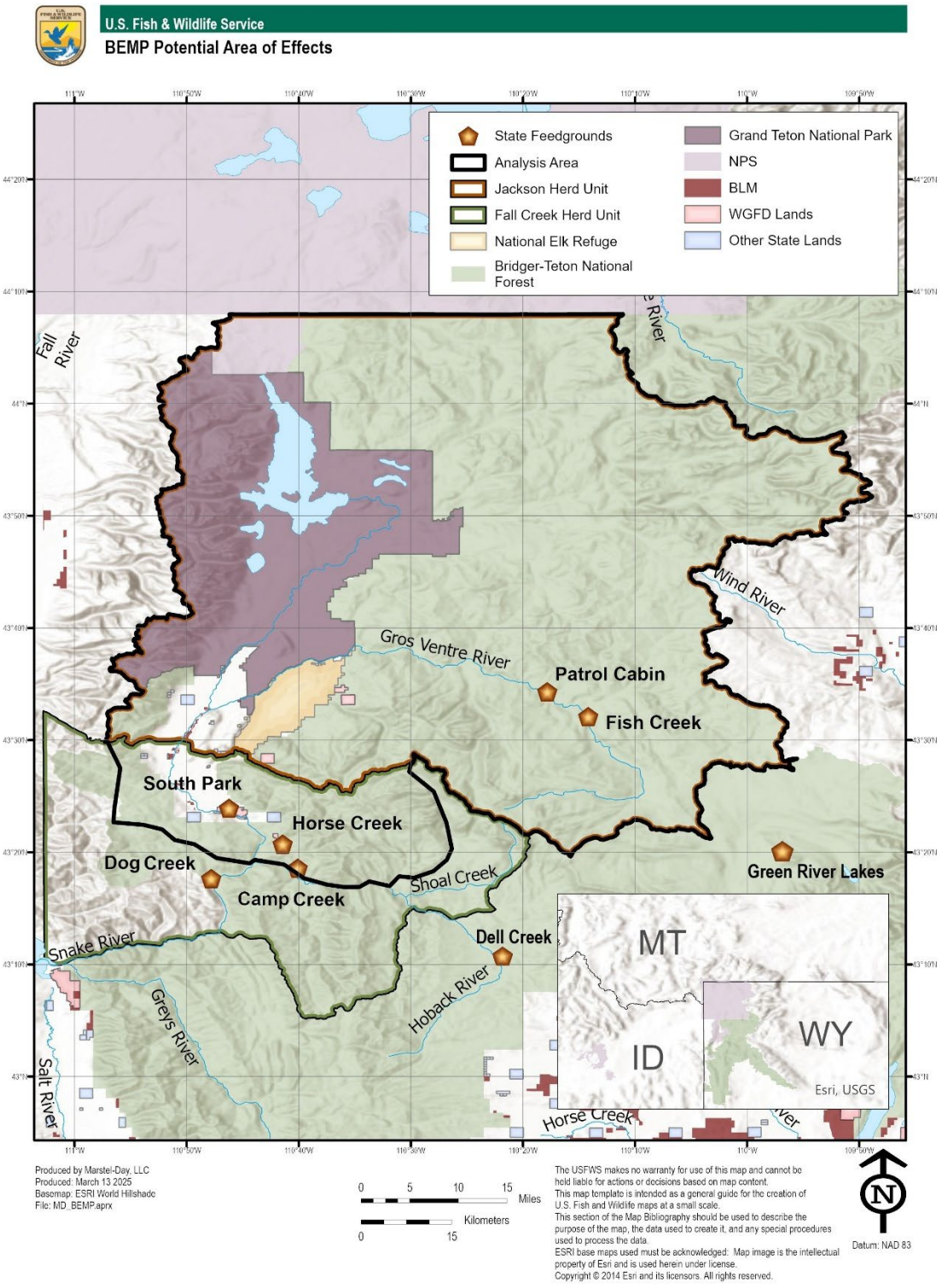

Figure 1. Map of the area of potential impacts. The analysis area (black polygon) is composed of the Jackson elk herd unit (orange polygon), part of the Fall Creek herd unit (green polygon), the Refuge, Grand Teton, and Bridger-Teton.

4.1. Natural Resources

Elk and bison play an important ecological role and are recognized as vital elements of the native biota that interact dynamically with their environment.

Elk

Elk: Affected Environment

The 2007 BEMP and EIS provide comprehensive documentation of the history, habitat and forage, distribution and movement, behavior and social interactions, breeding, calving, age and sex classes, genetics, and other factors influencing the Jackson elk herd. Below we concisely discuss those aspects of the Jackson elk herd that are most important for the analysis of the environmental consequences of the Service's proposed management actions, alternatives, and options.

Currently the Jackson elk herd population fluctuates near 10,000 animals, with approximately 7,500 elk wintering on the Refuge each year (See Figure 2 for the Jackson elk herd population over time).

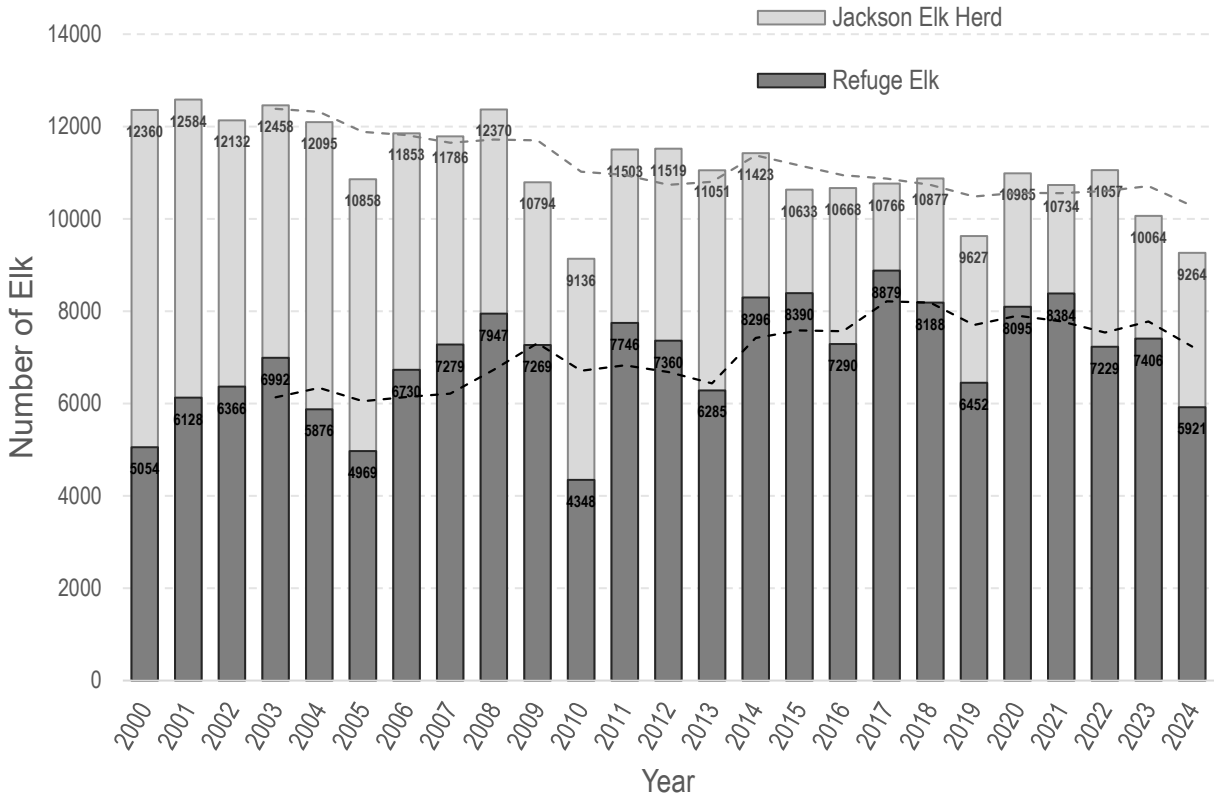

Figure 2. Winter Counts for the entire Jackson elk herd (light grey) and for the subset of elk occupying the Refuge (dark grey) 2000–-2024. The dashed-lines represent the moving average of elk numbers.

Adaptable foragers with a mixed diet, elk frequent a variety of habitats and move about seasonally. While they make short movements in the fall after the first frosts occur, they

generally remain on summer range until heavier snow covers forage, stimulating migrations to lower wintering areas. A few elk forgo migration and winter on wind-swept, more exposed parts of their summer range.

Most of the elk herd (7,513-8,570 in 2020–2023) occupies the Refuge in winter and utilizes the southern half of the Refuge from November to May. A smaller portion of the Jackson elk herd (1,486-2,533) winter in the Gros Ventre River drainage on the Bridger-Teton where WGFD operates two feedgrounds. A smaller number of elk (572-1,011) winter on other ranges to the east of the Refuge, in Grand Teton National Park, and in the Buffalo Valley (Wyoming Game and Fish Department 2024f).

As winter ends, the elk migrate to summer range. Approximately 60–70% of the Jackson elk herd engages in long-distance migration to summer ranges in Grand Teton, the Bridger-Teton, Teton Wilderness and Yellowstone (see Figure 3 for a map of elk migration near the Refuge). This proportion of the herd that migrates over long distances, considered LDME, has declined over recent decades. Declines in calf recruitment for this segment of the herd is thought to be the primary driver of decline (Kauffman, et al. 2023, Cole, et al. 2015).

Elk that use summer range in the areas immediately west and northwest of the Refuge are considered SDME. This segment of the population has increased dramatically in recent decades. For example, in the late 1970s and early 1980s, SDME represented only 2-4% of the elk collared on the Refuge. Additional monitoring since 2015 suggests that SDME now represent 30–40% of the elk that winter on the Refuge. Based on their distribution and migratory patterns, SDME are more likely to cause conflicts on private land, commingle with livestock, compete with LDME for winter range resources, and have higher calf recruitment rates than LDME (Cole, et al. 2015)

SDME also tend to spend a high percentage of time in hunt area 78 within the Jackson Hole area. Hunt area 78 includes private lands with limited hunter access. Also, SDME migrate to the Refuge later, so they are less vulnerable to harvest on the Refuge and Bridger-Teton land adjacent to the Refuge (Foley, et al. 2013). In recent years, harvest management of the elk herd has been structured to limit harvest of the LDME and increase harvest of the SDME, including securing public access to hunt private lands in key hunting locations (Cole, et al. 2015). See Figure 3 below showing the migration patterns of both the LDME and SDME.

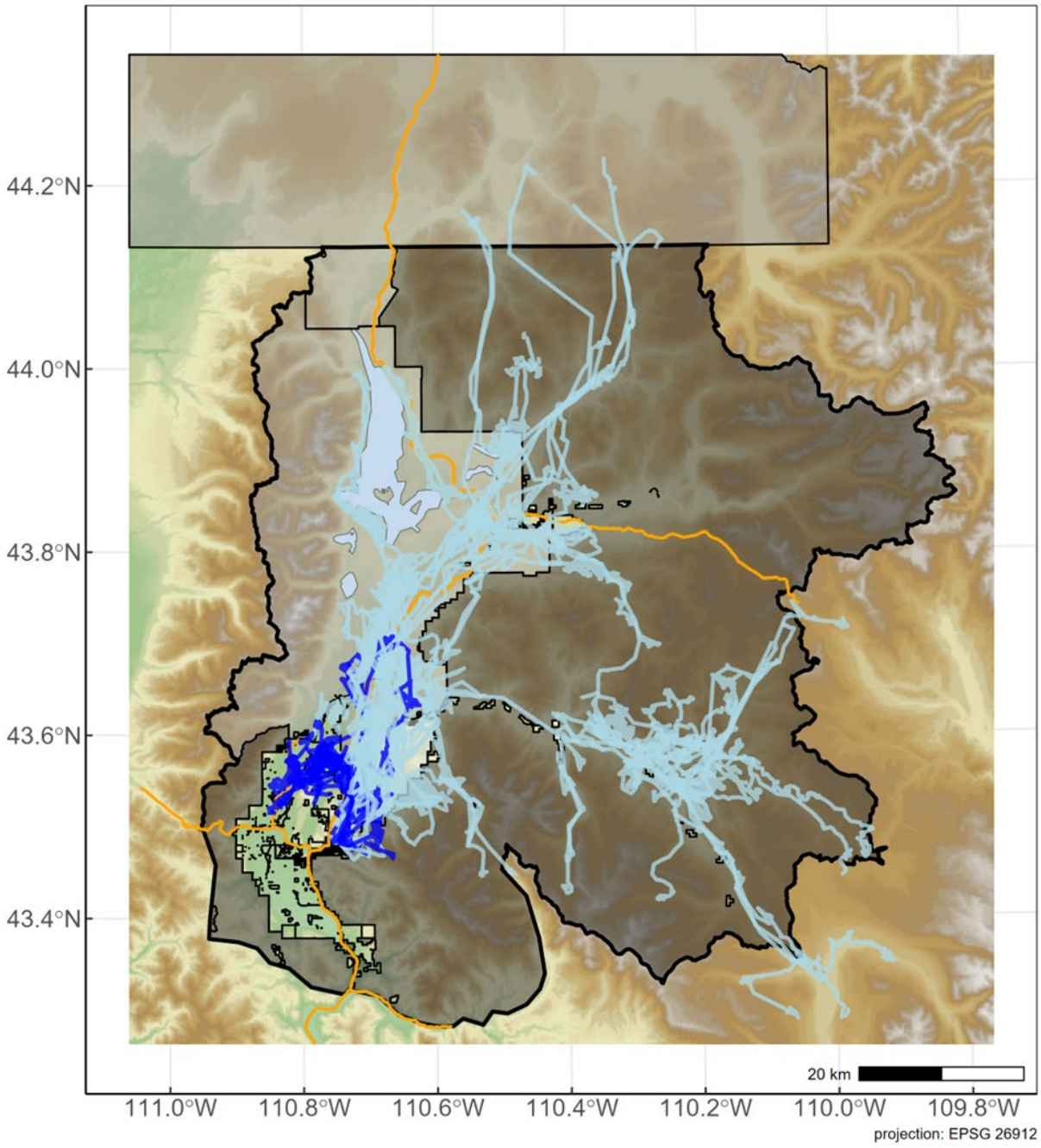

Figure 3. Map showing elk migration near the Refuge. Jackson elk herd migrations around the National Elk Refuge are shown in dark blue (SDME) and light blue (LDME). Elk migrations cross federal, state, and public lands. The map was generated by the USGS using data from the USGS Data Release Kauffman and others, 2020.

Classified as intermediate feeders, elk are less selective than either browsers or grazers (Baker and Hobbs 1987). Forage availability during winter (Jenkins and Wright 1988), and differences in nutritive value during other seasons are important influences on food choices (Merrill 1994, J. G. Cook 2002). In winter, elk primarily use open grassland, preferring cured grasses when available, but using browse species as well (Murie 1951); they may also be found in forests where they prefer shrubs (G. F. Cole 1969). In spring they use relatively open grassland with some timber, and in late summer and fall they use a variety of grassland and forest types. Grass comprises most of the diet in all seasons. Cole's (1969) examination of the Jackson elk herd found that forage proportions within the average yearlong diet were 51% grass and grasslike plants (sedge and rush species), 26% forbs (nonwoody broad-leaved plants), and 23% shrubs. Shrub species included willow, narrowleaf cottonwood, aspen, and silverberry.

Supplemental feeding bolsters the nutritional status of 68% to 91% of the Jackson elk herd in most winters, staves off seasonal weight loss, and has been shown to result in a marginal increase calf recruitment compared to unfed elk populations in the Greater Yellowstone (Dugovich, et al. 2025). The attraction of highly nutritious, easily accessible food during the winter months is powerful to both elk and bison, and both populations have become accustomed to utilizing the feeding grounds. As a result, elk and bison have been strongly conditioned to seek supplemental food on the Refuge rather than foraging normally, even during winters when natural forage is available and even abundant.

Figure 4. Elk waiting to receive supplemental feed after the bison are fed. Photo Credit: Kari Cieszkiewicz

Elk on native winter range may naturally lose from 5–15% of body mass in an average winter (Wisdom and Cook 2000) and 25% or more in severe winters. Various mechanisms, such as reduced activity levels and metabolic rates, insulating winter fur, behavioral adaptations, and catabolism of body fat, allow ungulates to cope with the energetic costs of winter and avoid death in the absence of artificially supplemented food sources (Mautz 1978).

Elk tend to favor slopes with a southerly aspect during winter months because they can be snow free due to sunshine and southwest winds (Skovlin, Zager and Johnson 2002). One factor affecting forage availability for elk and bison is the snow-water equivalent (the amount of water in inches contained in the snowpack). Deep, light snow allows elk easier access to underlying vegetation than shallower, heavy snow. While a snow-water equivalent of 6 inches is the threshold that we would consider forage to be available, temperature conditions that cause snow crusting (e.g. more rain on snow events) would make forage less available at lower snow-water equivalent levels. Areas receiving 6+ inches of snow-water equivalents in one season would be unsuitable for elk winter range during that year.

During an average winter, an estimated 51,000 acres in the Jackson elk herd area would likely be suitable as elk winter habitat (Hobbs, et al. 2003). Most of this acreage would be in the Gros Ventre River basin, with about 8,500 acres on the Refuge, as well as in the Buffalo Valley area. However, elk may or may not utilize all the available winter range due to predation risk, competition with other ungulate species, human disturbance, and other factors. Suitable habitat in years when snows were above average would decline to an estimated 20,000 acres, most of which would be in the Gros Ventre River basin and an estimated 2,600 acres on the Refuge. In a severe winter suitable habitat would decline to an estimated 12,000 acres, with less than 700 acres on the Refuge., suggesting that elk would be more likely to use private land in a severe winter scenario.

Males and females are spatially separated throughout much of the year due to differing adaptive strategies: females favor security, while large, quickly growing young males focus on food intake to maximize body size and antler growth (Geist 1982, 2002). Although considered herd animals, group size fluctuates widely (Murie 1951). In the spring elk cows may be alone, or in small groups of two or three when calves are born. When calves can move well, larger groups of cows, calves, and young bulls form. During the summer cows, calves, and young bulls are found in mixed-sex groups varying in size from 20 to 300 elk or more. At the same time, older bulls are often alone, but some may also form small groups. During the fall rut, cows and calves are found in smaller groups that can be managed by one mature bull. Younger bulls sometimes band together, but some remain near the herd and can join groups later in the season. Elk again form large groups during the fall migration and may maintain large herds throughout the winter, depending on the weather and forage availability. Elk may also be found as individuals, in small groups, or in larger herds at any time of the year (Murie 1951).

Most calving takes place during the transition between winter and summer ranges. After a gestation period of about 8.5 months, elk give birth from late May to early June. Although twins occur occasionally, most cows give birth to a single calf (Murie 1951). Elk calf survivability correlates positively with larger birth weight and rapid growth rate. (Geist 1986, 1991, 2002).

Elk feed on grasslands and in open areas, but they also rely on wooded areas for cover and hiding newborns (Geist 2002). The condition of elk calves depends largely on the condition of cows during pregnancy and lactation, which in turn is related to the condition of the habitat and food sources. A nutritionally stressed cow may give birth to a lower birthweight or weak calf or have insufficient milk to feed it, increasing the calf's mortality risk from starvation, disease, accident, or predation (Clutton-Brock, Guinness and Albon 1982, Clutton-Brock, Albon and Guinness 1989, Clutton-Brock, Price and MacCall 1992, Kunkel and Mech 1994, Smith, Peterson and Houston 2003), or reducing its growth rate. If nutritious forage is scarce, elk calves will be unlikely to successfully compete with adult elk (Knight 1970, Houston 1982).

High mortality for elk calves occurs in the first two months of life because calves have not yet acquired the stamina and speed to escape coyotes, bears, or other predators. An estimated 70% of all calves do not survive beyond eight or nine months (U.S. Fish and Wildlife Service 2002). While elk often return year after year to the same calving areas, snow levels can alter this behavior. During the last 20 years, calf-to-cow ratios on the Refuge have averaged 19.4. calves per 100 cows, which is lower than average compared to other elk herd units in the West. Although calf mortality has not been directly tracked in the Jackson elk herd in recent decades, the causes of low calf ratios on the Refuge and the Jackson elk herd overall are likely multifactorial and may be attributed to high predation rates on calves (Cole, et al. 2015), low elk pregnancy rates associated with density-dependent effects (i.e., less access to food resources, summer drought conditions), plant-phenology (i.e., less nutritious vegetation available), and disease (brucellosis) (Bidder, et al. 2023). Winter supplemental feeding has been found to increase survival rates of Jackson elk calves (<1 year old) (Smith and Anderson 1998), and slightly increase cow: calf ratios compared to unfed elk populations in the GYE (Dugovich, et al. 2025).

Elk calf recruitment rates (i.e., how many elk calves survive to adulthood) is one of the main drivers of the increased population size. Other factors impacting overall population size include starvation, predation, disease, and hunting. Human-wildlife conflict is not a large source of mortality for elk, and elk-vehicle collisions are currently low in the analysis area.

Predators on elk in the Jackson Hole area include wolves, cougars, grizzly bears, black bears, and coyotes. Most predators prey mostly on the young, old, sick, or more vulnerable elk. Grizzly bear predation on elk calves is significant (Barber-Meyer et al. 2008). Black bears primarily prey on calves (Barber-Meyer et al. 2008), and only occasionally on adult elk (Barmore and Stradley 1971), cited in (Boyce 1989). Coyotes prey on calves opportunistically but are often unable to because adult elk are large-bodied and, if nearby, capable of defending their young against these relatively small carnivores (Geist 1982). Wolves also prey on elk year-round and contribute to annual elk mortality. From 2018–2024, six (20%) of thirty collared elk mortalities were due to wolves (WGFD unpublished data 2024). Woodruff and Jimenez (2019) found that wolves preyed on elk calves on and around State operated feedgrounds in the Gros Ventre in excess of their availability. Wolves killing elk on and around elk feedgrounds has also been demonstrated by Barker et al. (2023), despite there being a relatively high degree of human activity around

feedgrounds. Since most elk in the Jackson herd are on feedgrounds in the winter, Barker et al. (2023) found that wolves prioritized prey acquisition over avoiding human activity.

Disease and Elk

A comprehensive history of Jackson elk herd disease is presented in the 2007 BEMP and EIS. As discussed in the Refuge's 2019 Step-down Plan, with large numbers of wintering elk and bison on the Refuge, artificially increased population densities have increased the risk for major outbreaks of endemic and exotic diseases. The Jackson elk herd has the highest density of any elk herd around the GYE (Cook, et al. 2023). Density-dependent ungulate disease, such as brucellosis, CWD, septicemic pasteurellosis, and scabies, is a major concern for the Refuge.

Figure 5. A collared elk cow with scabies on the Refuge. Photo Credit: Kari Cieszkiewicz

Brucellosis, septicemic pasteurellosis, psoroptic mange (scabies), necrotic stomatitis, necrotizing pododermatitis (foot rot), and helminth and lungworm parasitism are well documented in the Jackson elk herd. Although the population level effects of these diseases have been minimal for elk, their prevalence at the Refuge suggests that substantial population reductions, and other negative wildlife health effects, are possible. For example, bovine tuberculosis and malignant catarrhal fever have not been documented in the Jackson elk herd but could have serious negative population effects at current elk densities.

Figure 6. An example of "hoof rot" on a scavenged elk. Photo Credit: Kari Cieszkiewicz

Brucellosis

Brucellosis, first discovered in cows in the United States in 1910, is caused by several *Brucella* bacteria species that can be spread from infected animals to humans. *Brucella* bacteria can remain for more than 100 days in the environment, spreading from one animal to another through the grazing of contaminated pasturelands or the consumption of feedstuffs that were contaminated by waste or fetal membranes. While Federal efforts to eradicate brucellosis from cattle and other domesticated animals have been largely successful, it has proven more challenging to manage in free-ranging wildlife, such as elk and bison herds (U.S. Forest Service 2023). Brucellosis is endemic (meaning

present) in the elk in the Refuge and most of the western third of Wyoming (Wyoming Game and Fish Department 2024e).

Elk, bison, and cattle, as well as many other mammals, are susceptible to infection by the bacteria *Brucella abortus*, which causes brucellosis (D. S. Davis 1990, E. T. Thorne 2001). The Jackson bison and elk herds are chronically infected with the disease. Brucellosis has been present in elk on the Refuge since at least 1930 (Murie 1951). Transmission of brucellosis occurs through contact with infected tissues such as aborted fetuses, fetal fluids, fetal membranes, or vaginal discharges (Greater Yellowstone Interagency Brucellosis Committee 1997, E. T. Thorne 2001). Abortion is the characteristic sign of acute brucellosis, and there is no feasible treatment or cure for the disease (Greater Yellowstone Interagency Brucellosis Committee 1997). Studies indicate between about 50% and 90% of females abort their first calf after infection (Thorne, Morton and Ray 1979, Davis, Templeton, et al. 1990, Davis, Templeton, et al. 1991), but second and third pregnancies following infection tend to progress normally. However, Bidder et al. (2023) found the potential for more lasting effects of *Brucella sp.* exposure on elk pregnancy rates reducing probability of pregnancy by 12.4% in cows 6-9 yrs old.

The brucellosis seroprevalence (i.e., percentage of animals that test positive via a blood sample for having been exposed to the disease, but do not necessarily harbor an active infection) in Wyoming feedground elk average 32% and as much as 65% in bison (Wyoming Game and Fish Department 2019). Feedgrounds play an important role in artificially congregating elk and reducing their interactions with cattle, therefore lowering the risk of brucellosis transmission from elk to cattle. However, the high density of elk at feedgrounds can facilitate transmission from elk to elk, thus making it difficult to completely eradicate the bacteria from wildlife in Wyoming (U.S. Forest Service 2023). Based on genetic analysis of the Brucella bacterium, Kamath et al. (2016) found that the common ancestor of all brucellosis infections in the GYE were from the Jackson Hole area, and the 2 most widespread Brucella strains originated in the Refuge. These results suggest that feedground practices on the Refuge have the potential to amplify disease transmission and subsequently spread disease throughout the ecosystem via elk migration.

CWD

Since both the 2007 BEMP and the 2019 Step-down Plan were adopted, new science and information has become available about CWD. CWD is a chronic disease that fatally affects the central nervous system of members of the deer family (*Cervidae*), which includes elk. It was first identified in Colorado in captive deer in the late 1960s and in wild deer in 1981. In the 1990s the disease spread more wildly across Colorado and into southern Wyoming. As of early 2024, CWD was reported in 32 states and 4 Canadian provinces (Centers for Disease Control and Prevention 2024).

Figure 7. Refuge biologist getting ready to necropsy and disease sample a wolf-killed elk. Photo Credit: Kari Cieszkiewicz

Between 2020 and 2023, just over 1,400 elk in the Jackson Hole area were tested for CWD; of those, only one was confirmed positive (Cook, et al. 2024).CWD is caused by abnormally shaped proteins called prions, which can pass through an infected animal's digestive system and remain in the environment for years if not a decade or more (Centers for Disease Control and Prevention 2024). Infected animals typically do not show any signs of illness until late in the course of the disease, which increases the chances that hunters will contact infected elk without even knowing it. All potential modes of CWD transmission have not been identified, but evidence suggests it can pass directly from an infected animal to an uninfected one or through contact with soil, plants, or feed that is contaminated with the prions. Currently, there are no effective treatments for CWD making prevention an essential tool for wildlife management (U.S. Forest Service 2023).

CWD was detected in an elk in Grand Teton in December 2020, representing the first detection of CWD in the Jackson elk herd. In April 2026, CWD was detected in two sick and dead elk on the Refuge for the first time. Despite these recent detections of CWD on the Refuge, no additional elk have tested positive for CWD in the Jackson elk herd since 2020, suggesting that the disease remains at trace levels in the population. However, the presence of CWD in local elk represents a significant risk to the population. CWD has also been detected in adjacent elk herds. An elk tested positive for CWD in Wyoming's Fall Creek elk herd (the herd

south of Jackson) in November 2024, a cow elk found dead on the State's Horse Creek feedground tested positive for CWD in February 2025, and 6 elk tested positive for CWD on the State's Dell Creek feedground. It is all but certain CWD prevalence will increase in the Jackson elk herd; however, the exact timing is uncertain. CWD prevalence has been observed as high as 29% in free ranging (Sargeant, et al. 2021). A wide range of CWD prevalence estimates have been reported for elk in parts of Wyoming where CWD has been endemic for decades. For example, recent estimates suggest that elk CWD prevalence is 1.3% in the Snowy Range and as high as 12% in the Iron Mountain Area (WGFD unpublished data). In contrast to the Jackson elk herd, these elk herds are free ranging, winter on native range and not provided supplemental feed.Contact rates among elk on feedgrounds (Creech, et al. 2012, Cross, et al. 2013, W. Janousek, et al. 2013). These higher rates are likely because of densities on feedgrounds (Graves, et al. 2022). (2021) predicted that the Jackson elk herd would decline at a CWD prevalence of 7%, even in the absence of cow harvest due to low calf recruitment rates in the herd.

Harvest of Elk

Hunting is used as a tool to maintain the Jackson elk herd at the population objective set by WGFC, which is currently 11,000 elk. WGFD sets harvest limits and seasons for the Jackson elk herd and the Jackson bison herd to maintain these population objectives. Hunting of the Jackson elk herd on the Refuge is authorized in accordance with State and Federal regulation and is focused on cow/calf harvest. In hunt areas 72, 75 & 79 the NPS and WGFD jointly set season structure for the ERP as outlined in the park's enabling legislation. Bull harvest is only allowed on the Refuge first two weeks of the season and during the youth hunt portions of the season. The youth hunts consist of two, two-day periods, typically during the last week of November. The Refuge season lasts approximately 7 weeks. In 2025, the Refuge season was November 1 through December 19. Hunting of the Jackson elk herd also occurs on Grand Teton through NPS's elk reduction program, Bridger-Teton, state lands and private lands. In recent decades, the Refuge and Grand Teton contributed to the total annual harvest approximately 10% and 25%, respectively, while the remainder (65%) of the harvest takes place mainly in the national forest with very relatively little harvest occurring on state and private lands. Since 2014, annual total elk harvest for the Jackson herd, based on hunter harvest surveys conducted by WGFD, has fluctuated annually with a low total harvest of 743 elk in 2021 to a high of 1,746 elk in 2014 (https://wgfd.wyo.gov/hunting-trapping/harvest-reports-surveys). Harvest rates combined with other mortality factors have contributed to keeping the herd near WGFD population objectives over the past decade.

Consequences of the proposed action, alternatives, and options on hunting is discussed extensively in the "Hunting, Visitor Use, and Experience" and "Economics" sections below.

Elk: Environmental Consequences

Alternative A: No Action

Population

Under Alternative A, as modeled in the USGS SIR, we expect that the elk population will remain similar to the current population size of around 11,000 individuals (see Figure 2 for the elk

population over time) in the short term. However, once CWD prevalence and effects increase in the herd, this alternative will result in a long-term decline in the elk herd population that will be difficult to recover from. By year 20, we predict that this alternative will result in an approximately 53% decline in the population, or a decrease from about 11,000 individuals down to about 5,200 elk (USGS SIR, Appendix C, Table B1).[1]

Disease Prevalence

Under Alternative A, as modeled in the USGS SIR, CWD prevalence in the Jackson elk herd could reach 35% by year 20 and have significant effects on the Jackson elk herd population size and health, which will be exacerbated by supplemental feeding (USGS SIR, Appendix C, Table B1). This 20-year disease prevalence is the highest of all proposed alternatives due primarily to the fact that supplemental feeding results in elk contact rates that are 2–4 times higher than when they are not being fed in winter.

As discussed above in "Affected Environment: Disease and Elk," feedground practices on the Refuge are associated with the presence and prevalence of several other diseases that are generally less common in unfed elk populations (e.g. Brucellosis, septicemic pasteurellosis, psoroptic mange, necrotic stomatitis, necrotizing pododermatitis (foot rot), and helminth and lungworm parasitism). Although the population level effects of these diseases have been minimal for elk, their prevalence at the Refuge suggests that substantial population reductions and other negative wildlife health effects are possible if more serious ungulate diseases were introduced to the Refuge under Alternative A and continued feedground practices.

Mortality

Under this alternative, elk are less likely to die in the winter due to natural causes like starvation; however, a much higher number of elk are predicted to die from CWD over a 20-year period and have worse long term population outcomes compared to the other alternatives (USGS SIR, Appendix C, Figure B10). For example, modeling predicts that after 20 years, there will be fewer elk in the Jackson elk herd if current Refuge feeding practices continue because of CWD on the herd compared to other alternatives where feeding eventually reduced (USGS SIR, Figure B7, page B11). Beyond long term population outcomes under Alternative A, the effects of CWD will build up over time and result in an increase in individual deaths attributable to the disease, relative to the other alternatives (USGS SIR, Figure B10, page B13). We estimate that once infected with CWD, the average individual elk will survive for about 34 months (P. C. Cross, J. D. Cook, et al. 2023). Within a few months, elk may begin experiencing symptoms such as loss in body weight, depressive behavior, excessive drooling and urination, loss of coordination, and head tremors (Williams and Miller 2002). Under Alternative A, more individuals will suffer

[1] Throughout this EIS, we provide the averages of the many model stimulations that USGS ran as part of the SDM process. All models are simplifications of complex processes that are intended to capture only the most important factors. These averages are meant to provide our best estimates of what impacts may occur and comparison of those potential impacts among alternatives recognizing there is still much uncertainty about future impacts of the various alternatives. You can read more about the methodology and model stimulation outcomes in the various USGS SIR chapters.

from the prolonged negative physical states associated with CWD infection relative to other mechanisms of mortality.

Conversely, there will be fewer individual deaths attributable to starvation cumulatively over time under Alternative A (USGS SIR, Figure B10, page B13). Because we predict the population to decline the most under this alternative due to CWD, the elk population will eventually reach a more sustainable balance with available habitat. Additionally, remaining elk will continue to be fed, which further decreases the number of starvation-related deaths but continues to create an environment where the risk of disease spread between elk and from the environment is high.

Wildness

We expect that while fewer elk will starve under this alternative, there will be higher levels of stress among the herd members due to the social dynamics of supplemental feeding (Forristal, et al. 2011). Elk unnaturally aggregated on feedgrounds exhibit stress hormones at least one-third higher than non-feedground individuals (Forristal, et al. 2011). The psychosocial state most often responsible for stimulating this stress response is conflict; a natural occurrence on refuge feedgrounds as elk display greater levels of aggression (Derrell, Rager and Calpin 1997). Anxiety, uncertainty, and lack of control and information are psychological states that can also stimulate this stress response in elk (Derrell, Rager and Calpin 1997). The highly nutritious and easily accessible food on feedgrounds discourages natural foraging behaviors in a species historically found to scatter among the grasslands, foothills, and hills and slopes of the Gros Ventre Basin seeking winter forage (Murie 1951). Such non-feedground populations of elk experience less stress (Forristal, et al. 2011).

Beyond driving disease transmission through increased contact rates, the chronic stress elk experience through feedlot dynamics produces a cascading physiological response, which can include immune system repression; further driving disease transmission (Forristal, et al. 2011). The cascading physiological response associated with higher stress hormones also includes lower relative fitness levels; impacting their ability to reproduce and live their normal lifespan. Under Alternative A, we expect the elk to continue to experience the negative affective states

Figure 8. Aggressive behavior between elk on the feedlines of the National Elk Refuge, a common occurrence during wintertime supplemental feeding that induces stress. Photo Credit: Gannon Castle

that they are currently experiencing as a supplementally fed population, accompanied by an increase in disease transmission.

Distribution

Elk distribution will be like current conditions with most elk occupying Refuge and State feedgrounds during the winter months (USGS SIR, Appendix D, Figure C2); however, due to CWD induced population reductions, the actual number of elk occupying private lands will be lower than current conditions over time (USGS SIR, Appendix D, Table C2). The impacts of elk distribution outside the Refuge are discussed further in the sections below, including "Hunting, Visitor Use, and Experience," "Public Health and Safety," "Private Lands and Other Public Lands" and "Economics." In general, the likelihood of elk-vehicle collisions on Highway 89 and the likelihood of elk entering the town of Jackson from the Refuge will be lowest under Alternative A compared to all other alternatives.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Population

Alternative B proposes ending elk feeding when CWD prevalence reaches 3% or at year 7, whichever comes first. Most model outcomes predict that CWD will exceed 3% prevalence well before year 7, and therefore the 20-year population outcomes are most likely to match the 3% disease threshold alternative analyzed in the USGS SIR with a predicted population size for the Jackson elk herd of 6,900 after 20 years (USGS SIR, Appendix C, Table B1), which is the highest predicted population number compared to the other alternatives (see USGS SIR, Appendix G, Table F4). If it takes longer than predicted to reach the 3% prevalence level, and the Service and cooperating agencies are able to successfully implement hunter-harvest strategies to reduce the population of SDME, then the 20-year population outcomes would be predicted to be more like the aggressive hunting alternative analyzed in the USGS SIR with a predicted population size of 6,100 for the Jackson elk herd of after 20 years (USGS SIR, Appendix C, Table B1). Even with the population declines, the Jackson elk herd is still projected to be one of the highest density elk herds in the GYE (Cook, et al. 2023). There will still be a robust elk herd on the Refuge and in the landscape.

Disease Prevalence

If the Service stops the supplemental feeding of elk when CWD prevalence in the herd reaches 3%, CWD prevalence rates are predicted to be the lowest compared to other alternatives analyzed after 20 years (USGS SIR, Table B1, page B9). A predicted CWD prevalence of 23%, while high, remains lower than the predicted prevalence rate of 35% under Alternative A (USGS SIR, Appendix C Table B1). The predicted prevalence rate remains high because the proposed action only affects feeding operations on the Refuge, and elk will still be able to congregate on other feedgrounds in the region. The predictions regarding CWD prevalence in the USGS SIR assume that supplemental elk feeding will continue to occur at other feedgrounds in the Jackson elk herd unit and vicinity for at least 20 years, regardless of actions to continue or end feeding on the Refuge. Although long term elk distribution predictions are uncertain, models predict that if feeding ends on the Refuge, 25–30% of elk in the Jackson elk herd will continue to be fed on State-operated feedgrounds in the Gros Ventre drainage (USGS SIR, Chapters B and C). CWD

prevalence would be lower and elk population would be even greater over a 20-year period if feeding were to end on all regional feedgrounds (Cook, et al. 2023). As feedground practices come to an end on the Refuge under Alternative B, so will the increased risk of other disease prevalence and spread. Currently, there is not enough data or information available to predict what elk density levels the Service would need to achieve on the Refuge to significantly interrupt transmission of CWD or other density-dependent diseases. These density levels will be different for each disease, and given the environmental component of CWD transmission, CWD likely acts in both a density-dependent and frequency-dependent manner. Therefore, USGS, through the SDM process and the supplemental analysis done of Alternative D, attempted to analyze different CWD prevalence thresholds (e.g. 3%) and strategies for stopping the supplemental feeding of elk on the Refuge to determine the best outcomes for the elk population in both the short term and long term.

Mortality

Under Alternative B, supplemental feeding will end after 7 years or when CWD prevalence reaches 3% in the herd, whichever comes first. In this case, elk will be more likely to die-of winter starvation in the future relative to Alternative A, which proposes continued feeding of the herd. We predict that these starvation deaths may increase once feeding ceases but will likely decline as the population reaches a more sustainable equilibrium with available forage on the Refuge (USGS SIR, Appendix C, Figure B10*B,* page B13). Other natural causes of death may include predation, injury, vehicle collisions, parasites, and other diseases.

The USGS SIR predicts that starvation-related deaths will increase over the first 5 years, with around 5,900 total elk from the Jackson elk herd dying during winter months during this time (USGS SIR, Table B1, page B9). Elk calves account for the largest percentage of herd deaths, relative to cows and bulls (USGS SIR, Appendix C, Figure B1.2, page B18).

We also expect that there will be fewer individual deaths attributable to CWD under this alternative, when compared with Alternative A (USGS SIR, Figure B9*B*, page B12). Because disease prevalence is lower under Alternative B than A, fewer individuals will contract and die from CWD over time, avoiding the prolonged and negative physical states associated with the disease.

Wildness

We expect more elk will starve under this alternative compared to Alternative A; however, winter starvation in elk is a natural phenomenon, and 95% of elk in North America are not fed during winter months (B. L. Smith 2001). Typically, elk and other ungulates that live in temperate environments experience times when forage is limited, and this often results in elevated mortality caused by starvation particularly among the oldest and youngest age classes (Singer, et al. 1997). In the absence of supplemental feeding, there will be greater population fluctuations among years, but elk populations have the capacity to recover from starvation events during years with less severe winters (MacNulty, et al. 2020). However, Alternative B is projected to result in higher elk numbers over time than any other alternative, largely because of lower CWD prevalence associated with ending feeding on the Refuge (USGS SIR, Appendix C, Figures B7 and B10 and Appendix G, Table F4).

Because supplemental feeding will continue for up to 7 years under Alternative B, we expect that feedground dynamics will persist for as long as elk are unnaturally aggregated on the Refuge. The elk will continue to experience the stress-causing aggression on these feedgrounds, but to a lesser extent than what would be experienced under Alternative A (Forristal, et al. 2011). Elevated stress hormones in supplementally fed elk are positively correlated with elk density at the feed lines, not overall population density (Forristal, et al. 2011). For these reasons, as adaptive management actions are taken and the herd population decreases, time as fewer individuals are present and experiencing conflict at the feedline; ceasing altogether when feeding ends after 7 years or 3% CWD prevalence in the herd is reached, whichever comes first.

Under Alternative B, we would expect the same persistence and eventual decrease of psychological stress associated with feedground dynamics. As adaptive management strategies aim to shrink the elk population to a more sustainable herd size, and with the eventual cessation of feeding, fewer elk will be reliant on the feedlines, and more elk will learn to forage elsewhere over time. Elk experiencing these natural foraging behaviors off the feedgrounds will experience a decrease in stress and anxiety (Forristal, et al. 2011).

While many individual elk's lifespans may be shorter in the short term under Alternative B, once the elk population reaches a sustainable equilibrium in the future, the lower prevalence of CWD predicted under Alternative B will result in more individuals able to live their lives longer without having them cut short by the disease. One study by A.L. Williams and colleagues found that captive elk infected with CWD only lived an average of 4–7 years, even in the absence of other mortality causing pressures like predation or hunting (Williams, Kreeger and Schumaker 2014). For context, another study found that the average age of adult female elk killed by wolves in Yellowstone National Park was 13–16 from 1995–2016, and elk have been known to live upwards of 25 years (MacNulty, et al. 2020) (Murie 1951). For these reasons, future elk have a higher chance of living out their full lifespan relative to elk experiencing a higher prevalence of CWD under Alternative A.

Distribution

Winter elk distribution is strongly influenced by elk feeding practices, and elk distribution will be like current conditions if elk are supplementally fed on the Refuge (USGS SIR, Figure C2, page C8). However, when Refuge elk feeding operations end at either 3% CWD prevalence or in year 7 (whichever comes first) some elk will leave the Refuge for other areas. Experts predict that in the absence of feeding on the Refuge, roughly 50% of the elk that currently use the Refuge during the winter will continue to do so: 18% will move to State feedgrounds in the Gros Ventre drainage; 14% will move to State feedgrounds in the Fall Creek herd unit south of the Refuge; and 19% will winter in other areas off feedgrounds (USGS SIR, Figure B3, page B7) (see Figure 9 below). The exact number of elk that redistribute from the Refuge to other areas will depend on elk numbers during the year that feeding ends, but the number of elk occupying the Refuge is predicted to be lower over time under all alternatives.

Although the number of elk that will potentially leave the Refuge is expected to decline over time, Alternative B is expected to result in higher numbers of elk occupying private land and a higher number of Brucellosis induced elk abortions on private land compared to Alternative A (USGS SIR, Table C2, page C14). If feeding no longer occurs on the Refuge under Alternative B, elk will be more likely to leave the Refuge during the winter months for the town of Jackson or cross Highway 89 to access other private lands west of the Refuge. Higher elk activity in these areas could potentially increase elk-vehicle collisions compared to Alternative A, but it is not possible to quantify this effect. Hunting strategies designed to reduce the number of SDME in the Jackson elk herd could mitigate conflicts on private land and vehicle collisions because SDME are the elk most likely to exhibit these behaviors (Cole, et al. 2015, Cotterill, Cross, et al. 2025).

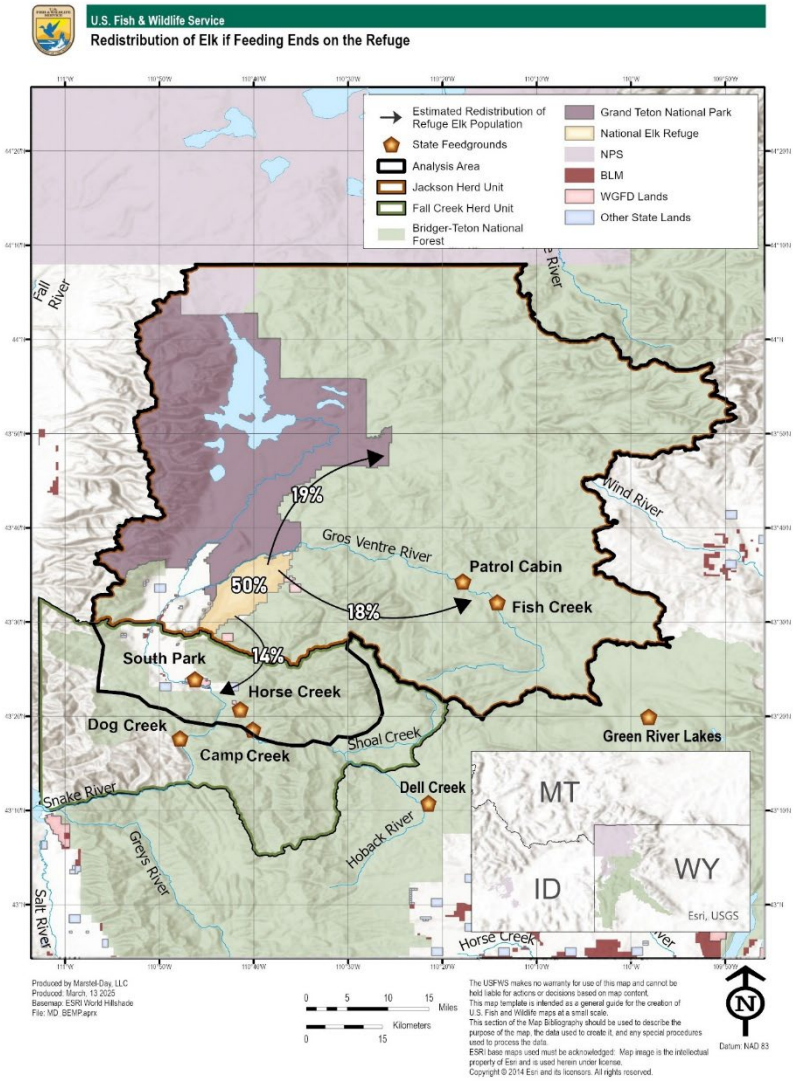

Figure 9. Map showing the estimated redistribution of the elk population when the Refuge stops supplemental feeding.

Alternative C: 5 Year Supplemental Feeding of 5,000 Elk

Population

Under Alternative C, as modeled in the USGS SIR, the Jackson elk population is estimated to decline to a projected 9,800 in 5 years and 6,100 in 20 years (USGS SIR, Appendix C, Table B1, page B9). Similar to Alternative B, even with the population reductions anticipated and proposed under this Alternative, the Jackson elk herd is still projected to be one of the highest density elk herds around the GYE (Cook, et al. 2023). There will still be a robust elk herd in the landscape.

Disease Prevalence

Under Alternative C, CWD prevalence is predicted to be 26% after 20 years (USGS SIR, Table B1, page B9), slightly higher than the CWD prevalence predicted under Alternative B. Like Alternative B, the SDM analysis assumed continued operation of other feedgrounds in the region with 25–30% of elk in the Jackson elk herd continuing to be fed on State-operated feedgrounds in the Gros Ventre drainage (USGS SIR, Appendices C and D). CWD prevalence would be lower and elk population would be even greater over a 20-year period if feeding were to end on all regional feedgrounds (Cook, et al. 2023). As feedground practices come to an end on the Refuge under Alternative C after year five, so will the increased risk of other disease prevalence and spread.

Mortality

About 6,200 elk in the Jackson elk herd are projected to die during the first 5 winters of Alternative C implementation (USGS SIR, Appendix C, Table B1, page B9). Higher mortality during the first 5 years of implementation is primarily attributed to lower feed rations causing high calf mortality during severe winters. However, over 20 years, the total number of elk deaths from all causes is projected to be comparable to Alternative A due to lower numbers of elk deaths associated with CWD and harvest (USGS SIR, Appendix C, Figure B10, page B13).

Alternative C could be a sharper reduction in supplemental feed than Alternative B depending on when a 3% CWD prevalence is reached in the herd. We can anticipate that under Alternative C, a greater number of elk will suffer from the experience of starvation during the first five years, relative to Alternatives A and D, and potentially Alternative B depending on when 3% CWD prevalence is reached. Elk calves account for the largest percentage of herd deaths, relative to cows and bulls (USGS SIR, B1.2, page B18).

We also expect that there will be fewer individual deaths attributable to CWD when compared with Alternative A (USGS SIR, Appendix C, Figure B9*B*, page B12). Because disease prevalence is lower under alternatives involving a reduction in feeding rather than status quo feeding, fewer individuals will contract and die from the disease over time under Alternative C, avoiding the prolonged and negative physical states associated with the disease.

Wildness

Under Alternative C, elk will continue to be fed on the Refuge for 5 years but at a reduced ration (sufficient to support 5,000 elk), after which feeding will no longer occur starting in year 6. This will result in elk aggregation and distribution patterns like Alternative A during the first 5 years and then more natural elk aggregation and distribution patterns when feeding ends.

Because supplemental feeding will continue for up to five years under Alternative C, we expect that feedground dynamics will persist for as long as elk are unnaturally aggregated on the Refuge. Elk will continue to experience stress-causing aggression on these feedgrounds. (Forristal, et al. 2011). Elevated stress hormones in supplementally fed elk are positively correlated with elk density at the feed lines, not population density (Forristal, et al. 2011). While the number of elk on the Refuge varies from year to year and will decline overtime under Alternative C, we can expect to see greater competition for feed in the earlier years of its implementation, and a subsequent increase in feed line aggression. For these reasons, elk under Alternative C would be expected to experience even more stress than elk supplementally fed under Alternatives A and B. However, as natural mortality increases and the herd population decreases, the stress levels will persist but decrease over time as fewer individuals are present and experiencing conflict at the feedline.

Under Alternative C, we would expect the same persistence and eventual decrease of psychological stress associated with feedgrounds dynamics. As the elk population decreases to a more sustainable equilibrium over the years that supplemental feeding is slowed, more elk will learn to forage elsewhere over time. Elk experiencing these natural foraging behaviors off the feedgrounds will experience a decrease in stress and anxiety (Forristal, et al. 2011).

While many individual elk's lifespans may be shorter in the short term under Alternative C due to increased winter mortality, once the elk population reaches a sustainable equilibrium in the future, the lower prevalence of CWD predicted under Alternative C will result in more individuals able to live their lives longer without having them cut short by the disease as discussed above under Alternative B. A study by A.L. Williams and colleagues found that captive elk infected with CWD only lived an average of 4–7 years, even in the absence of other mortality causing pressures like predation or hunting (Williams, Kreeger and Schumaker 2014). For context, another study found that the average age of adult female elk killed by wolves in Yellowstone National Park was 13–16 from 1995–2016, and elk have been known to live upwards of 25 years (MacNulty, et al. 2020) (Murie 1951). For these reasons, future elk have a higher chance of living out their full lifespan under Alternative C, relative to elk experiencing a higher prevalence of CWD under Alternative A.

Distribution

Under Alternative C, elk will continue to be fed on the Refuge for 5 years but at a reduced ration (sufficient to support 5,000 elk). Feeding a reduced ration will result in similar elk distribution during the first 5 years as Alternative A, because the lower feed rates will still be sufficient to keep elk that participate in the feed program on Refuge feedgrounds. Under Alternative C, feeding ends in year 6. Experts predict that in the absence of feeding on the Refuge, roughly 50% of the elk that currently use the Refuge during the winter will continue to do so, 18% will move to State feedgrounds in the Gros Ventre drainage, 14% will move to State feedgrounds in the Fall Creek herd unit south of the Refuge, and 19% will winter in other areas off feedgrounds (USGS SIR, Appendix C, Figure B3, page B7). The exact number of elk that redistribute from the Refuge to other areas will depend on elk numbers during the year that feeding ends, but the overall number of elk is predicted to be lower over time under all alternatives.

Although the number of elk that will potentially leave the Refuge is projected to decline over time, Alternative C is expected to result in higher numbers of elk occupying private land and a higher number of Brucellosis induced elk abortions on private land compared to Alternative A, lower than Alternative B, and comparable to Alternative D (USGS SIR, Appendix D, Table C2, page C14, and Appendix G, Table F4)

When feeding no longer occurs on the Refuge under Alternative C, elk will be more likely to leave the Refuge during the winter months for the town of Jackson or cross Highway 89 to access other private lands west of the Refuge. Higher elk activity in these areas could potentially increase elk-vehicle collisions compared to Alternative A, but it is not possible to quantify this effect. Hunting strategies designed to reduce the number of SDME in the Jackson elk herd could mitigate conflicts on private land and vehicle collisions because SDME are the elk most likely to exhibit these behaviors (Cole, et al. 2015, Cotterill, Cross, et al. 2025).

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Population

Under Alternative D, hunter-harvest strategies focused on the SDME segment of the population could be used to reduce the number of elk overwintering on the Refuge to approximately 5,000 elk by year 10. Hunter-harvest strategies would result in more elk being harvested rather than dying of CWD or natural mortality (e.g. starvation) and will concurrently reduce the proportion of SDME in the herd. Reducing SDME elk would be beneficial because fewer SDME elk reduces the likelihood of elk conflicts on private land and elk commingling with livestock and will also increase the likelihood of survival of the LDME portion of the herd due to less competition over winter forage and lower elk densities on the Refuge in winters, reducing conditions that lead to high CWD and other disease transmission.

The Service will meet with the cooperating agencies on an annual basis to evaluate the effectiveness of the adaptive management strategies being employed and, additionally, to determine the appropriateness of continuing to supplementally feed elk on the Refuge based on the several factors described in the description of Alternative D above in the “Alternatives”. If the Service determines that supplemental feeding should end on the Refuge to mitigate long term impacts of CWD to the herd when CWD prevalence reaches 3%, then the Jackson elk herd population would be predicted to be like Alternative B (approximately 6,900 in 20 years). Based on USGS modeling, if the Service determines to stop supplementally feeding elk on the Refuge when CWD prevalence reaches 7%, models predict that the average number of elk in the Jackson elk herd will be 6,100 after 20 years.

If the Service decides to continue to supplementally feed elk after CWD prevalence reaches 7%, models estimate that there will be long term population decline in the Jackson elk herd. If the Service continues to supplementally feed elk over a 20-year period, the Jackson elk herd population would decline like Alternative A (approximately 5,200 elk in 20 years). Therefore, Alternative D could potentially result in higher numbers of elk in the Jackson elk herd after 20 years than Alternative A and C, depending on if the Service decides to stop supplementally feeding elk and if harvest strategies are successful or not.

Disease Prevalence

Reducing the number of elk overwintering on the Refuge through hunter-harvest strategies will reduce the density of elk on the Refuge and lessen the conditions for disease transmission and prevalence in the Jackson elk herd. Under Alternative D, as we reach the goal of approximately 5,000 elk overwintering on the Refuge, there will be less need to supplementally feed elk which will also reduce the conditions leading to high disease transmission and prevalence. However, while the Refuge continues to supplementally feed elk, the Service will still be creating conditions where elk congregate in high densities and have the potential to contaminate the soils in the areas of the feedground, leading to a higher CWD prevalence than stopping feeding.

If the Service stops feeding elk under Alternative D if/when CWD prevalence in the herd is between 3% and 7%, the long term CWD prevalence in the herd is estimated to rise to between 23-26% over a 20-year period (USGS SIR, Table B1, page B9). If the Service decides to continue supplemental feeding on the Refuge, CWD prevalence has the potential to rise to 35% over a 20-year period, like Alternative A (USGS SIR, Table B1, page B9). However, the various strategies that could be implemented under Alternative D to reduce the number of elk overwintering on the Refuge could result in shorter feed seasons and more frequent years when feeding is not necessary. Reduced reliance on supplemental feeding could result in CWD prevalence lower than 35%, but still likely higher than if feeding ended completely. Like Alternatives B and C, the SDM analysis assumed continued operation of other feedgrounds in the region with 25–30% of elk in the Jackson elk herd continuing to be fed on State-operated feedgrounds in the Gros Ventre drainage (USGS SIR, Appendices C and D). CWD prevalence would be lower and elk population would be even greater over a 20-year period if feeding were to end on all regional feedgrounds (Cook, et al. 2023).

If feedground practices come to an end on the Refuge under Alternative D, so will the increased risk of other disease prevalence and spread.

Mortality

While the adaptive population management approach of Alternative D encompasses several actions among cooperating agencies, the Service intends for hunter-harvest strategies to be the main action. Under Alternative D, the goal is to reduce the number of elk wintering on the Refuge to approximately 5,000 individuals over the first 10 years primarily through hunter-harvest strategies. The Service predicts that an alternative increasing the harvest of elk will result in the lowest mortality attributable to CWD and natural causes like starvation, predation, injury, vehicle collisions, parasites and other diseases over the first five years (USGS SIR, Appendix C, B9A, page B12). So, the greatest short-term cause of elk mortality under Alternative D would be hunter-harvest.

As discussed for the other Alternatives, CWD and natural causes of death like starvation can cause individuals to experience prolonged periods of suffering as the disease progresses or food sources dwindle. For these reasons, while a greater number of elk will die in the short term overall under Alternative D, they will experience a quicker death through being hunted, avoiding the prolonged negative affective states associated with other mechanisms of mortality.

There is a potential that up to 6,100-7,200 elk could be cumulatively harvested from the Jackson elk herd over the course of 5-7 years of Alternative D through successful hunter-harvest strategies if authorized by the Wyoming Game and Fish Commission (USGS SIR, Appendix G). This is up to 1,028-1,220 elk harvested per year, compared to the average of 850 elk that were harvested per year from 2023-2025. This increase in harvest will aim to target the SDME segment of the Jackson elk herd that summers on private land and the southern portion of Grand Teton.

Wildness

The Service anticipates that Alternative D will impact the wildness dimensions of the SDME and LDME in different ways because the emphasis of the hunter-harvest action under this alternative targets SDME over LDME. In the short term, SDME populations will be greatly reduced over the first five years. While feeding may continue in varying capacities on the Refuge under this alternative, the hunted individuals will not live to experience the unnatural negative psychosocial and psychological states associated with the feedground dynamics (Forristal, et al. 2011). Conversely, LDME populations will continue to experience the stress-causing aggression on these feedgrounds for several years even as the SDME population declines because elevated stress hormones in supplementally fed elk are positively correlated with elk density at the feed lines, not population density (Forristal, et al. 2011). However, as the overall elk population reaches a more sustainable number, the Service anticipates that the supplemental feeding season will be shorter, and some years elk may not be fed at all. In the long term, the future LDME will experience less stress as less supplemental feeding will encourage a return to natural social and behavioral patterns.

While many SDME lifespans will be shorter in the short term under Alternative D, once the elk population reaches a population more in equilibrium with the habitat, more future individuals will be able to live their natural lifespan without having it cut short by CWD, or starvation associated with inadequate winter forage. One study by A.L. Williams and colleagues found that captive elk infected with CWD only lived an average of 4–7 years, even in the absence of other mortality causing pressures like predation or hunting (Williams, Kreeger and Schumaker 2014). For context, another study found that the average age of adult female elk killed by wolves in Yellowstone National Park was 13–16 from 1995–2016, and elk have been known to live upwards of 25 years (Murie 1951, MacNulty, et al. 2020). For these reasons, present and future LDME have a higher chance of living out their potential lifespan under Alternative D, compared to SDME under the same Alternative.

Distribution

Elk distributions will look similar across all alternatives, and similar to current elk distribution, while supplemental feeding continues on the Refuge. If the Service ends supplemental feeding on the Refuge, the exact number of elk that redistribute from the Refuge to other areas will depend on elk numbers during the year that feeding ends. As the population reaches more sustainable levels for the Refuge under Alternative D, less elk may move off the Refuge in the winter, even in the absence of feeding, because natural forage on the Refuge may be sufficient to keep them on the Refuge. However, as discussed under Alternatives B and C experts predict that

elk will move to State feedgrounds in the Gros Ventre drainage in the absence of feeding and lesser percentages will move to the Fall Creek herd unit south of the Refuge or other areas off feedgrounds (USGS SIR, Figure B3, page B7).

Elk: Other Reasonably Foreseeable Effects

Other Feedgrounds

Models project that the Jackson elk herd will decline 37%–47% over a 20-year period depending on Refuge management actions (USGS SIR, Appendix C, Table B1). These models assume that supplemental elk feeding will continue to occur at other feedgrounds in the Jackson elk herd unit and vicinity for at least 20 years. Although long term elk distribution predictions are uncertain, models predict that if feeding ends on the Refuge, 25–30% of elk in the Jackson elk herd will continue to be fed on State-operated feedgrounds in the Gros Ventre drainage (USGS SIR, Appendices C and D), including the two other feedgrounds that support the Jackson Elk Herd located on Bridger-Teton, and that this is why these models project high CWD prevalence in the herd regardless of actions to continue or end feeding on the Refuge. CWD has recently been detected in elk that use State operated feedgrounds south and southeast of the Refuge. A cow elk found dead on the State's Horse Creek feedground tested positive for CWD in February 2025, and 6 elk tested positive for CWD on the State's Dell Creek feedground. Elk collared on the Dell Creek feedground have been observed on the Refuge, which suggests that State operated feedgrounds could be a source of CWD for elk that use the Refuge and for the Jackson elk herd overall.

The continuation of feeding on other feedgrounds is subject to WGFD and State of Wyoming law and policy as well as the property owners of feedgrounds not located on state owned lands. Although all EIS alternatives that end feeding on the Refuge are expected to result in higher numbers of elk in the Jackson elk herd than if feeding continues in the long term, projected differences in CWD prevalence and elk population size between feeding and non-feeding alternatives would be even greater if feeding were to end on all regional feedgrounds (Cook, et al. 2023)

Disease Prevalence in State and Regional Elk Populations

Refuge feeding practices are associated with increased disease prevalence in elk (Cotterill, Cross, et al. 2018), and have the potential to spread infections via elk movements throughout the GYE (Kamath, et al. 2016). So, while the Refuge continues supplemental feeding practices as outlined under the various alternatives, CWD transmission will likely increase and potentially spread CWD to elk populations throughout the GYE. Because CWD prevalence in elk is currently negligible in GYE elk populations, continued elk feeding on the Refuge poses a novel risk to unfed elk populations in northwest Wyoming, Montana and Idaho. The magnitude of this risk has not been quantified and will vary depending on how long the Refuge continues its feeding practices, but continued cross-jurisdictional monitoring of CWD prevalence and elk movements is warranted. As discussed above in "Affected Environment: Disease and Elk," feedground practices on the Refuge have also increased prevalence of Brucellosis, septicemic pasteurellosis, psoroptic mange, necrotic stomatitis, necrotizing pododermatitis (foot rot), and helminth and lungworm parasitism in the Jackson elk herd. Although the population level effects of these

diseases have been minimal for elk, if more serious ungulate diseases were introduced to the Jackson elk herd there could be more serious impacts to the Jackson elk herd population as well as other State and regional elk populations.

Land Development

Only 2.8% of Teton County, Wyoming, is private land, and 31% of private land is under conservation easement. Under the Jackson-Teton CCP adopted in 2012 and amended in 2020, development on private lands will be directed towards areas with existing infrastructure, and natural and agricultural areas will be conserved (Teton County 2020).

Although private land development does represent a significant threat to elk habitat quality (Gigliotti, Atwood, et al. 2023) and migration patterns (Gigliotti, Xu, et al. 2022) throughout the GYE, future private land development in the analysis area will primarily affect SDME and is unlikely to negatively affect summer habitat use or migration patterns of LDME in the Jackson elk herd (Cole, et al. 2015, Cotterill, Cross, et al. 2025). Alternatives B and D propose reducing SDME populations, and therefore the greatest long-term risks to elk habitat quality and migration routes would occur on public lands north and northeast of the Refuge where the LDME migrate in summer. Primary future threats to elk habitat and migration routes on and adjacent to the Refuge are associated with increasing human use of public lands for recreation and associated infrastructure to serve those needs (USGS SIR, Appendix F, Chapter E). Specifically, elk habitat quality and migration route integrity may be affected by disturbance associated with higher human numbers in previously undisturbed areas, trail or multi-use pathway construction and use, and violations of seasonal closures designed to limit human disturbance of elk and other wildlife (Naylor, Wisdom and Anthony 2009, Larson, et al. 2016).

Changing Ecological Conditions

Annual average temperatures and mean annual precipitation have been increasing in the Greater Yellowstone Area (GYA), with significant increases since 1970, although both remain highly variable (Hostetler, Whitlock, et al. 2021). Extreme conditions have also increased. For example, there has been a 24% increase in the amount of rain falling during heavy storms in the region. (U.S. Global Change Response Program: USGCRP 2023). By mid-century, average annual precipitation is projected to be highly variable with both drier and wetter years than experienced historically.

Modeling on changing ecological conditions in the analysis area (see Appendix L) predicts warmer average temperatures, lower soil moisture during the growing season, increased fire risk, reduced snowpack, and lower snow-water equivalent. These results suggest more rain than snow in the future and more rain on snow events. Modeling also suggests lower average annual forage production on the Refuge and other low elevation areas over time. While access to forage may increase in winter due to less snowpack, the warmer temperatures could lead to lower soil moisture content during the growing season. That could lead to less forage production and thus less forage availability during the winter, which could have negative effects on elk calf production and winter survival. However, reduced snowpack at lower elevation areas could increase the amount of available elk winter range compared to current levels (Hobbs, et al. 2003). The net effect of lower forage levels associated with growing season drought and

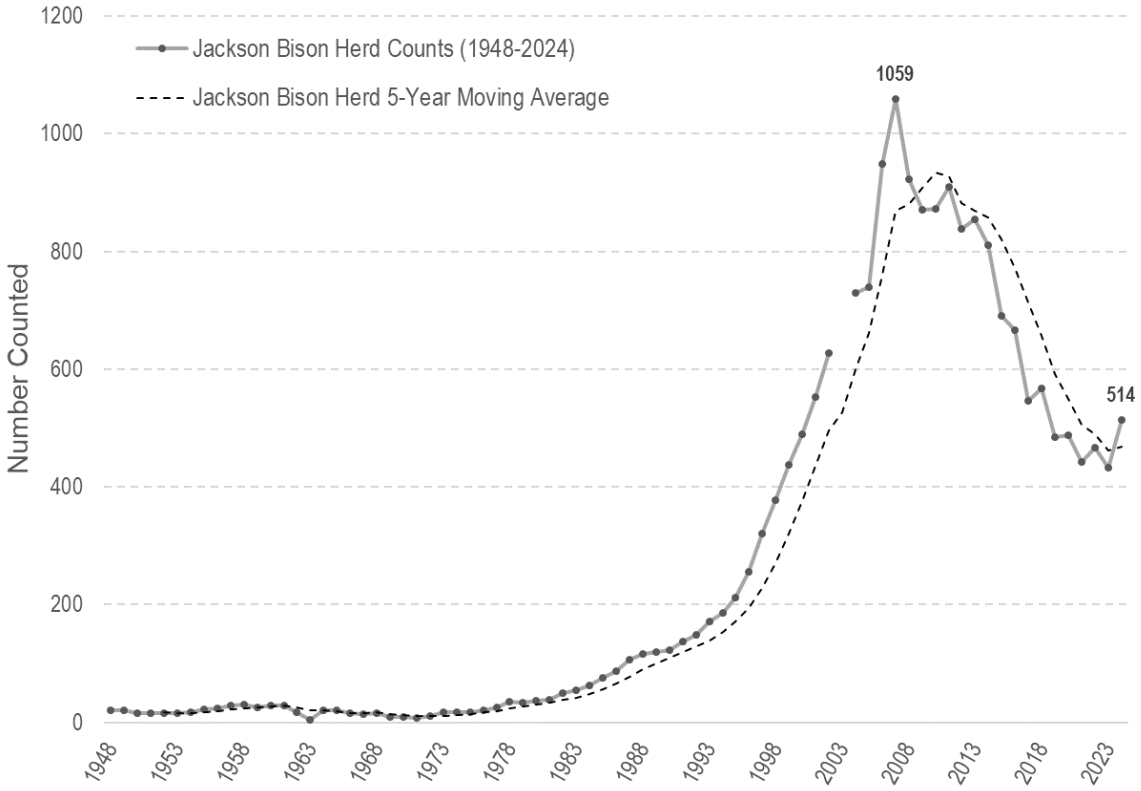

Figure 10. Bison counts for the Jackson bison herd, including the 5-year moving average, 1948–2024.

increased winter range area associated with reduced snowpack on regional elk populations are difficult to predict. See the "Habitat/Vegetation/Soils: Other Reasonably Foreseeable Effects" section below for additional discussion on how changing environmental conditions may affect habitat, vegetation, and soil.

Bison

Bison: Affected Environment

The 2007 BEMP and EIS provide comprehensive documentation of the history, habitat and forage, distribution and movement, behavior and social interactions, breeding, calving, and age and sex classes, genetics, and other factors influencing the Jackson bison herd. Below we concisely discuss those aspects of the Jackson bison herd that are most important for the analysis of the environmental consequences of the Service's proposed action, alternatives, and options.

Consistent with the 2007 BEMP, the bison herd was intentionally reduced from nearly 1,200 animals to approximately 500 (see Figure 10 for the history of the Jackson bison herd population), through hunting programs administered by WGFD. At the highest levels of bison numbers around 2007, it was difficult to keep bison out of the feedgrounds (making it hard to feed elk) and away from the sleigh-rides and the town of Jackson. Hunting continues to be used

as the primary tool to manage the bison population at objective levels and affect bison distribution.

The Jackson bison herd's distribution is nearly entirely within Grand Teton and the Refuge (see Figure 11). Currently, some bison venture onto Bridger-Teton, as well as state and private lands in the vicinity of Kelly and north of Jackson. Prior to 2018, most bison (>90%) overwintered on and around the Refuge. Since 2018, the percentage of the bison herd on Refuge feedgrounds in winter has decreased, ranging from 0% in the mild winter of 2018 to 83% in 2023 (Cook, et al. 2024). During the winter of 2023–2024, most of the Jackson bison herd (approximately 460 bison) was observed using Refuge feedgrounds.

Bison are primarily grazers whose diet is composed of grasses, sedges (*Carex* species, which grow in moist areas), some forbs, and rarely shrubs, and appear to need water (or snow) every day (Cooperrider, Boyd and Stewart 1986). A dietary study conducted on shortgrass plains in northeastern Colorado noted that bison consumed at least 85% grasses and sedges, adding shrubs to their diet when grasses were not available (Peden, et al. 1973).

The breeding season begins in mid-July and peaks during August. Typically, bison are born in the spring. Calving begins by mid-April, but most births occur during May and June, and 95% are completed by the end of July. Large herds of bison of mixed sex and age classes may congregate on range with suitable forage, especially during the rut, but herds seldom spend much time in any one place. Besides the availability of forage, the movement of a bison herd is affected by multiple factors including the onset of snowpack, snowpack magnitude, and herd size (Geremia, Wallen and White 2014).

As winter approaches, bison gradually alter their diets, adding plant species of decreasing palatability and nutritional quality as preferred foods become less available (Leopold 1933, Halfpenny and Ozanne 1989). The amount, quality, and availability of winter and transitional range depend on temperature and precipitation. As forage accessibility declines during the onset of winter, bison tend to move to lower elevations (Geremia, Wallen and White 2014). Halfpenny and Ozanne (1989) found temperature, snow depth, snow density, duration of winter, and lateness of spring to be critical factors affecting moose survival in Grand Teton. These factors would also be critical for bison, although perhaps to a lesser extent due to bison's ability to move snow aside with their heads to access vegetation. Farnes (unpublished data, cited in (Farnes, Heydon and Hansen 1999); (NPS and USFWS 1996)) noted that the northern range Yellowstone bison and elk during 1968–1981 generally foraged in areas with less than 6 inches snow-water equivalent. Snowpack with 1 to 2 inches snow-water equivalent was enough to initiate migration by at least some of the herd.

As ecosystem engineers, the way that bison move and graze across the landscape was found to enhance plant productivity by up to 40% (Frank, Wallen and White 2016), thus modifying where and when spring green up happens across elevations (Geremia, Merkle, et al. 2019).

Predation has not been a significant cause of death in the Jackson bison herd, although wolf predation may be the cause of some bison deaths. Other causes of mortality for the bison herd are hunting (discussed further below), vehicle collisions, and natural causes.

Genetic variability allows populations to evolve under different selection pressures and low levels of population genetic variation result in inbreeding over time (Berger and Cunningham 1994). Chronic inbreeding depression typically results in reproductive failure, poor recruitment, and lack of disease resistance (Halbert, et al. 2004, Giglio, et al. 2016, Hartway, et al. 2020). Recent studies suggest that the loss of genetic variation over time is a concern for nearly all Federal bison herds, and that the most important factors include herd size, age and sex ratios and herd management strategies (Hartway, et al. 2020, Oyler-McCane, et al. 2024). Small, isolated populations with skewed sex ratios are at most risk for impacts from chronic inbreeding, and herds from which adults are regularly removed without effective population OBJOBJ.

The DOI Bison Working Group has recently released guidance for management of bison genetic variability, with recommendations to restore gene flow through strategic translocation of bison among Federal herds (Oyler-McCane, et al. 2024). Although the Jackson bison herd is currently above the threshold for genetic concern, occasionally introducing a few new animals in the future could improve genetic variation. However, at least one bison was documented to migrate from Yellowstone to the Jackson bison herd and produce offspring in the 1990s (Grand Teton unpublished data), suggesting that low levels of animal movement from the Yellowstone to the Jackson bison herd may already exist.

Until recently, cattle hybridization had not been reported in the Yellowstone and Jackson bison herds, although the test historically used was poorly sensitive and is likely to miss low levels of cattle genes. Recent studies suggest that all Federal bison herds may contain very small amounts of cattle genes (Stroupe, et al. 2022), although the Jackson bison herd was not included in this study. Future research will guide implementation of any intentional bison introductions into the Jackson bison herd that may be needed, with careful screening for cattle hybridization and disease.

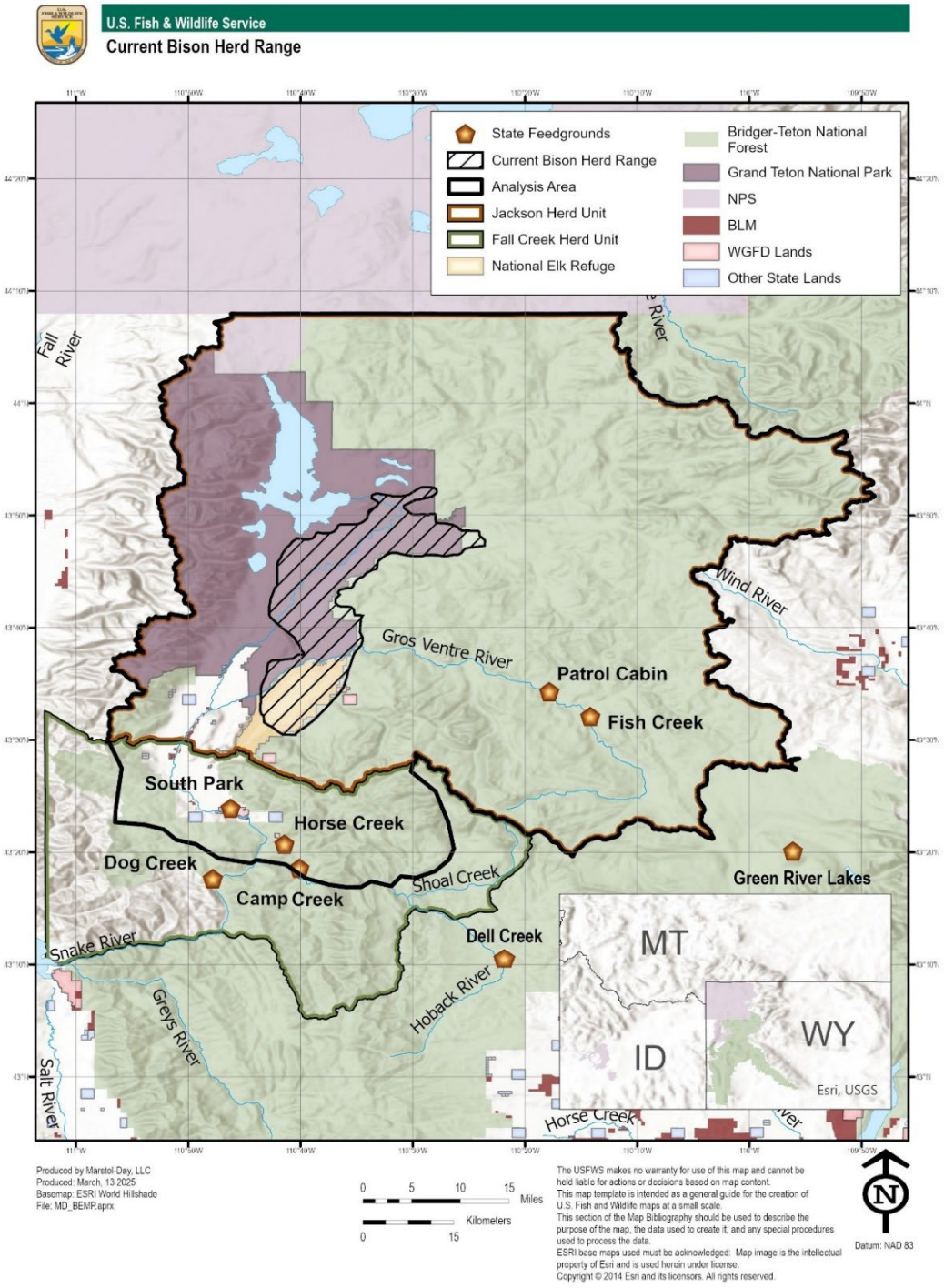

Figure 11. Map of the Jackson bison herd range. The Jackson bison herd's range is almost entirely within Grand Teton and the Refuge, with some bison moving onto Bridger-Teton, as well as state and private lands in the vicinity.

Harvest of Bison

The northern two-thirds of the Refuge is open to bison hunting with seasons running from mid-August through January. Bison harvest is also authorized in portions of Bridger-Teton, but most harvest occurs on the Refuge. Hunting seasons are designed to maintain a herd population objective of 500 bison and to discourage bison use of the Refuge until mid-winter. Over time, bison have begun migrating to the Refuge later in the winter and not migrating to the Refuge at all in years with low snow accumulation. WGFD sets the annual harvest level based on herd size relative to herd objective, harvest success, calf ratios, and bull ratios. In addition, through negotiations with WGFD, the Service authorizes bison harvest for Tribes participating in the Refuge's tribal bison hunt (Compatibility Determination for Cultural Bison Hunting by Federally Recognized Native American Tribes on the National Elk Refuge [2023]). We discuss the harvest of bison in more detail in the "Hunting, Visitor Use, and Experience" and "Cultural and Historical Resources" sections below.

Disease and Bison

A comprehensive history of Jackson bison health is presented in the 2007 BEMP and EIS. Bison mortalities on the Refuge are rare, but testing of a small number of samples collected has not identified any new diseases of concern. Tests conducted through 2018 suggest that parasite and disease presence in the Jackson bison herd have changed little in recent years, including continued exposure to common bovine viral diseases (bovine viral diarrhea, parainfluenza virus-3, and bovine respiratory syncytial virus), bovine brucellosis, and anaplasmosis. No exposure to bovine herpesvirus-1 (infectious bovine rhinotracheitis), epizootic hemorrhagic disease virus or paratuberculosis (Johne's disease) has been detected, with only rare detections of exposure to bluetongue virus in the Jackson bison herd.

As discussed above in the "Disease and Elk" section, brucellosis has been present in elk on the Refuge since at least 1930 (Murie 1951), and even though the bison herds were declared brucellosis free in 1968 after several years of testing, samples collected in the late 1980s revealed that they had been reinfected either by the mid-1970s when they began wintering on the Refuge, or possibly after they discovered the feedgrounds around 1980. Opportunities for brucellosis transmission into and within the Jackson bison herd are high because animals congregate on the feedgrounds. The seroprevalence of brucellosis in unfed bison herds in Yellowstone and Wood Buffalo National Park in Canada ranges from 25% (Tessaro, Forbes and Turcotte 1990) to 70.3% (Roffe, et al. 1999), while the seroprevalence in the smaller, fed Jackson bison herd ranges from 36% to 75% since 1992, with an average seroprevalence of 62.8% (WGFD unpublished data 2026). Therefore, brucellosis can be maintained in bison herds with or without winter feeding, and regardless of herd size. Nevertheless, winter feeding may exacerbate the infection rate by increasing the likelihood of transmission when animals congregate.

Disease associated with *Mycoplasmopsis (Mycoplasma) bovis* is an emerging threat to free-ranging bison causing respiratory illness, lameness, and mastitis that results in 25–60% mortality. This disease was first identified in cattle more than 60 years ago but was only recently found to affect bison (Janardhan, et al. 2010, Woodbury 2012, U.S. Department of Agriculture 2013, Register, et al. 2021, Kaplan, et al. 2024). Naïve herds are especially susceptible to

mortality events from *M. bovis*, although recurrent bouts of illness, reproductive failure and mortality are common in chronically infected herds. Once introduced into a bison herd, this disease is thought to be transmitted through contact with contaminated respiratory secretions, with high rates of contact among bison likely increasing transmission rates. Cattle are the reservoir for these bacteria, which has recently been identified as also causing die-offs in pronghorn (Malmberg, et al. 2020, Johnson, et al. 2022).There are no effective treatments or vaccines to prevent disease from *M. bovis*.

With cattle occurring throughout the region, previous exposure of the Jackson bison herd to *Mycoplasmopsis bovis* is possible. Blood samples from the Jackson bison herd collected from 1997–2018 were included in a large research study (Register, et al. 2021), with results from just 2 of more than 200 samples suggesting possible exposure to these bacteria. However, more recent research has identified problems with blood tests for this disease, and these results are not thought to be reliable. Tissue swabs are now thought to be about 85% effective at detecting infected animals, and tissue swabs are now used to test Jackson bison.

Ten Jackson bison swab samples were collected opportunistically in association with hunter harvest in 2018, with no detections of *Mycoplasmopsis bovis*. Combined with the fact that no bison have been observed sick or dying from this disease, it remains possible that the Jackson bison herd is naïve to *Mycoplasmopsis bovis* disease. The Service continues to conduct testing to better understand the potential for this disease to impact the Jackson bison herd.

Bison: Environmental Consequences

Alternative A: No Action

Population

As modeled in the USGS SIR, feeding will result in a stable herd population with similar bison numbers compared to current conditions (approximately 540 bison) over a 20-year period (USGS SIR, Appendix E, Chapter D-19), absent any emerging or novel disease threats to the bison.

Disease Prevalence

Continuing to feed bison will continue to artificially aggregate bison and will increase the risk of disease prevalence and sustained transmission in the Jackson bison herd, including brucellosis, emerging diseases, such as that caused by *Mycoplasmopsis bovis*, and novel diseases that may appear in the future. Unlike under Alternatives B and C, where bison feeding can be altered or ceased based on disease concerns, there is no disease threshold proposed in Alternative A, so Alternative A will result in the highest risk for adverse impacts to the Jackson bison herd from disease.

Distribution

Bison distribution will likely be like current conditions with most bison seasonally using Refuge feedgrounds during the winter months. As a result of this bison distribution pattern, Alternative A will result in the lowest bison use of private land, the lowest potential for commingling with livestock during the winter months, and the lowest potential for other negative consequences on private land surrounding the Refuge, such as vehicle collisions and human-bison conflicts that are described in more detail in the “Public Health and Safety” section. Preliminary research

suggests that *Mycoplasmopsis bovis* disease transmission may be highest in spring, summer and fall months, so reducing bison contact with cattle during the winter through supplemental feeding is unlikely to significantly reduce the risk of exposure of the Jackson bison herd to this disease.

Mortality

Other than harvest during the hunting season, the greatest bison mortality factor is human-wildlife conflict, either from being hit by car or needing to be euthanized by WGFD due to human-wildlife conflicts. Therefore, continuing to feed bison indefinitely would significantly decrease these mortality factors, but likely result in increased disease transmission (USGS SIR, Appendix E, Chapter D-7), and ensures, absent major disease events, that a minimum of 500 bison can be maintained in the Jackson bison herd.

Wildness

Supplemental feeding negatively affects bison wildness—also described as "wild character" in the DOI Bison Conservation Initiative, the International Union for Conservation of Nature Red List Assessment and other bison conservation guidance documents (Aune, Jorgensen and Gates 2017, U.S. Department of the Interior, Bison Working Group 2020, U.S. Department of the Interior, Bison Working Group 2024). The DOI established a "Shared Stewardship Strategy" for managing all the DOI bison herds in 2024, which lists its first goal as:

Bison are conserved as wildlife. To the fullest extent possible, past and current management maintains the wild character of bison, minimizes artificial selection, and allows forces of natural selection to operate, including natural age and sex demographics, competition for breeding, and the natural expression of behavior and resource selection. Bison are generally not vaccinated or provided medical intervention outside of exceptional circumstances that threaten the conservation value of the herd. Supplemental feeding only occurs when there are urgent conservation needs due to extraordinary conditions or required holding, and only then for the shortest necessary duration. When possible, populations are regulated through natural predation, and/or human hunting, and/or removal selection practices that contribute to maintaining a natural age class demographic (U.S. Department of the Interior, Bison Working Group 2024).

Supplemental feeding affects bison in several ways, including adverse changes to the digestive health (i.e., gastrointestinal microbiome) (Bergmann, Craine, et al. 2015, Bergmann 2017, Rueda, et al. 2023), likely contributing to expansion of the natural calving window, and increased survival of calves born outside the spring and summer seasons that would not occur without supplemental feeding. Behavioral changes also include altered migration patterns and changes in social structure associated with increased density on feedgrounds. Because feeding of bison would not cease under Alternative A, these effects would be the most prevalent and represent long-lasting alterations to the natural evolutionary pathway of bison as native, North American wildlife under this alternative, and reducing the conservation value of the Jackson bison herd to species conservation.

Alternative B: 7 Year Adaptive Management to 3% CWD Elk Prevalence

Population

Continuing to feed bison, when needed to avoid human-wildlife conflict as proposed in this alternative, will likely result in similar bison numbers compared to current conditions (approximately 540 bison) over a 20-year period (USGS SIR, Appendix E, Chapter D). The trigger point for initiating the feeding process will occur when the Service determines that bison movements suggest some may leave the Refuge for adjacent public lands. Hazing might be used preceding feeding to keep bison from leaving the Refuge, thus reducing the chances of human-bison conflict. However, if the Service eventually stops feeding bison completely due to disease prevalence and transmission, the predicted number of bison after 20 years would be lower (USGS SIR, Appendix E, Chapter D).

Disease Prevalence

Continuing to feed bison will continue to increase the risk of disease prevalence and transmission in the Jackson bison herd, including brucellosis, emerging diseases, such as *Mycoplasmopsis bovis*, and novel diseases that may appear in the future. However, under Alternative B, the Service is proposing to monitor novel and emerging disease threats and alter or stop feeding practices if epizootic disease transmission associated with supplemental feeding threatens the bison population, local cattle herds, or other wildlife populations.

Distribution

Under Alternative B, the Service is proposing to continue to feed bison as necessary to avoid human-wildlife conflict, as the USGS SIR notes that the continued feeding alternative had the lowest median number of conflict bison (143 cumulative across 20 years versus 1,077 cumulative over the same time for the no feeding alternative) (USGS SIR, Appendix E, Chapter D7). However, unlike under Alternative A, the Service would stop feeding under Alternative B if any emerging or novel disease threatens to significantly impact the herd. Therefore, this alternative will minimize human-bison conflict to current levels and allow the Service to adaptively manage the feeding of bison to avoid significant disease threats to the herd, likely resulting in the ability to maintain a minimum of 500 bison in the herd.[2]

Mortality

If the Refuge completely stops supplementally feeding bison, there will be increased bison mortality due to an increase in vehicle collisions and the euthanasia of bison by WGFD due to human-wildlife conflict. Unlike Alternative A, Alternative B also proposes to mitigate significant mortality events due to emerging or novel disease threats by altering or stopping feeding if necessary. Therefore, non-hunting related bison mortality levels under Alternative B would be like Alternative A, unless the Service ends or modifies supplemental feeding to reduce disease effects on the population. In that situation, the Service would need to weigh the risks of

[2] Experts agreed that it is four times more likely that bison conflict dynamics will change over time once feeding ends. However, they expressed some uncertainty about the level of human-bison conflicts that might occur. One out of five believed that the number of conflicts would increase over time, but four out of five believed that conflict would decrease over time. This led to a high degree of uncertainty but still shows an overall declining trend for conflict once feeding has stopped (USGS SIR, Appendix E, Chapter D7).

bison mortality from disease against the risks of mortality by vehicle collision or conflict-associated euthanasia to determine the best course of action.

Wildness

As described above in Alternative A, continued feeding would result in continued adverse effects to the bison's gut biome and digestive health, altered migration patterns, behavior and changes in social structure. The effects of feeding on migration, distribution and behavior are known and have been used by the Service specifically to change natural migration and distribution patterns to reduce human and livestock conflict. If the Service needed to scale back or eliminate the supplemental feeding of bison under Alternative B due to disease concerns, the effects to the bison's gut biome and digestive health would be reduced, and a more natural migration pattern and social hierarchy could eventually be established as well. However, the return of the Jackson bison herd to a more natural condition to protect the herd from disease impacts could also increase human-wildlife conflicts on nearby private lands.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Population

Under Alternative C, the Service would stop feeding bison after 5 years. The USGS SIR predicted the number of bison on the Refuge after 20 years under this alternative would be lower than currently exists, at an average of 473 bison (USGS SIR, Appendix E, Chapter D7). This is due in part to an estimated 3–25% decrease in the survival rate of conflict bison associated with vehicle collisions and euthanasia actions by WGFD once feeding ends. (USGS SIR, Appendix E, Chapter D12).

Disease Prevalence

As described in the alternatives above, continuing to feed bison would continue to increase the risk of disease prevalence and sustained transmission in the Jackson bison herd. However, under Alternative C, these risks would be significantly reduced once supplemental feeding ends after year five.

Distribution

Returning the Jackson bison herd to a natural condition after feeding ends will likely result in increased bison use of areas off the Refuge during the winter. Once supplemental feeding ends, it is anticipated that these distribution changes would result in approximately 760 cumulative conflict bison losses over 20 years versus approximately 140 under the status quo as bison leave the Refuge in search of new sources of winter forage (USGS SIR, Appendix E, Chapter D7).

Mortality

If the Refuge ends supplemental feeding of bison under this alternative, there may be increased bison mortality due to an increase in vehicle collisions and the conflict-associated euthanasia of bison by WGFD due to the projected significant increase in human-wildlife conflict noted above, due to the increased dispersal behavior of adults searching for alternative food sources in the absence of supplemental feeding. Although the uncertainty in the estimated mortality of conflict bison is high with anywhere from a 3–25% decrease projected in the survival rate of conflict

bison, increased mortality of bison is likely to occur under Alternative C after supplemental feeding is stopped. (USGS SIR, Appendix E, Chapter D12).

Wildness

As described above in Alternative A, continued feeding would result in continued adverse effects to the bison's gut biome and digestive health, altered migration patterns, behavior and changes in social structure. Therefore, ending supplemental feeding after 5 years would be anticipated to have a positive effect on bison digestive health, and would eventually create a more natural migration and distribution pattern and social structure for the bison herd as they search out new sources of winter forage. However, the return of the Jackson bison herd to a more natural condition after 5 years could also increase human-wildlife conflicts on nearby private lands.

Alternative D : Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Population

The population of bison on the Refuge would be like that of Alternative A, given that supplemental feeding of bison would continue under both alternatives. Therefore, the estimated herd population would be 541 bison after 20 years (USGS SIR, Appendix E, Chapter D7). However, given the conditions outlined below related to disease and human-wildlife conflicts that may arise from sustained supplemental feeding, the adaptive management strategies included in Alternative D may be needed to address these risks to successfully manage for the desired minimum population of 500 bison.

Disease Prevalence

The level of disease prevalence would be like that of Alternatives A and B when supplemental feeding occurs. Also, like Alternative B, Alternative D provides for adaptive management strategies such as pausing or ending supplemental feeding should epizootic disease introduction and transmission become a concern. Therefore, the prevalence of existing disease and risk from novel diseases in the bison herd is expected to remain stable under this alternative.

Distribution

Like under Alternative B, the Service is proposing to continue to feed bison as necessary to prevent interference with elk feeding and to avoid human-wildlife conflict. Supplemental feeding, coupled with hazing as needed, would be expected to keep bison from roaming onto adjacent properties.

Mortality

As previously discussed, supplemental feeding reduces the potential for wildlife-vehicle collisions and human-wildlife conflict. However, it can lead to the concentration of animals on feedgrounds and the spread of epizootic diseases. Therefore, this alternative is likely to have both positive and negative effects on bison mortality. The Service would need to weigh the risks of bison mortality from disease against the risks of mortality by vehicle collision or euthanasia by WGFD due to human-wildlife conflicts to determine the most appropriate adaptive management strategies that minimize overall mortality.

Wildness

As described previously, continued feeding would result in continued adverse effects related to the bison's gut biome and digestive health, altered migration and distribution patterns, and changes in social structure. If the Service decides to scale back or eliminate completely the supplemental feeding of bison due to disease concerns, the effects on the bison's gut biome and digestive health would be reduced, and a more natural migration pattern and social structure could eventually be established as well. However, the return of the Jackson bison herd to a more natural condition to minimize the impacts of disease could also increase human-wildlife conflicts on nearby private lands. The adaptive management strategies outlined within this alternative would be used to balance the potential adverse effects to bison with the need to minimize human-bison and bison-livestock conflict.

Bison: Other Reasonably Foreseeable Effects

Disease Transmission

Because the feeding program at the Refuge must be considered within the larger landscape context, the effects of feeding and disease transmission apply at a broader scale. It is possible that if the Service stops feeding bison, WGFD will continue supplemental feeding at an alternative site to reduce human-wildlife conflicts and that the risk of disease transmission will continue for the bison herd. Such feeding by WGFD would also result in continued negative impacts to the wildness and wild character of bison (e.g. digestive health, altered distribution and migration patterns, and changes in behavior and social structure).

Increasing Population and Visitation

There have been slight increases in regional population and Refuge visitation occurring in recent years (as described later in the "Hunting, Visitor Use, and Experience" and "Economics" sections), which could exacerbate the increased risk of human-wildlife conflict, including vehicle collisions.

Several projects to reduce wildlife-vehicle incidences across Wyoming are being proposed and proponents are seeking funding for these projects to be implemented, such as one project being considered by WGFD and the Wyoming Department of Transportation (DOT) on WY Highway 26/287 and called the Wind River to Grand Tetons Wildlife Crossing on the Togwotee Trail (The WYldlife Fund 2024a). On average, 28 wildlife-vehicle crashes are reported to law enforcement, at an estimated value of $791,400, with an additional 131 animal carcasses removed from the roadways annually (Wyoming Game and Fish Department 2024c). So, if projects like these are annually fully-funded and implemented on areas where bison cross busy roadways, they may help prevent some wildlife-vehicle collisions that would have otherwise occurred if bison are no longer fed on the Refuge and reduce the overall impacts of vehicle collisions to bison. (The WYldlife Fund 2024a).

In general, as described previously, supplemental feeding of bison and other wildlife alters their natural migration routes and behaviors. Migration routes and behaviors have also been impacted by a growing human population and expansion of private residences, businesses, and ranches limiting habitat and range. The Jackson area has experienced significant growth and development since the Jackson bison herd was established and continues to see slight increases

in human population growth and expansion today. It is therefore anticipated that the reasonably foreseeable effects of supplemental feeding, whether taking place on the Refuge or elsewhere, when combined with population growth, will continue to drive unnatural migration patterns among the bison herd.

Changing Ecological Conditions

As discussed above under "Elk: Other Reasonably Foreseeable Effects," annual average temperatures and mean annual precipitation have been increasing in the Jackson Hole area, with significant increases since 1970, although both remain highly variable (Hostetler, Whitlock, et al., Greater Yellowstone climate assessment: past, present, and future climate change in greater Yellowstone watersheds 2021). Modeling on how the changing ecological conditions in the analysis area (see Appendix K) predicts warmer average temperatures, lower soil moisture during the growing season, increased fire risk, reduced snowpack, and lower snow-water equivalent (e.g., more rain than snow in the future). This could result in higher winter forage availability due to reduced snowpack over a shorter winter season. Conversely, forage quantity and quality could be reduced due to drier soil conditions during the growing season, and more rain during the winter could increase snow density and icing that reduces forage availability. The net effect of these ecological factors on habitat quality for bison are difficult to predict.

Other Wildlife

Other Wildlife: Affected Environment

The Refuge provides habitat for several wide-ranging fish and wildlife species. The 2007 BEMP and EIS, as well as the Refuge's CCP, provide comprehensive documentation of the other fish and wildlife species utilizing the Refuge and the impact of the current management of the Refuge on these species. The categories of species most likely to be affected by bison and elk management are (1) other ungulates, in terms of competition for food, habitat changes, and potential for disease transmission, (2) predators and scavengers, in terms of their food base and potential for disease transmission, and (3) other species that could be affected by changes in habitat (U.S. Fish and Wildlife Service 2007).

Other Ungulates

The GYE supports large migratory herds of numerous ungulates due to its climate, geology, elevational and vegetational diversity, and relatively undeveloped state. In addition to bison and elk, pronghorn, mule deer, white-tailed deer, bighorn sheep, and moose occur within the primary analysis area and on the Refuge. White-tailed deer are not abundant, and nonnative mountain goats have little habitat overlap with bison and elk, so impacts on these species are not analyzed.

In the GYE, as in most areas, winter is the critical period for ungulates. Snow depth and density limit the amount of range accessible for use (Gilbert, Wallmo and Gill 1970). The severity of the winters also makes ungulates more vulnerable to other stresses. Unfamiliar human activity on winter range can be extremely draining on energy reserves compared to predictable and habitual activities, or to disturbances occurring during other seasons.

Predators and Scavengers

Comprehensive background information on gray wolf ecology and use of the Refuge and analysis area is described in the 2007 BEMP and EIS. As mentioned above in "Elk: Affected Environment," between 2018 and 2024, WFGD identified six (20%) of thirty of collared elk mortalities in the Gros Ventre drainage were due to wolves (Aly Courtemanch, Wildlife Biologist, WGFD, Jackson, WY, personal comm., 2024). The diet of wolves is primarily large ungulates, including deer and elk. Their diet also includes small mammals (Lodberg-Holm, et al. 2021). While wolves have the biological and social attributes to kill a wide array of ungulates, these same attributes are insufficient to allow wolves to be consistently successful hunters of any one particular prey species (Smith, Stahler and MacNulty 2020). Wolves seek out prey animals that are easily killed because of their small size, old age, poor health, or treacherous surroundings. They may test more prospective prey than they actually kill. As a result, the success rate of wolves hunting elk in northern Yellowstone has rarely exceeded 20% and drops to less than 10% when only adult elk are considered (Smith, Stahler and MacNulty 2020). About half of elk killed by wolves in northern Yellowstone are calves, a pattern that has changed little since wolf reintroduction (Smith, Stahler and MacNulty 2020). They also kill older females. This selective predation may limit the impact of wolves on elk abundance (Smith, Stahler and MacNulty 2020). As mentioned earlier in this EIS, between 2018 and 2024, WFGD identified six (20%) of thirty collared elk mortalities in the Gros Ventre drainage were due to wolves (Aly Courtemanch, Wildlife Biologist, WGFD, Jackson, WY, personal comm., 2024). As suggested by Barker, et al. (2023), the presence of two State managed elk feedgrounds near these kills shows that the feedgrounds provide considerable food benefit for wolves, and wolf predation can limit elk population increases associated with supplemental feeding (Dugovich, et al. 2025).

Coyotes are plentiful in the GYE, including the Refuge, Grand Teton, and Bridger-Teton. Coyotes are opportunistic predators that readily feed on carcasses, but they also catch a variety of small mammals from mice, squirrels, and rabbits to deer and pronghorn fawns and elk calves. They also feed on insects and fruit. In winter, elk and occasionally bison carcasses on the Refuge are an important part of their diet. In the spring coyotes may take elk calves during the first month of life. They rarely can kill bison calves due to the presence of the herd and protective mothers.

In addition to gray wolves and coyotes, cougars, black bears and other small mammalian predators and scavengers also utilize the Refuge and analysis area but will likely not be impacted by bison and elk management on the Refuge, because they do not rely on bison or elk to meet their nutritional needs.

Avian Predators and Scavengers

Bald eagles, Golden eagles, peregrine falcons, prairie falcons, red-tailed hawks, Swainson's hawks, American kestrels, rough-legged hawks, and other raptors are seasonal residents in Jackson Hole. Some of these raptors feed opportunistically on carcasses, especially in winter (see Figure 12). Black-billed magpies and common ravens are omnivores that eat a wide variety of insects, rodents, lizards, and frogs, as well as eggs and hatchlings of other birds. They often feed as scavengers on carcasses and human garbage. Elk carcasses are an important source of food in the winter for avian scavengers on the Refuge.

Other Species

Approximately 175 bird species occur on the Refuge, including several species of Neotropical migratory birds, which breed in North America and spend their winters in the tropics. Throughout their range, Neotropical migratory birds have been experiencing population declines (Terborgh 1989, U.S. Geological Survey 1999). Habitat fragmentation and degradation, as well as destruction of winter range, are at least three factors believed to be responsible for these declines (Dobkin and Wilcox 1986, D. S. Dobkin 1994, Martin and Finch 1995, George and Dobkin 2002).

Small mammal species in the Jackson Hole area are abundant and include ground squirrels, mice, voles, shrews, chipmunks, tree squirrels, muskrats, northern pocket gophers, pikas, cottontails, and snowshoe hares. Large rodents that occur in Jackson Hole are yellow-bellied marmots, porcupines, and beavers.

Only 11 reptile and amphibian species are present in Jackson Hole because of the high altitude and its associated cool climate. Most species are observed throughout the valley floor and foothill regions, especially along the Snake River, Buffalo Fork, and Gros Ventre River floodplains; some also inhabit the mountains up to 10,000 feet elevation.

Figure 12. Bald eagle scavenging on elk carcass on the Refuge. Photo Credit: Andrea Brophy

Flat Creek, and its associated marshlands, are integral for the natural recruitment of native trout and other native fish species for the Snake River watershed. Flat Creek and the lower portion of Nowlin Creek, a tributary of Flat Creek, provide a native fishery of trophy Snake River cutthroat trout. No stocking occurs in Flat Creek, making natural recruitment the only source of native trout. Both Flat and Nowlin Creeks are important spawning and recruitment streams for this species, and these creeks along with the Gros Ventre River are managed as wild Snake River

fine-spotted cutthroat trout fisheries and are important habitat for other native fish species. The Refuge is currently working with WGFD to evaluate potential enhancement and restoration projects for portions of Nowlin Creek. The relatively high number of elk using the Refuge has caused bank erosion and degradation through hoof shearing of Nowlin Creek, upstream of where it enters Flat Creek, in several locations, resulting in a wider, shallower stream bed that is not conducive to fish passage or adequate water depth for fish refugia (Roper and Saunders 2021).

Multitudes of invertebrate species occur on the Refuge in all habitat types. Invertebrates provide key functions within ecosystems through decomposition and nutrient cycling, pollination, herbivory, and as predators and prey.

Other Wildlife: Environmental Consequences

Alternative A: No Action

Other Ungulates

In the GYE, winter is the critical period for ungulates (mule deer, white-tailed deer, moose), as snow depth and density limit the amount of range accessible for use. The severity of winters also makes ungulates more vulnerable to other stresses, including disease, competition for forage and predation. Under Alternative A, the continued high density of elk and bison on the Refuge coupled with large congregations of animals on feed lines increases the risk of disease prevalence and transmission, including CWD which is contagious to elk, deer, and moose. The prevalence of CWD in elk is expected to be 35% after 20 years under this alternative (USGS SIR, Appendix C, Table B1), the highest of alternatives; therefore, posing the greatest risk of transmitting CWD to other ungulates.

In general, elk numbers are predicted to decline under all alternatives in the long-term, both on the Refuge and off the Refuge. Elk population decline will likely reduce competition for forage resources between elk and other ungulate species in the long term. Finally, as the elk population declines, potential prey switching by wolves from elk to moose and other ungulate species is possible. Assuming that there is a direct relationship between elk abundance and lower wolf predation on moose and other ungulate species, then Alternative A will have the greatest potential to cause wolves to switch from killing elk to other ungulates, and the greatest negative effect on other ungulate populations of any of the alternatives, because Alternative A is predicted to result in the lowest elk numbers over a 20-year period., Therefore, while continuing to provide supplemental feed in the winter lowers competition for winter forage in the short-term, the long-term decline in the elk population will lead to increased risk of disease and predation to other ungulates.

Predators and Scavengers

As discussed above in the "Elk: Environmental Consequences," we predict that the elk population will significantly decrease through the 20-year period of analysis due to CWD prevalence and associated mortality, with the elk population predicted to be the highest in the short term but the lowest in the long term under Alternative A. This will reduce availability of elk and elk carcasses to predators and scavengers over time which may result in a decrease in populations of these species and/or a shift of habitat utilization within and outside of the analysis

area. However, this group of species utilizes food resources opportunistically and the potential to shift to other animals and carcasses as a food resource may buffer impacts to populations.

With continued supplemental feeding of elk under Alternative A—No Action, there would be no change in the elk kill rate by wolves, particularly in proximity to elk feedgrounds in the Gros Ventre drainage as the elk population continues to decline because of CWD (i.e., 0–20 years). During this period, wolves would continue to target calves and older females. Carcasses of elk suffering from CWD would continue to be incinerated but some carcasses would be available to wolves in the short term. However, the gradual nature of the decline in the elk herd over this 20-year period would also allow gradual adjustment of the wolf population in the GYE such that there would be no detectable impacts to wolves under Alternative A. Furthermore, wolves may substitute bison for elk with a smaller elk herd. Using data from 1995–2015, Smith et. al (2020) reported that wolves seldom hunt bison because capture success has been limited. Rather, wolves scavenge bison carcasses and have increasingly replaced elk biomass with bison (and potentially other ungulates) biomass in their diet. In addition to prey biomass being the primary driver of wolf populations, other intrinsic regulatory factors including vital rates and associated social behavior may buffer impacts to wolves and wolf packs using the analysis area (Smith, Stahler and MacNulty 2020). Elk biomass (both live and in the form of carcasses) is predicted to decline over time under all alternatives, but the future effects on wolf numbers and pack dynamics are uncertain. Jackson elk herd winter range densities are still predicted to be relatively high compared to other areas in the northern Rocky Mountains and, with other food sources available, could be high enough to support a similar number of wolf packs than exist currently.

Other Species

The 2007 BEMP and EIS provide comprehensive analysis of how current management of bison and elk on the Refuge—including the supplemental feeding program on the Refuge as outlined in Alternative A—has impacted other fish and wildlife species utilizing the Refuge particularly through the alteration of habitat on the Refuge. Those environmental consequences outlined in the 2007 BEMP and EIS remain similar today and are summarized below.

On the Refuge, the small or narrow patches of riparian and aspen woodland habitats important to many bird species are often in poor condition due to over browsing by ungulates. Much of this is attributed to the decline of woody vegetation on the Refuge from 90 years of heavy browsing by elk and more recently by bison. However, even if these patches are protected in some manner resulting in improved condition, Neotropical migratory birds and other species may not benefit because of the size and shape of the individual patches. To both improve the condition of the plant community and benefit the survival and reproduction of Neotropical migratory birds, care must be taken to ensure that preserved habitats are large enough. Continued supplemental feeding will result in riparian and aspen woodlands on the Refuge continuing to support a less diverse community of birds and other species.

Sagebrush and grassland plant communities provide important breeding habitat between May and mid-July to some Neotropical migrant bird species, and these cover types are abundant on the Refuge. Typical bird species that nest in the sagebrush shrublands community are sage thrashers, Brewer's sparrows, and sage sparrows. Many sagebrush bird species are declining as

habitat throughout the West is converted to farmland and development. As aspen and riparian habitats on the Refuge are converted to sagebrush habitat due to heavy elk and bison browsing, more sagebrush shrubland habitat will become available to bird species dependent on this habitat.

Overgrazing by elk and bison reduces residual cover that would otherwise be available to small mammals. Large numbers of elk and bison, along with management activities designed to produce more forage for elk and bison, could decrease rodent populations, which would adversely affect avian and mammalian predators.

Bison and elk probably do not affect marmots, but the decline of woody vegetation on the Refuge due to over browsing by elk and bison has likely reduced the amount of habitat available for porcupines and beavers (Smith, Cole and Dobkin, Imperfect Pasture: A Century of Change at the National Elk Refuge in Jackson Hole, WY 2004).

The elk population decline predicted under all alternatives will serve to facilitate habitat restoration and recovery on the Refuge and will typically benefit most species of small mammals, large rodents, birds, reptiles and amphibians as discussed further in the "Native Habitat: Environmental Consequences" section.

Additionally, the reduction in elk use of the Refuge coupled with the ongoing efforts by the Refuge and WGFD to restore portions of Nowlin Creek that have suffered bank erosion and degradation through hoof shearing will result in better fish passage, additional portions of the stream having adequate water depth for fish refugia and overall improvement to fish habitat conditions. The rate at which habitat restoration and recovery occur on the Refuge is dependent on the timing of each alternative's success in reducing the elk population utilizing the Refuge.

Under this alternative, invertebrates will recover slower than compared to Alternatives B, C and D. A reduction in elk numbers on the Refuge could allow for the establishment of woody species and increase forb production and diversity. These changes can elicit a trophic cascade, improve native invertebrate diversity and abundance and increase the ecosystem services they provide.

Alternative A, which promotes supplemental feeding and the associated concentration of elk on the Refuge through the entire period of analysis (20 years) will result in the slowest habitat restoration and recovery efforts.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Other Ungulates

As discussed under Alternative A, winter is a time when ungulates are more vulnerable to other stresses, including competition for forage and predation. While most mule deer migrate to lower elevation winter complexes, a small portion (approximately 200–300 individuals) choose to winter in the urban and suburban areas around Jackson, WY, including the Gros Ventre Buttes, lower Cache and Twin Creeks, and the town of Kelly. Competition between elk and mule deer occupying this minimal winter range may initially increase once supplemental feeding is eliminated and additional elk disperse to other local winter range. However, efforts to reduce short-distance migrant elk (SDME), combined with an overall reduction of the Jackson elk herd

due to cessation of feeding, will result in less competition between elk and mule deer through the period of analysis and will benefit mule deer in the northern extent of the Sublette Range Mule Deer Herd. Additionally, competition for forage and space with bighorn sheep and moose may be affected by changes in elk distribution, both on and off the Refuge. While the long-term decline in elk numbers is expected to alleviate competitive pressure, the short-term redistribution of elk following the cessation of feeding could temporarily increase competition for limited winter resources among these ungulate species.

Potential prey switching by wolves from elk to other ungulate species is possible. Assuming that there is a direct relationship between elk abundance and lower wolf predation on other ungulates, then Alternative B will have the least potential to cause wolves to switch from killing elk to other ungulates of all the alternatives because it is predicted to result in the greatest elk numbers over a 20-year period. Also, because Alternative B is predicted to result in the lowest CWD prevalence of all the alternatives, this alternative also is predicted to result in the lowest risk of CWD transmission to other ungulates.

Predators and Scavengers

Despite significant declines, the elk population is predicted to be the highest under Alternative B over the 20-year period. However, the significant reduction in elk biomass (both live and carcasses) may result in a decrease to populations of these species and/or a shift of habitat utilization within and outside of the analysis area. However, this group of species utilizes food resources opportunistically and the potential to shift to other animals and carcasses as a food resource may buffer impacts to populations.

Under Alternative B, wolves would continue to target prey on calves and older females in the Gros Ventre drainage, particularly in proximity to feedgrounds. This pattern would continue until the disease threshold was reached or seven years passed. During the first several years of implementation, winter mortality of elk due to starvation (non-CDW) may attract wolves to carcasses on the Refuge. Following that, the number of carcasses would decline until the elk herd reached a stable population around 5,000. As documented by Smith et. al, 2020, the wolf population could adjust to fewer elk through intraspecific strife (i.e., wolves killing each other). Even so, as the Jackson elk herd is still projected to be one of the highest density elk herds around the GYE (Cook, et al. 2023), there would still be many elk on the landscape to support sustainable wolf populations and potentially the same number of wolf packs that exist currently. Additionally, wolves will likely substitute scavenged bison (and potentially other ungulates) biomass for some of the decreased elk biomass with a smaller elk herd. In addition to prey biomass being the primary driver of wolf populations, other intrinsic regulatory factors including vital rates and associated social behavior may buffer impacts to wolves and wolf packs using the analysis area (Smith, Stahler and MacNulty 2020). While the future effects on wolf numbers and pack dynamics are uncertain, the impacts to wolves are not predicted to be significant.

Finally, there would be the potential for increased human-wolf interaction in the landscape due to increased hunter-harvest strategies proposed. Wolves prioritize acquiring prey over avoiding humans, which could result in potential conflict with human hunters for ungulate prey and thereby increase wolf mortality (Barker, et al. 2023). While this may affect wolf behavior and

dynamics and result in some increase in wolf mortality, it is not predicted to have population-level impacts on wolves.

Other Species

Long term beneficial effects to other species will be like Alternative A; however, short term benefits to other species will likely be greater under Alternative B because the elk population overwintering on the Refuge is predicted to decline most quickly under Alternative B, speeding up habitat restoration and recovery efforts.

Under this alternative, invertebrates may recover faster than Alternatives A. A reduction in elk numbers on the Refuge could allow for the establishment of woody species and increase for production and diversity. These changes can elicit a trophic cascade, improve native invertebrate diversity and abundance and increase the ecosystem services they provide.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Other Ungulates

Like Alternative B, the long-term decline in elk numbers is expected to alleviate competition between elk and other ungulates; however, the short-term redistribution of elk following the cessation of feeding could temporarily increase competition for limited winter resources among these ungulate species. Unlike Alternatives B and D, Alternative C does not include strategies to reduce SDME, and so the increased competition between elk and mule deer may be greater in the short-term than these alternatives.

Under Alternative C, continued concentration of elk on feed lines through year five of implementation will exacerbate the risk of disease prevalence and transmission to other ungulates, including CWD; but Alternative C is predicted to have one of the lowest CWD prevalences of the alternatives considers, and, therefore, lower CWD transmission risks to other ungulates over a 20-year period.

Also like all alternatives, potential prey switching by wolves from elk to other ungulate species is possible as the elk population declines.

Predators and Scavengers

Similarly to Alternative B, Alternative C will have impacts to food sources to predators and scavengers a decreasing supply of elk biomass on the Refuge because the elk population will be reduced significantly in both the short term and long term. However, unlike Alternative B, under Alternative C there may also be less bison and thus less bison biomass for predators and scavengers in the landscape in the long term. This potential reduction in both elk and bison biomass available to predators and scavengers in both the short term and long term may result in a decrease in populations of these species and/or a shift of habitat utilization within and outside of the analysis area. However, as described under Alternative B, predators and scavengers utilize food resources opportunistically and the potential to shift to other animals and carcasses as a food resource may buffer impacts to populations.

Like Alternative B, winter mortality of non-CWD elk due to starvation in the short term (first five years) may provide wolves and other predators with some additional carcasses as a food

source in the spring, which would decrease after approximately five years. In addition, the wolf population would likely adjust to fewer elk through intraspecific strife (i.e., wolves killing each other). Even so, the Jackson elk herd is still projected to be one of the highest density elk herds around the GYE (Cook, et al. 2023), so there would still be many elk on the landscape to support wolves under Alternative C. Additionally, wolves will likely substitute scavenged bison biomass (and potentially other ungulates) for some of the decreased elk biomass with a smaller elk herd. In addition to prey biomass being the primary driver of wolf populations, other intrinsic regulatory factors including vital rates and associated social behavior may buffer impacts to wolves and wolf packs using the analysis area (Smith, Stahler and MacNulty 2020).

Other Species

Short term and long-term impacts to other species on the Refuge will be like Alternative B with a potentially slightly longer habitat restoration and recovery period depending on when the elk herd reaches 3% CWD prevalence and the Refuge stops supplemental feeding of elk under Alternative B.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Other Ungulates

Under Alternative D, continued concentration of elk on feed lines will exacerbate the risk of disease prevalence and transmission to other ungulates, including CWD. This risk could decrease sooner, relative to Alternative A, which has no adaptive process for determining if feeding continues to be appropriate, and later relative to Alternative B, which has a certain stop to supplemental feeding when the Jackson elk herd reaches 3% CWD threshold. In addition, the increased harvest of elk, with emphasis on SDME, under Alternatives B and D may serve to further reduce the risk of disease transmission to other ungulates by simply reducing the elk population earlier in the implementation of these alternatives.

Continued supplemental feeding of elk will reduce forage competition with other ungulates. Like Alternatives B and C, efforts to reduce SDME will facilitate a reduction competition between elk and mule deer through the period of analysis (20 years) and may benefit mule deer in the northern extent of the Sublette Range Mule Deer Herd.

Like all alternatives, potential prey switching by wolves from elk to other ungulate species is possible as the elk population declines.

Predators and Scavengers

While the elk population is predicted to decline under all alternatives, the elk population after 20 years is highly variable under Alternative D and could between approximately 5,200-6900 elk. Like all alternatives, this will reduce availability of elk biomass to predators and scavengers in potentially both the short term and long term which may result in a decrease in populations of these species and/or a shift of habitat utilization within and outside of the analysis area. However, this group of species utilizes food resources opportunistically and the potential to shift to other animals and carcasses as a food resource may buffer impacts to populations.

Wolves would continue to target prey on calves and older females in the Gros Ventre drainage, particularly in proximity to feedgrounds. This pattern will continue until if the Service decides to stop supplemental feeding, which at that time, as documented by Smith et. al, 2020, the wolf population could adjust to fewer elk through intraspecific strife (i.e., wolves killing each other). Even so, as the Jackson elk herd is still projected to be one of the highest density elk herds around the GYE (Cook, et al. 2023), there would still be many elk on the landscape and likely sufficient to support similar numbers of wolf packs. Additionally, wolves will likely substitute scavenged bison (and other ungulate) biomass for some of the decreased elk biomass with a smaller elk herd. In addition to prey biomass being the primary driver of wolf populations, other intrinsic regulatory factors including vital rates and associated social behavior may buffer impacts to wolves and wolf packs using the analysis area (Smith, Stahler and MacNulty 2020). Ultimately, the future effects on wolf numbers and pack dynamics are uncertain.

As under Alternative B and potentially to a greater degree, there would be the potential for increased human-wolf interaction in the landscape due to increased hunter-harvest strategies proposed. Wolves prioritize acquiring prey over avoiding humans, which could result in potential conflict with human hunters for ungulate prey and thereby increase wolf mortality (Barker, et al. 2023).

Also, like Alternative B, successful reduction of the SDME portion of the Jackson elk herd will reduce the population while minimizing the reduction of the LDME portion of the herd. This will, in turn, minimize the potential impact on predators and scavengers that utilize the LDME through the GYE.

Other Species

Impacts to other species on the Refuge will likely be like Alternatives B and C with a potentially slightly longer habitat restoration and recovery time depending on the success of reducing the population of elk overwintering on the Refuge over a 10-year period and if/when the Service determines to stop supplemental feeding practices.

Other Wildlife: Other Reasonably Foreseeable Effects

Land Development

The Jackson Hole area has experienced significant growth and development since the Refuge was established in 1912 and this area continues to see slight increases in human population growth and expansion today. As discussed later in this EIS (“Land Use and Development: Other Reasonably Foreseeable Effects” section), the vulnerability of the area to residential development is moderate to high (Pocewicz, et al. 2014). With approximately one third of Teton County already under residential or commercial use (Teton County 2020), as additional ranchland and other privately-owned open space is converted to those uses, loss of vegetation can be anticipated, with ripple effects on the wildlife species that rely on that forage (Wyoming Game and Fish Department 2017a). This past and current residential and commercial development has resulted in a significant decrease in wildlife habitat and had adverse effects for wildlife. However, under all the alternatives, there is anticipated to be a positive impact to wildlife habitat on the Refuge as the elk population on the Refuge reaches more sustainable numbers. Additionally, Teton County is actively engaged in land use planning, and nearly 65%

of development over the last 10 years has occurred in already developed areas, so coordination with the County, the town of Jackson, and other entities involved in regional planning could help alleviate some of the effects on vegetation and native habitat in the future.

Human-Wildlife Conflicts

As discussed in more detail above in the "Bison: Other Reasonably Foreseeable Effects" section, several projects to reduce wildlife-vehicle incidences across Wyoming are being proposed and in the process of seeking funding to implement, including a wildlife crossing project specific to the Refuge developed by Teton County. Should projects like this become fully funded and implemented, they will serve to reduce wildlife-vehicle collisions and will have an overall beneficial effect on other wildlife on the Refuge and in the analysis area.

Invasive Plant Species

The reduction in elk for all alternatives over the period of analysis and subsequent habitat recovery and restoration efforts will likely result in reduced transfer of invasive species to the Refuge and greater resiliency of habitat. Any future ground disturbance that may be required for habitat restorations efforts may result in the spread of invasive species. This can be mitigated through Early Detection and Rapid Response Protocols, which will prevent new outbreaks and spread. As they arise, novel invasive species on the Refuge will impart additional costs to identify and treat them. Regardless, it is likely that invasive species will persist on the Refuge and analysis area and—based on resource availability for Early Detection and Rapid Response and follow-up treatment—may increase through time causing negative impact to habitat and other wildlife species.

Changing Ecological Conditions

Over half of all plant and animal species in North America have shown range shifts due to temperature changes. This includes invasive species, thereby potentially exposing native species to increased competition, predation, and disease risks and lowering the suitability of habitat for some species. The impacts of changing ecological conditions discussed in Appendix K and other sections, including above for elk and bison and below for habitat/vegetation/soils, will also impact other wildlife species on the Refuge, including changes in forage type and availability and potential new invasive species that may adversely impact native species on the Refuge.

Candidate, Threatened and Endangered Species

Candidate, Threatened, and Endangered Species: Affected Environment

Past "Biological Opinions" were completed for the 2007 BEMP that documents the effects of implementing the BEMP (2007 BEMP, pgs. 171–202 and Appendix E). Additionally, a Biological Opinion was completed for the CCP that documents the effects of implementing the CCP and is included in the CCP as Appendix G (CCP, pages 288–324). The Refuge is currently in an intra-Service consultation on the draft BEMP in compliance with Section 7 of the Endangered Species Act.

Species originally considered in the 2007 BEMP Biological Opinion, but are no longer listed as candidate, threatened or endangered species include the bald eagle and gray wolf.

Grizzly Bear (Threatened)

Grizzly bears in the GYE are currently listed as a threatened species under the Endangered Species Act; however, there is currently an ongoing status review being conducted by the Service for the species in the lower 48 states. The GYE grizzly bear population has continued to increase during the implementation of the 2007 BEMP from an estimated 571 bears in 2007 to an estimate of 1,030 bears in 2023 (Haroldson 2008, Gould, van Manen and Haroldson 2023). The 2021 Interagency Grizzly Bear Study Team report titled "A Reassessment of the Chao2 Estimates for Population Monitoring of Grizzly Bears in the Greater Yellowstone Ecosystem" suggest that past annual population estimates have been underestimating the population and actual bear numbers are higher than previously reported (Interagency Grizzly Bear Study Team 2021). Use of the Refuge has been incidental but increasing. The first documented use of the Refuge occurred in 1994 when a sow and three yearlings were observed feeding on a bison gut pile. Since that first observation grizzly bears have been documented on the Refuge by direct observation or through trail cameras as follows: August 1, 2013 — one adult; August 20, 2013 — one sow and three cubs; August 27, 2013 — one adult; April 13, 2014 — one sow and two cubs; April 27, 2018 — one age unknown; November 18, 2018 — one unknown age; August 27, 2021 — four bears age unknown; September 3, 2021 — one adult; September 5, 2021 — one sow and four cubs; September 26, 2021 — one adult; December, 2020 — one sow and four cubs; December 9, 2022 — one sow and four cubs and August 25, 2023 — one sow and one cub. Over the past decade several other grizzly bear sightings on the Refuge have been reported by hunters and other members of the public. The Service anticipates more use of the Refuge by grizzly bears in the future.

Canada Lynx (Threatened)

Refuge elevation ranges from 6,200 to 6,700 feet with no suitable habitat for Canada lynx. The Refuge does not have any lynx analysis units or critical habitat designated, nor does the Refuge share any lynx analysis units' boundaries with Grand Teton. There have been no confirmed Canada lynx observations on the Refuge in 112 years of record keeping, and we do not anticipate any future habitat changes that would facilitate occupancy by Canada lynx. There is proposed critical habitat for this species, but the Refuge is located outside the critical habitat area. Because the Refuge has no suitable habitat for Canada lynx and does not encompass critical habitat, none of the alternatives will effect this species.

Yellow-billed Cuckoo (Threatened)

Although there have been no confirmed, yellow-billed cuckoo observations on the Refuge in 112 years of record keeping, including the most recent survey conducted in 2023 in cooperation with Grand Teton, there is approximately 550 acres of cottonwood riparian habitat on the Refuge that could potentially be suitable habitat. The yellow-billed cuckoo is a Neotropical migratory bird that historically was distributed throughout most of the United States, southern Canada, and northern Mexico. There is proposed critical habitat for this species, but the Refuge is located outside the critical habitat area.

North American Wolverine (Threatened)
The North American wolverine is found throughout the state of Wyoming. Wolverines have occasionally been documented on the Refuge, with the most recent confirmed observation in winter 2024. Wolverine use of the Refuge appears to be transitory with wolverines crossing the Refuge between higher elevation habitat in adjacent mountain ranges. None of the alternatives will impact wolverines, because they only rarely are present in the Refuge and that presence is transitory and so do not rely on bison or elk in or around the Refuge to meet their lifecycle needs.

Monarch Butterfly (Proposed—Threatened)
The monarch butterfly is currently found on the Refuge. Egg cases have also been documented suggesting that there is some Monarch reproduction on the Refuge. This species is typically found on the margins of wetlands and grassland areas where there is milkweed or other forb species.

Whitebark Pine (Threatened)
Refuge elevation ranges from 6,200 to 6,700 feet with no suitable habitat for Whitebark pine. There have been no confirmed Whitebark pine observations on the Refuge in 112 years of record keeping, and we do not anticipate any future habitat changes on the Refuge that would facilitate occupancy by Whitebark pine. Therefore, none of the alternatives will impact the species.

Candidate, Threatened and Endangered Species: Environmental Consequences

Alternative A: No Action

Grizzly Bear (Threatened)

Under Alternative A, the existing supplemental feeding program for both elk and bison would be continued, resulting in a long-term decline in the elk population on the Refuge due to the increasing prevalence of CWD. Although grizzly bear presence on the Refuge has historically been minimal, the GYE grizzly population has increased substantially in recent decades, and more frequent grizzly bear activity on the Refuge is likely in the future (Haroldson 2008, Gould, van Manen and Haroldson 2023, Interagency Grizzly Bear Study Team 2021).

Grizzly bears are opportunistic omnivores and have been documented consuming elk and bison on the Refuge, including winter-killed carcasses, opportunistically killed calves, hunter-killed carcasses or gut piles, and adults weakened during the fall breeding season. However, grizzly bears are not obligate carnivores; they are food generalists, consuming a wide variety of foods including vegetation, living or dead mammals, fish, insects, and human refuse (Knight, Blanchard and Eberhardt 1988, Mattson, Blanchard and Knight 1991, Schwartz, Miller and Haroldson 2003). Within the GYE, grizzly bears have been documented to consume over 266 distinct plant and animal species ranging from grasses, fungi, berries, and seeds, to fish, carcasses, and other meat sources (Gunther, et al. 2014).

Some studies suggest that grizzly bears' dietary flexibility allows them to switch foods according to availability and nutritional value (Servheen 1981, Kendall 1986, Mace and Jonkel 1986, Martinka and Kendall 1986, LeFranc, et al. 1987, Aune and Kasworm 1989, Schwartz, Miller and Haroldson 2003, Edwards, et al. 2011, Gunther, et al. 2014). However, other research indicates that dietary flexibility does not necessarily confer resilience to large-scale, persistent

declines in critical resources such as elk. When high-quality foods become scarce, bears may be forced to alter their behavior in ways that carry demographic costs, including reduced body condition, lower reproductive success, and decreased survival (Pease & Mattson 1999; Felicetti et al. 2004; Haroldson et al. 2005; Costello et al. 2014). Cumulative loss of key foods, whether through habitat loss, fragmentation, or prey decline, can manifest as smaller litters, lower cub survival, or shifts in distribution that increase the likelihood of human-bear conflict (Schwartz et al. 2006; Van Daele et al. 2013).

Therefore, under Alternative A, the predicted long-term decline in the Refuge elk population (driven by high CWD prevalence) could reduce the availability of a key food resource for grizzly bears, particularly in late winter and spring when bears may scavenge elk carcasses. Because the elk population decline is projected to be greatest under this alternative, the negative long-term effects on grizzly bears are expected to be more pronounced compared to other management options. While grizzly bears are capable of shifting their diet to other available foods, the loss of high-quality, energy-rich elk carcasses may ultimately impact bear body condition, reproductive output, and survival, especially if other food resources are also limited.

Periodic supplemental feeding of bison under Alternative A is expected to result in a stable bison population. However, bison are not a primary food source for grizzly bears, and direct interactions between the two species are rare. Therefore, continued bison feeding is not anticipated to have a significant effect on grizzly bears.

Yellow-billed Cuckoo (Threatened)

Although the Refuge harbors 550 acres of potentially suitable habitat for the Yellow-billed cuckoo, this species has not been documented on the Refuge to date. In addition, the Refuge does not encompass critical habitat. Under this alternative, the long-term decline in the elk population on the Refuge due to the prevalence of CWD may result in decreased pressure on riparian habitat, allowing regeneration of additional habitat suitable for Yellow-billed cuckoos. Therefore, Alternative A (No Action Alternative) may have a positive effect on this species. Periodic supplemental feeding of bison under Alternative A would result in a stable bison population and no effect on Yellow-billed cuckoo.

Monarch Butterfly (Proposed—Threatened)

Under this alternative, the long-term decline in the elk population on the Refuge due to the prevalence of CWD may result in decreased pressure on wetland edge and grassland habitat, allowing regeneration of additional habitat suitable for Monarch butterflies. Therefore, Alternative A (No Action Alternative) may have a positive effect on this species.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Grizzly Bear (Threatened)

Under Alternative B, the elk population on the Refuge is predicted to decline in both the short and long term due to a combination of increased harvest, winter mortality, and the effects of chronic wasting disease (CWD). During the initial five years of implementation, increased winter mortality of elk—primarily from starvation unrelated to CWD—may provide a temporary increase in carcass availability for grizzly bears within a 7.5-mile radius of the Refuge in the

spring. This distance reflects the maximum range grizzly bears have been documented traveling to access carcasses (Craighead and Mitchell 1982) As the elk population declines and stabilizes at lower levels after the cessation of supplemental feeding (anticipated within seven years or when CWD prevalence reaches 3%), the number of elk carcasses available to grizzly bears is expected to decrease. In the long term, grizzly bear use of the Refuge is likely to return to being incidental, with bears adapting to the broader range of food resources available throughout the GYE, including both animal protein and a wide variety of plant-based foods. As discussed under Alternative A, grizzly bears are well-documented food generalists, known to consume over 266 distinct plant and animal species in the GYE.

A key feature of Alternative B is the Service's collaboration with cooperating agencies to strategically focus elk hunting on the SDME segment, which now comprises approximately 40% of the elk wintering on the Refuge. By targeting SDME for harvest, the intent is to reduce their numbers while maintaining or increasing the proportion of LDME in the herd. LDME are particularly important as a food resource for grizzly bears and other GYE wildlife due to their broader ecosystem movements. If these management efforts are successful, they may help mitigate some of the negative impacts to grizzly bears and other species that rely on elk as a key food source.

In the short term, increased elk hunting to achieve population reduction goals will result in more hunters on the landscape, which may increase the frequency of hunter-grizzly bear interactions. Such encounters can occasionally lead to management actions by WGFD, including the removal of conflict bears. These risks are expected to be most pronounced during the initial years of implementation when hunting pressure is highest.

Following the cessation of supplemental feeding, the Service plans to restore habitat on former prairie/shrub feedground locations and riparian areas along Flat and Nowlin Creeks. These restoration efforts may enhance the availability of alternative food sources for grizzly bears on the Refuge, potentially offsetting some of the impacts associated with reduced elk carcass availability.

Like Alternative A, the bison population is predicted to remain stable under Alternative B and have no impact on grizzly bears.

Yellow-billed Cuckoo (Threatened)

Although the Refuge harbors 550 acres of potentially suitable habitat for the Yellow-billed cuckoo, this species has not been documented on the Refuge to date. In addition, the Refuge does not encompass critical habitat. Under this alternative, the short-term decline in the elk population on the Refuge due to the prevalence of CWD may result in decreased pressure on riparian habitat, allowing regeneration of additional habitat suitable for Yellow-billed cuckoos. Therefore, Alternative B may have a positive effect on this species.

Monarch Butterfly (Candidate)

Under this alternative, the shorter-term decline in the elk population on the Refuge due to the prevalence of CWD may result in decreased pressure on wetland edge and grassland habitat,

allowing regeneration of additional habitat suitable for Monarch butterflies. Therefore, Alternative B may have a positive effect on this species.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Grizzly Bear (Threatened)

Under Alternative C, a ration sufficient to support 5,000 elk would be provided during winters on the Refuge for five years, with bison also receiving supplemental feed during this period. As with Alternative B, the reduction in supplemental feeding is expected to result in increased winter mortality of elk due to starvation for those animals above the 5,000-elk threshold. In the short term (first five years), this may provide grizzly bears within a 7.5-mile radius of the Refuge with additional carcasses as a food source in the spring, similar to the effects described for Alternative B.

After five years, when supplemental feeding ceases, the number of elk carcasses available to grizzly bears is expected to decline as the elk population stabilizes at a lower level. In the long term, grizzly bears are likely to adapt by utilizing the wide range of food sources available in the Greater Yellowstone Ecosystem, consistent with their dietary plasticity, as described under Alternatives A and B

As with Alternative B, cessation of feeding will be followed by habitat restoration on former prairie/shrub feedground locations and riparian areas along Flat and Nowlin Creeks. These restoration efforts may provide additional foraging opportunities for grizzly bears on the Refuge.

Yellow-billed Cuckoo (Threatened)

Although the Refuge harbors 550 acres of potentially suitable habitat for the Yellow-billed cuckoo, this species has not been documented on the Refuge to date. In addition, the Refuge does not encompass critical habitat. Under this alternative, the short-term decline in the elk population on the Refuge due to the prevalence of CWD may result in decreased pressure on riparian habitat, allowing regeneration of additional habitat suitable for Yellow-billed cuckoos. Therefore, Alternative C (5 Year Supplemental Feeding for 5,000 Elk) may have a positive effect on this species.

Monarch Butterfly (Threatened)

Under this alternative, the short-term decline in the elk population on the Refuge due to the prevalence of CWD may result in decreased pressure on wetland edge and grassland habitat, allowing regeneration of additional habitat suitable for Monarch butterflies. Therefore, Alternative C (5 Year Supplemental Feeding for 5,000 Elk) may have a positive effect on this species.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Grizzly Bear (Threatened)

Under Alternative D, impacts to grizzly bears are expected to be like those described for Alternatives B and C. The elk population overwintering on the Refuge is predicted to decline in both the short and long term due to a combination of increased harvest (with a specific focus on the short-distance migratory elk [SDME] segment), winter mortality, and CWD.

A key component of Alternative D, like Alternative B, is the targeted harvest of the SDME segment of the elk herd while maintaining or increasing the proportion of the LDME. As discussed under Alternative B, LDME are particularly important as a food resource for grizzly bears and other GYE wildlife due to their broader ecosystem movements. By focusing the harvest on SDME, this strategy may help sustain a more resilient prey base for grizzly bears and other carnivores.

During the first several years of implementation, increased hunting mortality of elk may provide grizzly bears within a 7.5-mile radius of the Refuge with additional carcasses as a food source in the spring, paralleling the effects described for Alternatives B and C. As the elk population stabilizes at lower levels over the long term (after approximately 10 years), the number of carcasses available to grizzly bears is expected to decrease. Grizzly bears are likely to resume their incidental presence on the Refuge and adapt to utilizing the wide range of food sources available in the Greater Yellowstone Ecosystem, consistent with their dietary plasticity.

As with Alternatives B and C, cessation of supplemental feeding will be followed by habitat restoration on former prairie/shrub feedground locations and riparian areas along Flat and Nowlin Creeks, which may provide additional foraging opportunities for grizzly bears on the Refuge

Yellow-billed Cuckoo (Threatened)

Although the Refuge harbors 550 acres of potentially suitable habitat for the Yellow-billed cuckoo, this species has not been documented on the Refuge to date. In addition, the Refuge does not encompass critical habitat. Under this alternative, the decline in the elk population both in the short term and long term on the Refuge may result in decreased pressure on riparian habitat, allowing regeneration of additional habitat suitable for Yellow-billed cuckoos. Therefore, Alternative D may have a positive effect on this species.

Monarch Butterfly (Candidate)

Under this alternative, the decline in the elk population on the Refuge both in the short term and long-result in decreased pressure on wetland edge and grassland habitat, allowing regeneration of additional habitat suitable for Monarch butterflies. Therefore, Alternative D may have a positive effect on this species.

Threatened and Endangered Species: Other Reasonably Foreseeable Effects

Other reasonably foreseeable effects to threatened and endangered species will be like those described for other wildlife. As none of the alternatives are likely to have adverse impacts on threatened and endangered species, and—in some cases—minor, beneficial effects through restoration of habitat, all the alternatives will likely have minimal compounding impacts on threatened and endangered species.

Vegetation/Habitat/Soils

Vegetation/Habitat/Soils: Affected Environment

Native Habitat

The Service classified 33 plant community types on the Refuge, 23 of which are dominated by native plants and 10 by nonnative grass species (Figure 13). Homesteaders, or Refuge staff, planted nonnative grass plant communities to support hay production, or pasture for livestock or elk. Smooth brome, intermediate wheatgrass, meadow brome, and Russian wildrye, and crested wheatgrass are common examples of nonnative plant communities on the Refuge. While some of these communities have adapted to natural conditions where adequate soil moisture exists, most are perpetuated by irrigation activities.

Native grasslands are important plant communities on the Refuge because they provide winter forage for elk and bison, which are primarily grazers. Native grasslands occur where there is sufficient precipitation to grow grasses but not trees, or where drought, frequent fires, grazing by large mammals, or human disturbance have prevented trees or shrubs from growing. Native grasslands, including some bluegrass, wheatgrass, and needlegrass species, cover approximately 8,092 acres. Except for localized areas, native grasslands are in good condition, especially in the northern part of the Refuge (Eric Cole, biologist, USFWS, Jackson, WY, personal comm., 2025).

Sagebrush shrublands encompass approximately 8,010 acres and are scattered throughout the Refuge, with the largest concentrations in the east-central and northeastern parts. Sagebrush shrublands are generally tall, dense, and comprised of native species in the northern half of the Refuge, with some small areas in the McBride and Peterson management units having shorter, lower density sagebrush (Eric Cole, biologist, USFWS, Jackson, WY, personal comm., 2025). Sagebrush and grassland plant communities provide important breeding habitat between May and mid-July to some Neotropical migrant species, and these cover types are abundant on the Refuge and in Grand Teton. Typical bird species that nest in the sagebrush shrublands community are sage thrashers, Brewer's sparrows, and sage sparrows. Many sagebrush bird species are declining as habitat throughout the west is converted to farmland and development, and wildfire increases due to invasive plant species. As aspen and riparian habitats on the Refuge are converted to sagebrush habitat due to heavy elk and bison browsing, more sagebrush shrubland habitat will become available to bird species dependent on this habitat. Efforts to restore cultivated areas to native sagebrush communities on the Refuge and in the Grand Teton would also benefit sagebrush-dependent bird species.

The Refuge contains approximately 2,676 acres of wetlands, including marshlands, wet meadows, and open water (see Figure 13). Wetlands function as a natural sponge that stores and recharges groundwater supplies. Wetlands moderate streamflow by releasing water to streams (especially important during drought) and reducing flood damage by slowing and storing floodwater. Wetland plants protect streambanks against erosion because the roots hold soil in place and the plants break up the flow of stream or river currents. Wetlands improve water quality by filtering sediment, pollutants, and excess nutrients from surface runoff. As one of the most biologically productive ecosystems in the world, the nutrient-rich environment of wetlands provides food and habitat for a variety of wildlife. Wetlands on the Refuge are some of the most

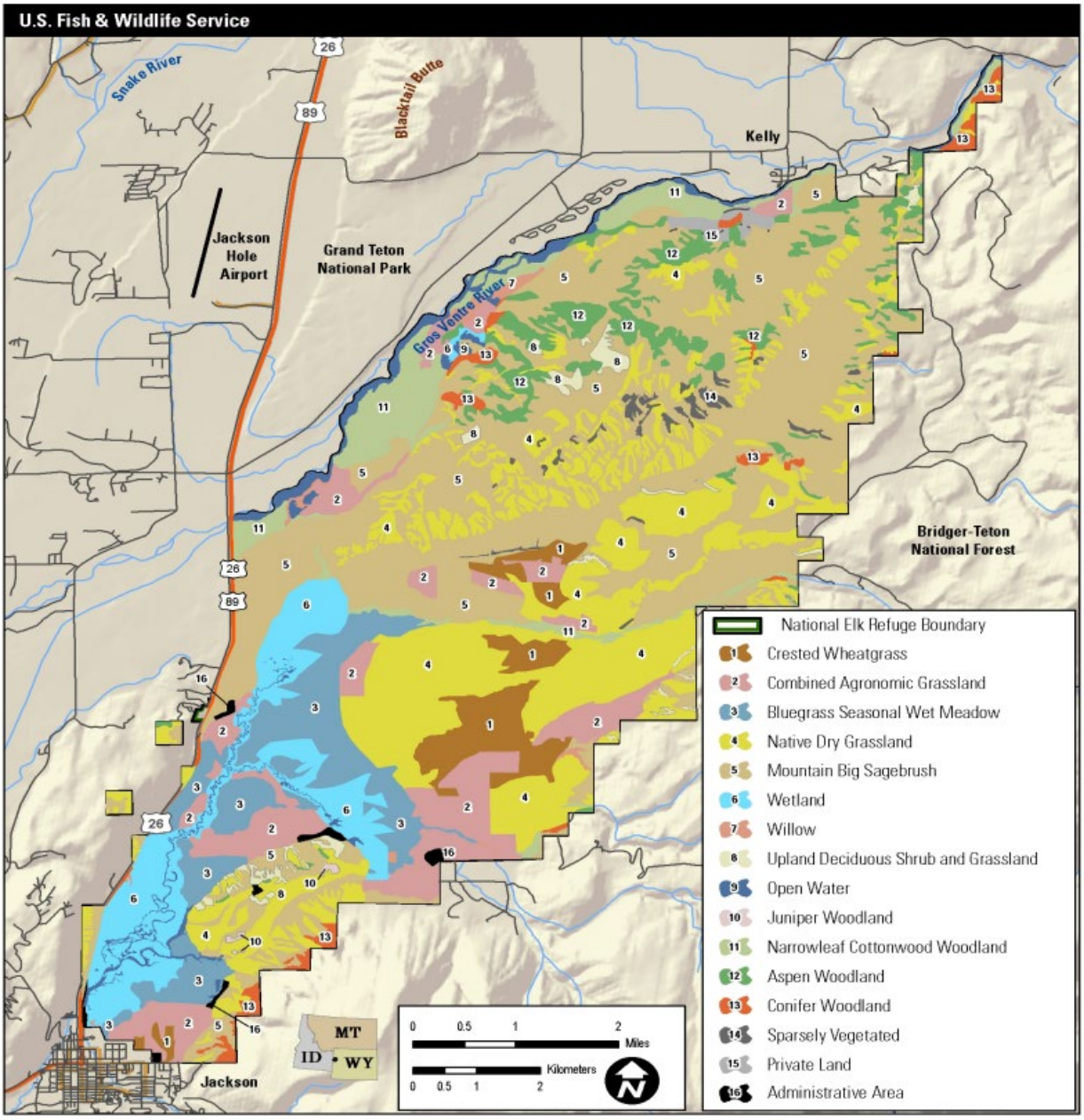

Figure 13. Map of Plant Communities on the Refuge

diverse and important in Jackson Hole because of their water-regulating functions, visual qualities, and importance to wildlife, especially resident and migratory birds. Most wetland areas receive moderate to heavy use by elk but are generally considered to be in good condition. A few limited areas receive extremely heavy use, and they are in fair condition. Bison graze wet areas adjacent to the Poverty Flats feedground and wet meadows near the fish hatchery.

Wet meadow habitats occur on approximately 1,720 acres in the Refuge and are comprised of shrubby cinquefoil, sedges, and grasses such as foxtail barley, timothy, Kentucky bluegrass, tufted hairgrass, and common horsetail. Approximately 1,450 of the 1,720 acres contain willow

plants less than 1.5 feet tall, indicating that mature willow stands have been converted to other plant communities because of decades of heavy elk browsing (Smith, Cole and Dobkin 2004).

In the arid West riparian and aspen woodland habitats with a shrub understory support the most species-rich communities of breeding birds (Dobkin and Wilcox 1986, Knopf, et al. 1988, Saab, et al. 1995, Mitton and Grant 1996, Tewksbury, et al. 2002), provide critical migration habitat for migratory landbirds (D. S. Dobkin 1994), and are centers for biological diversity (Brussard, Charlet and Dobkin 1998). These habitats are critical for breeding habitat and migration stopovers for 80% of migratory bird species (Krueper 1992) because they are used extensively for feeding, nesting, shelter, and travel corridors. Riparian areas and aspen woodland communities occur on approximately 3,227 acres of the Refuge. These habitat types have been declining in condition and acreage throughout Refuge history. Riparian woodlands and aspen woodlands are particularly important as wildlife habitat and have been affected by elk and bison browsing. Riparian woodland habitat consists of approximately 300 acres of willow habitat and about 1,090 acres of cottonwood communities. Riparian woodlands occur along the Gros Ventre River and Flat Creek. Cattle and wildlife grazing and browsing, especially in arid systems, can greatly affect the quality of riparian habitat for Neotropical migrants (Roath and Krueger 1982, Taylor 1986, Saab, et al. 1995, Ammon and Stacy 1997). Upland aspen has been declining in Jackson Hole for the last several decades (Loope and Gruell 1973), as well as throughout the West (Kay 1998). Fire suppression is a major factor in the reduction of aspen (Loope and Gruell 1973, Kay 1998, White, Olmstead and Kay 1998), but on the Refuge ungulate browsing has greatly accelerated this decline (Dieni, et al. 2000, E. M. Anderson 2002). While intact riparian areas and aspen woodland communities support a high diversity of wildlife, migratory birds in particular, when these habitats are over-browsed, they cannot meet the habitat requirements of these species and as a result support a less diverse array of species.

Aspen woodland habitat consists of approximately 1,850 acres of aspen-dominated communities on hillsides, usually some distance from water. Aspen dominated woodlands are scattered on the Gros Ventre Hills throughout the northern part of the Refuge and on the eastern edge of the Refuge in the south, next to the Gros Ventre Wilderness. Many aspen stands are characterized by mature trees, with little if any aspen understory. Aspen stands in the northern hills of the Refuge appear to be declining slowly, but some aspen communities escape browsing, and stand replacement is occurring periodically.

Conifer forests on the Refuge cover 160 acres and consist of Douglas-fir, juniper, lodgepole pine, wheatgrasses, and other plant species. Conifer forests occur mostly on the extreme eastern edge of the Refuge in the north and in the south on hillsides next to Bridger-Teton and on the northern slopes of the Gros Ventre Hills. Elk use the Refuge forests and the adjacent national forest land for cover and shelter from winter storms, and they graze on palatable understory shrubs and grasses. Bison rarely use conifer stands.

Forage Production

Forage production is an estimate of the amount of food available to elk and bison produced in each growing season across the entire Refuge (approximately 24,700 acres). This includes: (1) annual growth of trees and shrubs that are less than 8 feet from the ground, and (2) herbaceous

vegetation such as grasses, forbs, and weeds, which are a subcategory of forbs. Annual forage production mostly depends on the species composition of the plant community, precipitation, the amount of water available for irrigation, the number of staff members available for irrigation activities, and infestation by insect herbivores such as grasshoppers. The time of year that precipitation occurs is also important, rain in the spring and early summer increases forage production more than any other time of the growing season.

The Service is irrigating approximately 4,500 acres to increase forage production Refuge-wide and decrease reliance on supplemental feeding by providing an alternative food source for the elk on the Refuge. Refuge-wide herbaceous forage production averaged 15,963 (range 9,126–23,993) tons during 1998–2024. In recent years, irrigation of approximately 4,500 acres has increased Refuge-wide forage production by approximately 10% compared to what would have been produced with precipitation alone, and by 15% in the southern portion of the Refuge that receives the greatest use by elk and bison. The irrigation program is primarily funded through donations from the Jackson Hole Friends of Scouting through a Community Partnership Agreement where the Friends provide proceeds generated from the annual antler auction to the Refuge for elk management activities. The irrigation program is augmented by the Refuge budget to remain sustainable as the Friends donation is dependent on the number of antlers collected and annual price of antlers which can fluctuate greatly each year. Full implementation of the irrigation program requires a minimum of one permanent and three seasonal staff members working seven days a week during the irrigation season – May through September. In addition to labor cost, there is considerable overhead for equipment, fuel, maintenance and repair.

Invasive Species

Invasive species are defined as one that is nonnative to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (National Invasive Species Council 2025). Invasive plant species spread easily, replace native habitat, reduce diversity, and cause great expenditure of financial and human resources. Adjacent private lands are often the sources for invasive plants, including State-designated noxious weeds, such as musk thistle and spotted knapweed. There are more than 20 invasive plant species on the Refuge including bindweed, dalmatian toadflax, oxeye daisy, Scotch thistle, black henbane, diffuse knapweed, perennial pepperweed, whitetop, bull thistle, houndstongue, Russian knapweed, wooly mullein, Canada thistle, marsh sow thistle, scentless chamomile, yellow toadflax, crested wheatgrass, cheatgrass, Kentucky bluegrass, fowl bluegrass, clover, and common tansy (U.S. Fish and Wildlife Service 2016).

Invasive plant infestations cover more than 1,000 acres of the Refuge. Many of the infested areas are a direct result of abandoned livestock-feeding areas and corals, old homesites, and roadbeds. Invasive grasses, forbs, and woody species are problematic because they diminish the quality and suitability of habitat to support many native wildlife species (U.S. Fish and Wildlife Service 2016). The Refuge began managing invasive plant species as early as 1958, although they were considered “exotic” species at the time. By the early 1980s, the Refuge began using herbicides in addition to mechanical control, such as pulling and cutting, to reduce the spread of invasives (Clark, Casey and Halverson 2000).The Refuge and nearby Grand Teton continue to use

biological, cultural, chemical, and mechanical means to control invasive plants, but complete eradication is too resource intensive and costly to achieve. However, through these efforts, invasive plants have not substantially impacted wildlife forage conditions, but spotted knapweed and musk thistle infestations could pose a serious threat in the future (U.S. Fish and Wildlife Service 2016).

Soils

Over 20 different soil types are found on the Refuge. Soils at lower elevations are alluvial, generally sandy loam or loam, and are shallow and permeable. Soils at higher elevations are also loamy, with considerable areas of gravelly soils and cobblestone on south-facing slopes and ridges (Young 1982).

One of the primary soil types on the Refuge is Greyback gravelly loam (0 to 3% slopes), which is a deep, somewhat excessively drained soil that occurs in irrigated areas (Young 1982, U.S. Department of Agriculture 2025). Approximately 20% of these irrigated areas have a cobbly loam surface layer but are otherwise similar to Greyback gravelly loam. In Greyback gravelly loam soil, permeability is moderately rapid, and available water capacity is low. Roots penetrate to a depth of 60 inches or more. Surface runoff is slow, and the erosion hazard is slight. For Greyback gravelly loam with 3% to 6% slopes, the surface runoff is medium, and the erosion hazard is moderate (Young 1982). This soil type does not have a hydric soil rating (U.S. Department of Agriculture 2025).

Another primary soil type on the Refuge is Cryaquolls-Cryofibrists complex, which are deep, poorly drained, and very poorly drained soils. These nearly level soils occur in seep areas surrounding springs and streams within the Refuge (Young 1982, U.S. Department of Agriculture 2025). For this soil type, permeability is moderate to slow, and available water capacity is moderate to high. Roots penetrate to a depth of 60 inches or more. Surface runoff is very slow, and the erosion hazard is slight. The water table is at or near the surface during most of the year (Young 1982). This soil type has a hydric soil rating (U.S. Department of Agriculture 2025).

The existing soil in the feedgrounds on the Refuge is likely experiencing compaction due to the high density of elk. Current supplemental feeding provided to elk and bison maintains populations above the natural carrying capacity of the habitat. Soil compaction at feedgrounds can occur in response to pressure exerted at the surface by these grazing animals and by the equipment used to feed elk. This supplemental feeding has resulted in the heavy use or overgrazing of Refuge vegetation. Vegetation, and their roots, holds soil in place—increasing soil stability and containment. Vegetation minimizes soil erosion.

Scientific literature suggests that prions (the transmissible element of CWD) can enter the soil through elk infected with CWD. The spread of CWD by soil can occur when soil particles bound to infectious prions are inhaled or ingested by grazing animals, such as elk (Johnson, Phillips, et al. 2006, Johnson, Pedersen, et al. 2007, Wyckoff, et al. 2016). When grazing, animals consume soil both accidentally and intentionally (Johnson, Phillips, et al. 2006). Research has shown that earthworms can consume and transport infectious prions in soil, thus possibly contributing to

infectious spread (Pritzkow, Morales and Camacho, et al. 2021). Laboratory research has shown that plants can uptake prions from contaminated soil—transporting the prions to its stems and leaves. Prions can also topically bind to a plant's roots and leaves. Infected plants are then consumed by animals, further spreading prion diseases, such as CWD (Pritzkow, Morales and Moda, et al. 2015)).

Soil samples have been taken on feedground locations and other locations on the Refuge and tests are currently being developed in collaboration with USGS to determine if CWD prions are present in the environment. However, because CWD is currently at trace levels in the Jackon elk herd, soil contamination is likely very low. Higher rates of CWD prevalence creates a greater source of infected prions that can enter soil with potential for spreading CWD to elk that are not infected.

Vegetation/Habitat/Soils: Environnemental Consequences

Alternative A: No Action

Native Habitat

Under Alternative A, continuing to provide supplemental feed will result in continued heavy use of Refuge vegetation communities, including sensitive vegetation communities, until the elk population decreases due to CWD impacts toward the end of the 20-year period (USGS SIR, Appendix B, A-32).

Elk use of cottonwood communities is predicted to be around 1,615 days, and use of willow communities is predicted to be around 385 days over a 20-year period, which is the highest use days compared to other alternatives (USGS SIR, Appendix B, A-37, Table A1).

If this alternative is selected, native plant communities on the Refuge would continue to be degraded by overgrazing. Supplemental feeding maintains elk and bison numbers that are more than the natural carrying capacity of the habitat. As a result of these high animal numbers, grazing and browsing by elk and bison has modified the structure of and caused the loss of, some plant communities. In the southern half of the Refuge, the Poverty Flats grasslands receive heavy use by elk, and Miller Butte receives moderate to heavy use. On the southern end of the Refuge, there is little residual growth of bunchgrasses following previous years of ungulate grazing during the grass dormant season. This removal can increase the production of some perennial bunchgrass plants, although standing dead plant material has been shown to be beneficial to plant health by some authors (Briske 1991, Sauer 1978). The grasslands on the northern end of the Refuge receive less use by elk and bison because of deeper snow and hunting disturbance. In general, sagebrush stands closer to feeding grounds are shorter and less dense. In the southern half of the Refuge, sagebrush stands are in poor condition because of over browsing by elk and bison, and mechanical damage by bison, elk, and mechanical equipment use during supplemental feeding operations.

Elk browsing in cottonwood communities has removed understory, and cottonwood trees are not regenerating. Cottonwood stands close to the McBride Feedground experience higher snag density and higher down woody debris cover. Cole (2002a, 2002b) did not find a difference in the number of woody plant species in stands closer to feeding grounds as compared to stands

farther away, but total woody cover grew with increasing distance from feedgrounds (Smith, Cole and Dobkin 2004).

Most wetlands receive moderate to heavy winter use by elk, but herbaceous vegetation generally recovers its dense and tall condition and largely native species composition during the growing season. Bison rarely use wetlands when their population is maintained at objective levels. There is often little residual cover in wet meadow communities because of heavy grazing by elk. The amount of residual cover varies from year to year depending on the depth of snow cover and grazing pressure. Dobkin et al. (2002) state that willow, cottonwood, and aspen stands on the Refuge were modified by browsing by ungulates; this is based on historical photographs, written records, and an understanding of the ecology of these communities. Dieni et al. (2000) and Smith et al. (2004) also note the growing experimental evidence that ungulate browsing is the cause of declines in aspen and cottonwood communities. Dobkin et al. (2002) also found that willow sites on the Refuge were "mostly poorly functioning or nonfunctioning ecologically." They concluded that although willow habitat is influenced by flooding, hydrologic conditions, ungulate use levels, fire frequencies, and precipitation patterns, the decline of willows on the Refuge appears to be mostly related to heavy browsing (28 – 55% removal of annual growth).

Anderson (2002) found that riparian woodland habitats that are heavily browsed by elk were characterized by (1) lower willow volume, (2) lower willow shrub diameter, (3) fewer willow habitat bird specialists, (4) fewer species that nest in willow, and (5) fewer aerially foraging species.

The decline of willows along Flat Creek in the southern part of the Refuge has exceeded 95% (Smith, Cole and Dobkin 2004). Shrubby cinquefoil, a less palatable woody species, is abundant in the prior range of willows and has probably increased as willows declined. In contrast, willows in the northern end of the Refuge are moderately browsed, and only a few willow plants reach their full height potential. Growth of new willow stems out of the browse zone is sporadic, and there is some space between most willow clumps. Large numbers of elk on the Refuge prevent suppressed willow plants from growing out of the browse zone. Decades of winter browsing by elk have reduced these willows to remnant plants less than 18 inches high. There are 1,450 acres of suppressed willow plants in what are now wet meadow communities but were once willow habitat. However, exclosures (fenced areas) that have been constructed in wet meadow habitat on the Refuge have successfully demonstrated the ability of willow to recover if protected from ungulate browsing (Eric Cole, biologist, USFWS, Jackson, WY, personal comm., 2025).

In addition, over browsing from elk negatively impacts aspen communities on the Refuge. Anderson (2002) found that aspen woodland habitats that were browsed heavily by elk were characterized by (1) less understory volume of vegetation, (2) lower densities of non-sapling live and dead trees, (3) greater proportions of dead aspen trees (non-sapling), (4) more regeneration of suckers less than 0.5 meter, (5) less recruitment to overstory, (6) lower density of aspen saplings, (7) lower proportion of the stands contained saplings, (8) higher rates of sucker browsing, (9) lower proportion of suckers, (10) more damage to bark, (11) higher density of dead trees, and (12) higher proportion of the stands contained dead aspen trees.

Elk browsing on aspen suckers restricts aspen recruitment by preventing suckers from growing out of the browse zone. Many aspen stems are approximately 120 years old, which is approaching the maximum lifespan of 150 years. Most of these stands will eventually convert to sagebrush shrubland habitat, primarily in the form of snowberry and rose stands. A few stands may convert to native grassland habitat, depending on their location and the understory condition. Findings by Keigley et al. (2009) suggests that limited scale regeneration of aspen has occurred in the northernmost parts of the Refuge since 2005. Possible but untested explanations of this regeneration include the presence of wolves, changes in ungulate distributions or migration patterns, changes in ungulate numbers, or some combination of these factors.

Cottonwood and aspen saplings grow inside exclosures (fenced areas) on the upper section of Flat Creek, indicating that these trees can replace themselves if ungulates are totally excluded. Regeneration of young conifer trees appears sufficient to replace existing stands, but subdominant species in these communities that are much more palatable to elk, such as serviceberry and chokecherry, are heavily browsed and are not regenerating.

Forage Production

Under Alternative A, there would be no impact to forage production, and the Service would continue to current irrigation practices on the Refuge.

Invasive Species

The introduction and spread of plant species are increased by both the mechanical disturbance of equipment used for feed operations and by the increased use of that land by elk and bison, both of which also negatively affect existing vegetation(USGS SIR, Appendix B, A-6).The USGS SIR predicted that continued supplemental feeding of elk proposed in Alternative A will have the highest number of feed days (1,243) (USGS SIR, Appendix B, A-6), and is therefore expected to facilitate the spread and introduction of invasive species such as Cheatgrass, musk thistle, whitetop at a higher rate than other alternatives analyzed in this EIS.

Under this alternative, the Refuge will continue their partnership and funding agreement with Teton County Weed and Pest to treat invasive plant species through chemical, mechanical, and other control methods in accordance with the Refuge's 2015 CCP and the Intra-Service Section 7 Biological Evaluation for Integrated Pest Management (2024).

Soils

Under Alternative A (the No Action Alternative), supplemental feed would continue to be provided to elk and bison during winter months as detailed in Section 3.2 of this EIS. This supplemental feeding maintains elk and bison populations above the natural carrying capacity of the habitat. This supplemental feeding could result in the continued heavy use or overgrazing of Refuge vegetation. The continued overgrazing of Refuge vegetation could in turn cause increased soil erosion and compaction in the Refuge, especially at feedgrounds where elk and bison congregate. This minor increased risk of soil disturbance would persist at the elk feedgrounds until the existing elk population decreases due to CWD effects toward the end of the 20-year period.

Because this alternative would increase CWD in elk, CWD soil contamination would also increase at the Refuge, especially at the elk feedgrounds. Since Alternative A has the highest CWD prevalence at year 20 (Cook, et al. 2024), it would also likely have the highest CWD soil contamination at year 20 when compared to the other alternatives. However, the Service's CWD disease protocol for incinerating elk carcasses on the Refuge is implemented to reduce contamination of the soil. Alternative A would also limit adjacent private property use by elk and bison; thus, adverse soil effects outside of the Refuge would remain unchanged.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Native Habitat

There is some indication that grazing by elk and bison can increase the productivity and stability of grassland systems, enhancing the nutrient content of grazed plants (Frank and McNaughton 1993, F. J. Singer 1995, Wallace 1996). They may contribute to new plant growth by distributing seeds, fertilizing by recycling nutrients through their waste products, and bison by breaking up soil surfaces with their hooves and wallows. However, when elk and bison populations are at levels that exceed the carrying capacity of the native habitat, they can adversely affect native habitat as discussed above. Reducing the numbers and density of elk and bison on the Refuge is expected to result in increased height and cover of woody plant communities on the Refuge, with subsequent benefits to bird and invertebrate species that depend on these conditions. In the future, there could be less damage and loss to willow, cottonwood, aspen stands, and sagebrush shrublands. As elk distribute off the Refuge after the supplemental feeding program ends when 3% prevalence is reached or after 7 years, there is predicted to be increased pressure on willow, aspen, and cottonwood habitat on areas adjacent to the Refuge, and there could be some degradation of these habitats in the short term. However, in the long term as the elk population reaches a sustainable level for the landscape, the impacts of elk grazing on the landscape should be those that are natural and beneficial to the ecosystem.

Forage Production

Like Alternative A and across all alternatives, the Service anticipates that where will be no impacts to forage production over the next 20 years on the Refuge and the Service will continue current irrigation practices on the Refuge.

Invasive Species

Like Alternative A, the mechanical disturbance of equipment used for feed operations will continue under Alternative B, until the disease threshold has been met, or seven years have elapsed. The USGS SIR predicted that there would be an average of 140 feeding days over the next 20 years under this alternative (USGS SIR, Appendix B, A-22), which would likely continue the spread and introduction of invasive plant species, although at a lower rate than the other alternatives analyzed in this EIS.

However, the continued feeding of bison after the 3% threshold is met or 7 years have passed, will mean the mechanical disturbance of feed operations will continue, though at a smaller scale, indefinitely. This will contribute to the introduction and spread of invasive plant species on the Refuge.

Just like Alternative A, the Refuge will continue their partnership and funding agreement with Teton County Weed and Pest to treat invasive plant species through chemical, mechanical, and other control methods in accordance with the Refuge's 2015 CCP and the Intra-Service Section 7 Biological Evaluation for Integrated Pest Management (2024).

Soils

The gradual reduction of elk supplemental feeding proposed under Alternative B could result in the gradual reduction in overgrazing of Refuge vegetation by elk. This gradual reduction in overgrazing could in turn cause decreased soil erosion and compaction in the Refuge, especially at elk feedgrounds before the Service stops supplemental feeding. Soil disturbance would gradually decrease at the Refuge, especially at elk feedgrounds, until the existing elk population decreases to a more sustainable level.

Overall, Alternative B would result in less CWD prevalence in elk at year 20 when compared to Alternative A (Cook, et al. 2024); thus, overall, it would result in less CWD soil contamination at year 20 at the Refuge, especially at the elk feedgrounds. Similar across alternatives, the Service's CWD disease protocol of incinerating elk carcasses on the Refuge would be implemented to reduce contamination of the soil. Alternative B could have more soil disturbance at the Refuge at year 20 due to a higher elk population size (at 8,600) than Alternative A (6,700) (Cook, et al. 2024).

Alternative B would result in slightly more use of adjacent private lands, cumulatively over the 20 years, than Alternative A (Cook, et al. 2024). Thus, Alternative B could result in slightly more soil disturbance on private lands.

Bison would continue to be fed at the Refuge under Alternative B to maintain a minimum of 500 bison. Thus, under Alternative B, minor soil disturbance would continue and remain unchanged at the bison feed locations. Adverse soil effects caused by bison outside of the Refuge would remain unchanged.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Native Habitat

Similar to Alternative B, the reduction in the numbers and density of elk and bison on the Refuge is expected to result in increased height and cover of woody plant communities on the Refuge, with subsequent benefits to bird and invertebrate species that depend on these conditions, as well as the potential for less damage and loss to willow, cottonwood, aspen stands, and sagebrush shrublands. However, the timeframe over which these effects would occur would be different. Negative impacts to native habitat from browsing are expected to decrease upon implementation of this alterative as feed rations are reduced and again at year 5, when feed operations are completely stopped.

Also, like Alternative B, as elk distribute off the Refuge after the supplemental feeding program ends at year five, there is predicted to be increased pressure on willow, aspen, and cottonwood habitat on areas adjacent to the Refuge, and there could be some degradation of these habitats in the short term. However, in the long term as the elk population reaches a sustainable level for the

landscape, the impacts of elk grazing on the landscape should be those that are natural and beneficial to the ecosystem.

Forage Production

Like Alternative A and across all alternatives, the Service anticipates that where will be no impacts to forage production over the next 20 years on the Refuge and the Service will continue current irrigation practices on the Refuge.

Invasive Species

Like Alternative A, the mechanical disturbance of equipment used for feed operations will continue under Alternative C, although reduced, until feed operations are completely stopped after five years have elapsed. The USGS SIR predicted that there would be around 311 feeding days over the next 20 years under this alternative (USGS SIR, Appendix B, A-22), which would likely continue the spread and introduction of invasive plant species, although at a lower rate than the No Action Alternative.

The overall effects of this alternative would be like those under Alternative B, except that the timeframe would likely be slightly different (i.e., 5 years versus up to 7). Compared to the other alternatives, the rate of spread and introduction of new invasive plant species is expected to begin decreasing immediately upon implementing this alternative as feed rations are reduced. Additionally, following year five, when a complete cessation of feed operations is implemented, a further reduction in the rate of spread and introduction of new invasive plant species is expected.

In addition, unlike Alternative B, feed operations for bison will not continue under this alternative and will not contribute to the rate of spread and introduction of new invasive plant species on the Refuge.

Just like the other alternatives, the Refuge will continue their partnership and funding agreement with Teton County Weed and Pest to treat invasive plant species through chemical, mechanical, and other control methods in accordance with the Refuge's 2015 CCP and the Intra-Service Section 7 Biological Evaluation for Integrated Pest Management (2024).

Soils

Under Alternative C, elk would be fed a sufficient ration to support 5,000 elk during winter months for the next five years to reduce the population size prior to stopping supplemental feeding completely at year six. Under Alternative C, the adverse effects to soil would be like those under Alternative B. However, Alternative C could have slightly less soil disturbance at the Refuge at year 20 due to a lower elk population size. Additionally, Alternative C could have a very slightly higher CWD soil contamination at the Refuge at year 20 and slightly less soil disturbance from elk use of adjacent private lands, as compared to Alternative B.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Native Habitat

Similar to all alternatives, the reduction in the numbers and density of elk on the Refuge is expected to result in increased height and cover of woody plant communities on the Refuge, with subsequent benefits to bird and invertebrate species that depend on these conditions, as well as the potential for less damage and loss to willow, cottonwood, aspen stands, and sagebrush shrublands. However, the timeframe over which these effects would occur would be different and depend on the actions of cooperating agencies and the success of the adaptive management strategies implemented by the Service.

If the actions to reduce the number of elk overwintering on the Refuge are successful, the benefits to native habitat described above are expected to be seen within a few years of implementation. However, if significant progress to reduce the overwintering population of elk on the Refuge is not made, and feed operations are continued, then the impacts to native habitat under this alternative are expected to be similar to the No Action Alternative with beneficial impacts to overall habitat on the Refuge over the long term but continue degraded habitat in the areas where supplemental feeding continues. Similar to Alternatives B and C, there could be impacts to willow, aspen, and cottonwood habitat on areas adjacent to the Refuge as the Service works with WGFD and other cooperating agencies to distribute elk off the Refuge onto adjacent lands (i.e., Bridger-Teton) and there could be some degradation of these native habitats on those lands in the short term. However, in the long term as the elk population reaches a sustainable level for the Refuge and the landscape, the impacts of elk grazing on the landscape should be those that are natural and beneficial to the ecosystem.

Forage Production

Like Alternative A and across all alternatives, the Service anticipates there will be no impacts to forage production over the next 20 years on the Refuge, and the Service will continue current irrigation practices on the Refuge.

Invasive Species

The effect of this alternative is dependent on the actions of cooperating agencies and the success of the adaptive management strategies implemented by the Service.

The mechanical disturbance of equipment used for feed operations will continue under Alternative D, until if/when feed operations are completely stopped. If the efforts of cooperating agencies and the Service are successful, feed days would be reduced over time as the overwintering population of elk on the Refuge decreases, resulting in a somewhat reduced rate of spread and introduction of new invasive plant species on the Refuge. However, if efforts are not successful in decreasing the overwintering population of elk, feed days and the effects thereof would be expected to reflect those described under the No Action Alternative, unless the Service decides to reduce feed or stop supplemental feeding practices on the Refuge.

Just like the other alternatives, the Refuge will continue their partnership and funding agreement with Teton County Weed and Pest to treat invasive plant species through chemical, mechanical,

and other control methods in accordance with the Refuge's 2015 CCP and the Intra-Service Section 7 Biological Evaluation for Integrated Pest Management (2024).

Soils

Like all alternatives, Alternative D would reduce the elk population on the Refuge. However, this reduction could be more gradual under Alternative D over a longer (timeframe than Alternatives B and C. The reduction of the elk population under Alternative D could result in the reduction in overgrazing of Refuge vegetation by elk over the next 10 years. This reduction in overgrazing could in turn cause decreased soil erosion and compaction in the Refuge, and if the Refuges stops supplemental feeding, this will decrease in erosion, and compaction would occur especially at elk feedgrounds. Soil disturbance would gradually decrease at the Refuge, until the existing elk population decreases to a more sustainable level. Under Alternative D, soil disturbance from bison would be like Alternative B.

The sooner the Service stops supplemental feeding of elk, if the Service stops supplemental feeding of elk, under this Alternative, the less CWD soil contamination, especially at the elk feedgrounds. As the potential to result in higher CWD soil contamination than Alternatives B and C, since feeding could continue.

Alternative D has the potential to result in more use of adjacent private land as compared to Alternative A, however the amount of increased use of private land by elk is not expected to adversely impact soils.

The timeframe over which the above soil effects would occur would depend on the actions of cooperating agencies and the success of the adaptive management strategies implemented by the Service. If the actions to reduce the number of elk overwintering on the Refuge are successful, the reduction in soil erosion and compaction as described above could occur within only a few years of implementation. In addition, the soil effects on adjacent private lands could be less if cooperative strategies are successful. Conversely, if progress to reduce the population of elk on the Refuge is not successful with the implemented cooperative strategies, then the soil effects under Alternative D could be like the No Action Alternative.

Vegetation/Habitat/Soils: Other Reasonably Foreseeable Effects

Invasive Species

Under Alternatives B and C and potentially D, as feeding slows and eventually ceases on the Refuge, it is anticipated that a portion of the elk herds will move off the Refuge to find new sources of winter forage. As they potentially disperse to neighboring counties like Sublette and Lincoln—where the concentration of invasive weed species like leafy spurge, perennial pepperweed, and hoary cress are much higher than they are in Teton County (Nagler, Ritten and Mealor 2024)—there is a greater chance these elk will bring back seeds from these species onto the Refuge when they return in the spring. In addition, invasive species not currently found in the region, but potentially found in neighboring states, could be spread in this manner. For example, 38% of newfound invasive species in Wyoming are already managed in other western states (University of Wyoming Extension 2025). The migration and return of the elk could therefore

create opportunities for new invasive species to gain a foothold and spread across the Refuge if not managed quickly through early detection and rapid response procedures.

Changing Ecological Conditions

Summer precipitation amounts and growing season length are expected to change notably on the Refuge (see Appendix K), as discussed above related to forage availability for elk and bison. This extension of the growing season coupled with relatively small change in summer precipitation suggests changes in soil-moisture on the Refuge and potentially a profound change in range condition by mid-century. This may especially be true if dryer, longer summers follow wetter, warmer spring conditions. This combination has the potential to influence plant species composition, alter overall range productivity and heighten fire risk on the Refuge.

As discussed above, over half of all plant and animal species in North America have shown range shifts due to temperatures and associated changing ecological conditions. This includes invasive plant species, which can have adverse effects on native vegetation. Some invasive plant species present on the Refuge, like cheatgrass, may increase due to these changing conditions, such as increasing frequency or intensity of wildfires. The stressors caused by invasive species, as well as from habitat fragmentation, could be exacerbated by these changing conditions, and may in fact have the potential for combined impacts that could be greater than they would be individually. There also may be a further spread of invasives through increasing extreme events, such as windstorms and floods (National Fish, Wildlife, and Plants Climate Adaptation Network 2021).

Land Development

As discussed later in this EIS ("Land Use and Development: Other Reasonably Foreseeable Effects" section), the area faces moderate to high vulnerability to residential development pressure (Pocewicz, et al. 2014). Currently, about one third of Teton County is already developed for residential or commercial purposes (Teton County 2020). Continued conversion of ranchland and other privately-owned open spaces to these uses is expected to result in further loss of native vegetation, which in turn will diminish available habitat and forage for wildlife species that depend on these plant communities (Wyoming Game and Fish Department 2017a). Teton County is actively engaged in land use planning, and nearly 65% of development over the last 10 years has occurred in already developed areas, so coordination with Teton County, the town of Jackson, and other entities involved in regional planning could help alleviate some of the effects on vegetation and native habitat in the future.

Soils

As discussed above, it is anticipated that additional ranchland and privately-owned open space in the Jackson Hole area will be converted to residential and commercial use. Any such future residential or commercial development would cause a loss of vegetation, potentially increasing soil erosion. This minor effect would likely be temporary during construction if best management practices are followed and if exposed soils are revegetated.

Alternative A (the No Action Alternative) would likely have the highest CWD soil contamination in year 20 when compared to the action alternatives. CWD prevalence, and thus

CWD soil contamination, could change in the study area in response to other future elk management actions at other off-Refuge feedgrounds. Past and present Refuge and off-Refuge elk feeding are associated with increased CWD prevalence. Therefore, Alternative A, when combined with other past, present, and reasonably foreseeable actions increasing CWD soil contamination, would further add to the adverse effects on soil quality.

Water Resources

Water Resources: Affected Environment

Water Resources

Surface hydrologic features on the Refuge include the Gros Ventre River, Flat Creek, Nowlin Creek, Cache Creek, and several other small creeks and springs (Figure 14). The Gros Ventre River is the largest watercourse on the Refuge and is among the river segments designated as wild and scenic by the Craig Thomas Snake Headwaters Legacy Act of 2008. The southern and central portions of the Refuge, where supplemental feeding of elk and bison occurs in the winter, lies in the Flat Creek drainage, including the Nowlin Creek tributary. There are no Refuge feedgrounds near the Gros Vente River.

Ground water flows from northeast to southwest across the Refuge toward the Snake River. The aquifer has high water quality but also has high permeability and substantial interconnection to the rivers and lakes, making it vulnerable to contamination in the recharge areas. Losses to groundwater are common on Flat Creek where it enters the Refuge, and this section often dries up after the spring snowmelt in July.

Water from Cache Creek reaches the Refuge via an underground diversion which surfaces into a cistern located near Refuge headquarters and is used for irrigation. In addition to natural watercourses, there are many miles of irrigation ditches. Three wells and an enclosed water storage reservoir are used by the town of Jackson.

As discussed in the "Vegetation/Habitat/Soils: Affected Environment" section above, riparian habitat along the Gros Ventre River and Flat Creek are very important for Refuge wildlife. Riparian woodlands are also important for water quality by providing shade, which helps to keep water temperatures lower to meet the needs of aquatic life and as bank stabilization to prevent erosion and sedimentation. Flat Creek, and its associated marshlands and tributaries, are integral for the natural recruitment of native trout for the Snake River watershed. Sampling of the native Snake River cutthroat trout, a species that prefers cool water, from 2010 to 2017 on the Refuge in Flat Creek found that the Refuge remains an excellent stronghold for this species (Teton Conservation District 2019).

The Refuge has about 105 cubic feet per second of adjudicated water rights for about 7,500 acres of irrigable land. In 2010, the Service installed a K-line irrigation system for the purpose of increasing forage production for elk (U.S. Fish and Wildlife Service 2009). The Service typically irrigates approximately 4,500 acres each year. Most of the water used for irrigation is from Flat, Cache, and Nowlin Creeks.

For further discussion of the water resources on the Refuge, including water rights, please see the 2015 Refuge CCP.

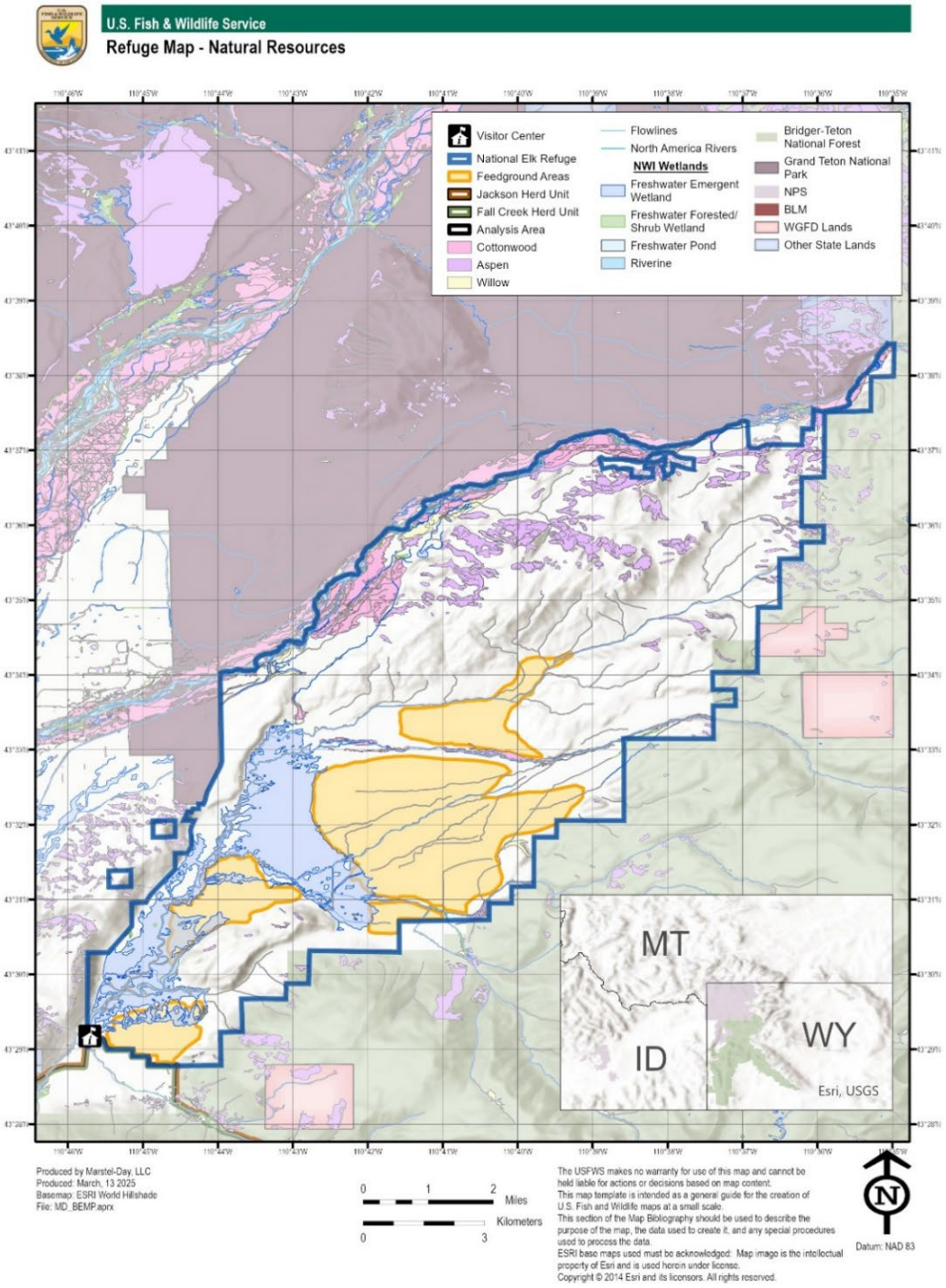

Figure 14. Map of natural resources of the refuge in relation to the feedgrounds areas

Water Quality

The Teton Conservation District has been monitoring water quality in Flat Creek for many years. The latest water quality data and the most recent Flat Creek Watershed Plan was published in 2019 (Teton Conservation District 2019).

In 1996, the Wyoming Department of Environmental Quality (WDEQ) found that the state's designated beneficial uses were threatened for a section of Flat Creek, after it leaves the Refuge (below Cache Creek to its confluence with the Snake River). Flat Creek through this section does not meet the surface water quality standards for total suspended solids and turbidity primarily due to urban runoff (Teton Conservation District 2019).

Teton Conservation District monitored water quality on Flat Creek during stormwater run-off events from 2014–2018 at several sampling sites from near where Flat Creek leaves the Refuge to the WGFD South Park elk feedground, south of Jackson. At the sampling site closest to the Refuge boundary (North Town Edge site), water quality was generally very good, including those parameters most likely to be affected by this BEMP. Median water temperatures were 53°F, with a range of 40–57°F. This is below the threshold of 60°F for aquatic life. The median turbidity was 4 Nephelometric Turbidity Units, which is well below the standard of 10 Nephelometric Turbidity Units; however, there were two individual data points above this. The range of total suspended solids was 3–10 milligrams/liter (mg/L), with a median value of 5 mg/L.

Nitrates were of some concern previously on the Refuge in Flat Creek when sampling in 1997 and 2002 detected levels higher than expected for typical western Wyoming waters (although still well below WDEQ water quality standards). Irrigation and fecal material from elk and bison could be contributing to the elevated nitrate concentrations. More recent sampling from 2014–2018 along Flat Creek downstream of the Refuge did not find detectable levels of nitrates until the furthest sampling station at the WGFD South Park elk feedgrounds (Teton Conservation District 2019).

The large amount of fecal matter produced by wintering elk and bison is also a possible nonpoint source of microbial pollution affecting Refuge water quality but has not been documented as a problem. *Escherichia coli* (*E. coli*) monitoring by WDEQ in 2017 during the recreation season (May–June) found that the median concentration in Flat Creek just outside of the Refuge was less than 50 colony forming units (cfu) per 100 milliliters, well below the recreational standard of 126 colony forming units per 100 milliliters (Teton Conservation District 2019, Wyoming Department of Environmental Quality 2019). However, samples from further downstream (south of Jackson near WGFD South Park elk feedground) did exceed the standard and WDEQ declared this section as "impaired" for *E. coli* in 2020 (Wyoming Department of Environmental Quality 2020). Subsequent research in 2021 into the microbial communities in Flat Creek found that human sewage was the primary contributor to *E. coli*, and that subsurface flow from septic systems and wastewater treatment is likely a major mechanism of fecal loading (Ruehling 2022). This was a change from research in 2003 that found that majority of *E. coli* came from wildlife sources (Teton Conservation District 2019).

Water Resources: Environmental Consequences

Effects on water resources were evaluated in the 2007 BEMP and EIS (U.S. Fish and Wildlife Service 2007), the Refuge Irrigation Expansion Project Plan (U.S. Fish and Wildlife Service 2009), the Refuge CCP (U.S. Fish and Wildlife Service 2016) and the Step-down Plan (U.S. Fish and Wildlife Service 2019a) The following assessment incorporates these findings, as well as supplementary assessments.

Under all alternatives, there would be no change to current irrigation practices to support forage production on the Refuge. The impacts of Refuge irrigation on water resources were analyzed by the Service in the Refuge Irrigation Expansion Project Plan and Environmental Assessment in 2009 (U.S. Fish and Wildlife Service 2009). The operation of the irrigation system was found to have no significant impacts on Refuge resources. Looking forward, irrigation practices on the Refuge may be impacted by changes in precipitation over time. Over the next 20–40 years, average annual precipitation is projected to be highly variable with increased frequency of heavy rainstorms and prolonged periods of drought (U.S. Global Change Response Program: USGCRP 2023). However, these impacts would be the same across alternatives because no changes in irrigation practices are proposed.

Alternative A: No Action

In the short term, this alternative would result in few, if any, changes in water quality as compared to baseline conditions on the Refuge. High concentrations of elk and bison on the Refuge feedgrounds in the winter would continue to introduce unnaturally high amounts of fecal material into watercourses, resulting in elevated *E. coli* and other changes to the microbial community.

The current trend of riparian woodland habitat declining in condition and acreage would be expected to continue under this alternative. Of the four alternatives, continuing to feed elk is predicted to have the highest impact on sensitive riparian vegetation on the Refuge (USGS SIR, Appendix D, Figure C7, D–F). Decades of winter browsing by elk have reduced willow plant community cover by 95% and to remnant plants less than 18 inches high. Elk browsing in cottonwood communities has removed understory, and cottonwood trees are not regenerating.

Over the long term, elk numbers are predicted to decrease on the Refuge even with continued feeding due to CWD (USGS SIR, Appendix D, Figure C5). This could result in minor beneficial effects on aquatic microbial communities because of less fecal material entering surface runoff and beneficial effects to riparian woodlands.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Under Alternative B, actions taking in cooperation with WGFD and other cooperating agencies, including hunter-harvest strategies and the cessation of supplemental feeding of elk when 3% CWD prevalence is reached, should reduce the number of elk overwintering and relying on feedgrounds on the Refuge. Reducing the population and density of elk, especially around the Nowlin Marsh area, which is close to the feeding grounds, may result in less fecal matter getting into the Nowlin Marsh and eventually Flat Creek, providing benefits to water quality on the

Refuge and downstream. In addition, elk foraging on natural vegetation will be more dispersed across the Refuge and therefore fecal deposits will not be as concentrated near waterways. This may further help reduce the amount of fecal material entering Flat Creek through surface run-off.

This alternative is also projected to result in lower impact (fewer elk-use days) on riparian woodlands (narrowleaf cottonwood and willow) on the Refuge than the continue feeding alternative (USGS SIR, Appendices D and E, Figure C7, D–F). Less browsing pressure may allow some vegetation to regenerate and improve water quality by lowering water temperatures through increased shade and reduced sedimentation (total dissolved solids and turbidity) through bank stabilization. Vegetated buffers along streams also have the potential to intercept fecal pathogens conveyed towards the channel by surface flows (Teton Conservation District 2019). The Service's current disease management protocols of incinerating elk carcasses will also help maintain water quality regardless of the number of elk mortalities occurring on the Refuge.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Impacts under this alternative are expected to be like Alternative B. However, impacts on water quality would likely begin sooner as feed rations would be reduced to 5,000 immediately upon implementation before stopping altogether in year 5.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Like Alternatives B and C, this alternative would likely reduce the number of elk overwintering and relying on feedgrounds on the Refuge. Positive impacts to water quality such as decreased fecal matter and reduced browsing of vegetation may take longer under Alternative Depending on the outcomes of the adaptive management approach. However, the cumulative number of elk-days in willow and cottonwood communities over the next 20 years on the Refuge is predicted to be like other alternatives (USGS SIR, Appendix G, Table F4).

Water Resources: Other Reasonably Foreseeable Effects

All the alternatives would result in few, if any, changes to water quality in Flat Creek downstream of the Refuge. Flat Creek has been designated as "Impaired" by WDEQ for total dissolved solids, turbidity and *E. coli.* The most recent monitoring data indicate that the water quality in Flat Creek as it leaves the Refuge is well below the standards set by WDEQ for these parameters. However, the values are not zero, and therefore the Refuge is still contributing to the overall load further downstream in the impaired sections.

Sampling and anecdotal evidence strongly suggest that the native fishery remains intact throughout Flat Creek. In the town of Jackson, Snake River spotted cutthroat trout are regularly observed spawning and are caught by anglers. Under Alternative D, the Refuge would also continue to support the native trout fishery in Flat Creek.

Over the long term, elk numbers are predicted to decrease on the Refuge even with continued feeding due to CWD (USGS SIR, Appendix D, Figure C5). This could result in minor beneficial effects on aquatic microbial communities downstream of the Refuge because of less fecal material entering surface runoff.

The predicted reduction in browsing pressure for riparian woodlands due to the decreasing elk population under all alternatives may also result in additional beneficial effects downstream in Flat Creek. Increased vegetation may help lower the Refuge's contributions to sedimentation (total dissolved solids and turbidity) through bank stabilization. Vegetated buffers along streams also have the potential to intercept fecal pathogens conveyed towards the channel by surface flows (Teton Conservation District 2019).

Under any alternative where the Service decides to stop supplementally feeding elk, some of the previously fed Refuge elk are predicted to move to the WGFD feedgrounds south of Jackson (USGS SIR Report, Appendix C, Figure B3). This includes the South Park feedground on the portion of Flat Creek designated as impaired for *E. coli.* Additional elk on this feedground may increase the fecal load into the creek and contribute to elevated levels of *E. coli*. However, the primary source of *E. coli* in Flat Creek is from human sewage, so this impact may be minor (Ruehling 2022).

4.2. Cultural and Historic Importance and Resources

Cultural and Historic Importance and Resources: Affected Environment

Cultural and Historic Importance

The human history of the Refuge starts with the indigenous people who lived in the area. The arrival of Euro-Americans had a major effect on not only the indigenous people, but also on the environment. Over 10,000 years of human occupation has been documented throughout the region. Generally, the occupation is divided into prehistoric and historic periods. The prehistoric period encompasses the indigenous Native American occupation of the region and represents most of the time span. The historic period generally begins at the time of European and Euro-American contact with the indigenous Native American populations. Both the prehistoric and historic occupation time frames are further divided into other periods based on either technological changes or broad-based cultural patterns. These time periods will not be discussed further as they are well documented in current academic and popular literature.

Prior to Euro-American contact, the indigenous people inhabiting the region are thought to have seasonally used this high-elevation valley primarily during the warm months, and it is believed that no one tribe occupied Jackson Hole year-round. Traditional uses of the land included hunting and fishing, collection of plants and minerals, and ceremonial activities. The most prominent groups that occupied the eastern Idaho and western Wyoming area before settlement by Euro-Americans were the Bannock, Eastern Shoshone, and Northern Shoshone tribes. Other American Indian Tribal groups have some historical or continued association with lands now within the Refuge: Assiniboine, Athabascans, Comanche, Crow, Gros Ventre, Kiowa, Kootenai, Nez Perce, Salish, Teton Sioux, and Umatilla. In addition, the Arapaho, Blackfeet, Cheyenne, and other Siouan groups and people of the Plains made excursions into the region for hunting, warfare, and trade (Walker 2005).

The Shoshone-Bannock Tribes have provided the following information related to the cultural importance and history of the Shoshone-Bannock on the Refuge and surrounding areas:

The Shoshone-Bannock Tribes have called the lands that now make up the Refuge and surrounding areas, including Yellowstone, home since time-immemorial.[3] The archaeological records and historical documentation undeniably proves that the Shoshone-Bannock Tribes lived upon and utilized these lands for subsistence hunting, fishing, and gathering to provide for their Tribal membership long before westward expansion and settlement.[4] The bounty of natural resources to this particular region created considerable conflict between Shoshone-Bannock Tribal members and early settlers, commercial guides, hunters, and the early tourism industry.[5] This animosity towards Shoshone-Bannock Tribal members exercising their treaty right to hunt, ultimately resulted in the loss of Tribal member lives in what became known as "The Jackson Hole War," in which 27 settlers surrounded and disarmed a Bannock hunting party near Jackson Hole, consisting of 9 men, 13 women, and 5 children.[6] After a forced march of 30 miles, the Bannocks attempted to escape fearing violence. An elder Bannock man, Se-wa-e-gat, was shot and killed, another was wounded, and "an infant was lost in the melee and never found."[7] This is an example of the hardship and adversity the Shoshone-Bannock Tribes have had to navigate to continue their way of life and protect their federal reserved rights. The Shoshone-Bannock Tribes are now headquartered in Fort Hall, Idaho located in southeastern Idaho and continue to exercise their right to hunt pursuant to their treaty.

These paramount rights were reserved by the Shoshone-Bannock Tribes in their solemn treaty agreement known as the 1868 Fort Bridger Treaty (TREATY WITH THE EASTERN BAND SHOSHONI AND BANNOCK, 1868., 15 Stat. 673). Article IV of this agreement guarantees the right of the Tribes to hunt upon the unoccupied lands of the United States. The Shoshone-Bannock Tribes actively manage their hunters subject to their Tribal game code, fish and game regulations, Tribal Fish and Wildlife Department, Tribal Fish and Game Enforcement Department, Fish and Game Commission, and Tribal Court.

In the early 2000's the Shoshone-Bannock Tribes and the Service worked together to establish a [tribal] bison hunt to recognize the cultural significance of the land and resources of the Refuge to the Shoshone-Bannock Tribes. It also recognizes the importance of the treaty reserved rights held by the Shoshone-Bannock Tribes in their solemn treaty agreement. The Refuge's 2023 Compatibility Determination stipulates the following:

The [tribal] bison hunt, as referenced in the Comprehensive Conservation Plan (CCP) for the National Elk Refuge (NER/Refuge) (2015) is being expanded to include additional federally

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[3] Gregory E. Smoak, The Shoshone-Bannock Tribes and the Fort Bridger Treaty: Their Off-Reservation Rights 127-153 (American West Center University of Utah, 1997).
[4] *Id.*
[5] *Id.*
[6] *Id.*
[7] *Id at 148.*

recognized native American Tribes (hereafter referred to as "Tribes") that claim treaty-based hunting rights on the lands of the NER.[8]

In addition to the [tribal] bison hunt, the Shoshone-Bannock Tribes also gather culturally significant resources on the Refuge for their use within the Shoshone-Bannock Tribes. This recognition of Tribal rights and priorities strengthens the trust relationship between the Shoshone-Bannock Tribes and Service and the important cultural and legal connection to the lands that still exist today.

Refuge resources of contemporary tribal importance include elk, bison, and other culturally important natural resources. Bison continues to be of particular interest to many Native American Tribes on a regional and national scale, because the animals are central to cultures and traditions. As described above by the Shoshone-Bannock Tribes, associated present-day tribal activities on the Refuge include the tribal bison hunt conducted by the Shoshone-Bannock and Eastern Shoshone Tribes based on the cultural significance of the Refuge to these Tribes.

Cultural and Historic Resources

Cultural resources are fragile, non-renewable evidence of past human history and heritage in the landscape. About 20% of the Refuge has been inventoried for cultural resources. There are at least 24 known cultural resources on the Refuge: 7 prehistoric sites and 17 historic sites. Five sites are historic properties, meaning that they are eligible for the National Register of Historic Places (National Register), and at least eight sites not yet evaluated for the National Register. Based on environmental conditions in conjunction with previous cultural resource inventories across the surrounding landscape, additional prehistoric and historic resources are thought to exist on the Refuge.

At least eight prehistoric archaeological sites have been recorded, which include roasting pits, stone circles, and a bison kill site. Among the artifacts that have been identified are elk and bison bones, numerous cores, flakes, choppers, scrapers, bifaces, and projectile point fragments.

The historic sites are primarily represented by ditches and associated water control structures, trash scatters and dumps, collapsed log structures and foundations associated with homesteads, the remains of a local schoolhouse, and the Kelly Cemetery.

The Miller House, built in 1898 and listed on the National Register in 1969, was one of the early homesteads in the valley. It was one of the first tracts purchased for the Refuge and served as the Refuge's original office. The National Register nomination for the property was amended in 2001 to include the Miller Barn (the list includes the USFS cabin as well). The historic Miller

[8] *See* Compatibility Determination (CD) for Cultural/Ceremonial Bison Hunting by Federally Recognized Native American Tribes on the National Elk Refuge. 2023. Fish and Wildlife Service, Jackson, WY; Compatibility Determination for Hunting on the National Elk Refuge. 2015. U.S. Fish and Wildlife Service, Jackson, WY. 2 pp; Comprehensive Conservation Plan and Environmental Assessment: National Elk Refuge. 2015. U.S. Fish and Wildlife Service, Jackson, WY. 333 pp.

Ranch (48TE903) consists of three main structures: the Miller House, the Miller Barn, and a USFS cabin.

In 2016, the Refuge Headquarters Complex/Administrative Area (48TE2006) was formally documented and evaluated as a National Register-eligible historic district under Criterion A and C, with multiple buildings (including Quarters 1, the Office, the Service and Comfort Station, and Quarters 9) recommended as eligible/contributing under the district's 1940–1966 period of significance.

Cultural and Historic Importance and Resources: Environmental Consequences

Alternative A: No Action

Cultural and Historic Importance

The supplemental feeding of elk and bison has ensured stable populations of both elk and bison historically. However, as supplemental feeding of elk is predicted to cause an increase in CWD prevalence and threatens the long-term population and health of the elk herd, this alternative could adversely impact this cultural resource of the Tribes. However, as discussed above in the "Bison: Environmental Consequences" section, continued supplemental feeding as proposed under Alternative A ensures a stable population of bison on the landscape, because it reduces human-bison conflict on the landscape, which is the main cause of bison mortality. Therefore, the continued feeding of bison under Alternative A is predicted to maintain the current population of 500 bison absent any major disease concerns, which also ensures there is sustainable population that allows for the continued tribal bison hunt. However, Alternative A does not include any adaptive management of the supplemental feeding of bison if a disease concern would arise and therefore, if a novel disease arises in the bison herd, the continued supplemental feeding practices could increase the risk of long-term impacts of disease on the health and sustainability of the Jackson bison herd.

Cultural and Historic Resources

Bison and elk herds, which are free ranging, have the potential to damage cultural resources, but to a lesser extent as they do not congregate in the same area for as long a period compared to feeding areas. Previous ranching in the area would have had similar effects as elk and or bison feeding.

Past and current supplemental feeding of elk and bison herds create concentrations of ground disturbance in the locations feeding occurs due to both the high concentration of animals and the management activities necessary to conduct supplemental feeding, which has the potential to damage cultural resources in these locations. However, supplemental feeding occurs in the winter when there is snowpack and frozen ground that protects these resources, so over the many years that the supplemental feeding program has been in existence, there have not been any documented impacts on cultural resources. Supplemental feeding practices do not happen around the Miller House or the Refuge Headquarters Complex/Administrative Area, so there are no direct or indirect impacts on historic resources on the Refuge.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Cultural and Historic Importance

This alternative is predicted to have better long-term outcomes for bison, elk, and other natural resources on the Refuge than the Alternative A and so will likely have long term beneficial effects on the cultural importance of the Refuge's natural resources. Continued supplemental feeding of bison to avoid human-wildlife conflict will ensure a sustainable bison population into the future and the continued ability to offer tribal bison hunts on the Refuge.

Cultural and Historic Resources

Alternative B is predicted to reduce the amount of surface disturbing activities within the first couple years and over the 20 years of implementation as the Service phases out supplemental feeding of elk and as the elk population decreases over time, which will lower the risk of direct or indirect impacts to cultural and historic resources.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Cultural and Historic Importance

Like Alternative B, this alternative is predicted to have better long-term outcomes for elk, and other natural resources on the Refuge than Alternative A and so will likely have long term beneficial effects on the cultural importance of those natural resources. However, Alternative C is predicted to have the worst outcomes of all alternatives for the long-term sustainability of the bison population, which could have adverse consequences on the future ability of the Service to continue offering the tribal bison hunt on the Refuge.

Cultural and Historic Resources

Like Alternative B, the implementation of Alternative C will reduce the risk of direct or indirect effects to cultural and historic resources in the first few years of implementation as the Service phases out supplemental feeding of elk and bison. There will be less risk of direct or indirect impacts to cultural and historic resources under this alternative compared to other alternatives, because the Service would also stop supplementally feeding bison. So, under Alternative C, there will be the fewest animals congregating and management activities in the areas where animals have historically been fed.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Cultural and Historic Importance

Impacts on cultural resources would be like Alternative B with long term benefits to the natural resources of cultural and historical importance on the Refuge.

Cultural and Historic Resources

Like Alternatives B and C, the implementation of Alternative D will lower the direct and indirect impacts to cultural and historic resources over time as the Service works cooperatively with WGFD and other cooperating agencies to reduce the elk population wintering on the Refuge and eventually stop supplementally feeding elk.

Cultural and Historic Importance and Resources: Other Reasonably Foreseeable Effects
There are no reasonably foreseeable past, current, or future actions that will add to any of the above-described impacts to cultural resources.

4.3. Hunting, Visitor Use, and Experience

Hunting, Visitor Use, and Experience: Affected Environment

The Refuge is often considered one of the "crown jewels" of the NWRS because of its spectacular scenery, proximity to two renowned national parks (Grand Teton and Yellowstone), and the large, charismatic populations of seasonal elk and bison populations. It is the spectacle of thousands of elk wintering on the Refuge's grasslands that intrigues the public and makes the Refuge iconic. The Refuge attracts approximately 472,000 visitors annually for a variety of seasonal recreational activities. Generally, tourism in the Jackson Hole area is expected to fluctuate as a function of several factors including national-scale socioeconomic trends, weather conditions, and wildlife presence (Loomis and Caughlan 2004).

Length of Stay
Seasonally, visitors frequented the Refuge primarily in the winter months (74%), followed by spring (40%), fall (22%), and summer (17%). A single day trip to the Refuge was the most popular length of stay (88%) and visitors were reported to stay an average of 2 hours. Multi-day trips averaged 3 days, with a smaller portion of visitors (17%) participating in an extended stay (Dietsch, et al. 2020).

Visitor Origin and Other Details
In 2018, visitors to the Refuge consisted of residents living approximately 50 miles or less from the Refuge and non-local visitors living more than 50 miles away. Nearly all visitors lived in the United States, with most of the visitors originating from Wyoming, Texas, and Idaho. Approximately 1% of the visitors resided in other countries. Transportation to the Refuge was primarily by private vehicle (74%) and by the Refuge shuttle bus or tram (30%).

The Refuge repeat visitors (38%) averaged 18 visits within a 12-month timeframe. Some visitors (41%) also combine their trip to the Refuge with an average of 2 visits to other national wildlife refuges. Other visitors (68%) combined their trip with visits to public lands (Dietsch, et al. 2020).

The visitor services staff at the Refuge offer year-round programs that incorporate traditional recreational activities as well as wildlife viewing, photography, interpretation, and environmental education into visitor use and experience.

Hunting
The Refuge oversees and manages a very popular and high demand elk and bison hunt for both resident and non-resident hunters. Hunting is allowed as a compatible recreational activity and serves as a wildlife management tool on the Refuge. The Refuge manages the hunt program in cooperation with WGFD, and the required special permits are issued through the WGFD website.

Currently, elk hunting (Hunt Area 77) on the Refuge begins in October and ends in mid-December. Hunting is focused on cow/calf harvest and seasons are designed to reduce the number of elk wintering on the Refuge and discourage elk use of the Refuge until later in the winter. Only one permitted hunting outfitter operates on the Refuge, primarily guiding elk and bison hunters. The number of guided hunts on the Refuge varies each year depending on wildlife presence. In 2022, there were 51 guided hunts, while in 2023, there were 35.

The general process for setting harvest allocation of the Jackson elk herd is as follows: WGFD conducts surveys during the winter to determine a population's status/estimate in relation to the management objective. From there, field personnel develop management proposals designed to move the population closer to the objective through hunting season design. That could include season dates, license quotes, changes in allowed harvest, etc. The season proposals are then vetted and approved by the Wildlife Division of the Department and presented to the WGFC in April of each year for approval. WGFC has the authority to approve/create regulations regarding the season setting process.

For 2024, the proposed number of hunting licenses for the Jackson elk herd was 2,700, with approximately 2,430 allocated to residents and 270 to nonresidents. The estimated number of recreation days associated with hunting the Jackson elk herd was approximately 16,900. See Table 1 for more hunting season characteristics of the Jackson elk herd from 2018 to present.

Table 1: Hunting Season Characteristics

	2018–2022 Average	2023	2024 Proposed
Jackson Elk Herd			
Trend Count	10,493	9,264	11,000
Harvest	1,101	862	1,100
Hunters	2,612	2,006	2,600
Active Licenses	2,749	2,184	2,700
Recreation Days	16,894	12,532	16,900
Jackson Bison Herd			
Trend Count	463	514	500
Harvest	103	19	60
Hunters	154	49	70
Active Licenses	154	49	70
Recreation Days	1,403	709	750

Source: (Wyoming Game and Fish Department 2023)

The 2025 elk hunting season for the Refuge will have significant changes in season length and elk license numbers to reduce harvest of LDME and increase harvest of SDME. This is, in part, due to the down trending Jackson herd objective count and increased proportion of SDME. The three-year average was 9,733 elk as compared to the current herd objective of 11,000 elk. These changes include a later hunt start date (November 1), shortened overall hunt period, and extending the season through December 19. The last 12 days of the season will be a Unit 77

specific hunt that will permit 100 cow/calf licenses only. The early part of the season will have significantly reduced license numbers, which at the time of writing was not yet determined.

A 2006 study by Needham et al., found that nearly all hunters (99%), both residents and nonresidents, would continue hunting elk in Wyoming if CWD prevalence was at 10%. However, if CWD rose to 50%, 19% of Wyoming elk hunters would choose to hunt in another state and 19% would stop hunting altogether. Nonresident hunters were more likely than residents to stop hunting elk in Wyoming as CWD prevalence increased (Needham, Vaske and Manfredo 2006).

As discussed in the "Bison: Affected Environment" section, the northern two-thirds of the Refuge is open to bison hunting with seasons running from mid-August through January. For 2024, the proposed number of hunting licenses for bison was 70, with total recreation days of 750 associated with hunting the bison herd, most of which occurs on the Refuge. See Table 1 for more hunting season characteristics of the Jackson bison herd from 2018 to present.

Fishing

The Refuge fishing program is popular with locals and visitors with approximately 2,000 anglers each season. Fishing is allowed on the Gros Ventre River (April 1 – November 30), Upper Flat Creek (May 1 – November 30), Lower Flat Creek and Nowlin Creek (August 1 – October 31) and Fish Hatchery Pond (year-round) during daylight hours. Fly fishing is the preferred fishing technique and is focused on trout, primarily Snake River fine-spotted cutthroat, the native trout of the Jackson Hole area. In addition to public access to fishing, the Refuge permitted 16 fishing guide companies employing 162 guides who guided 99 trips for 250 clients in Fiscal Year (FY) 2024 (USFWS unpublished data 2025).

Wildlife Observation and Photography

Thousands of people observe and photograph elk at close proximity on the Refuge while participating in the sleigh ride program. Bison are popular with visitors and residents as a symbol of the West, and they are central to the culture and traditions of many American Indian tribes. Bison are less visible on the Refuge in the winter but can occasionally be viewed in the Chambers and McBride area from the Refuge Road or Highway 89. The Refuge, because of the abundance of wildlife observation opportunities, also has many visitors accessing the Refuge for commercial photography and filming.

Sleigh Rides

Visitors are provided the opportunity to take part in a winter interpretive program from horse drawn sleighs through a concessionaire agreement with a private business. This program provides visitors with a close look at elk on the Refuge while riding on horse-drawn sleighs.

During the winter season of 2018–2019, the concessioner had just over 36,000 visitors participate in sleigh rides. This hour-long activity commences at and returns to the west boundary of the Nowlin Management Unit along Highway 89. Winter supplemental feeding at the Nowlin feedground sustains up to 2,000 elk in this vicinity which can be viewed from the sleighs.

Environmental Education, Information and Interpretation
The Refuge offers year-round public programming that includes web-based introductions, background information, and pre-recorded (audio-accessible sessions) windshield tours of areas within the Refuge based on winter and summer access. In addition, daily talks and special family events are provided at the National Elk Refuge and Greater Yellowstone Visitor Center. During the winter season, December through March, the Refuge also offers four winter naturalist driving tours of the Refuge each week. These tours are free, offered on a first-come, first-serve basis and are a very popular way to view and learn about Refuge and its wildlife.

National Elk Refuge and Greater Yellowstone Visitor Center
The visitor center is situated at the southern edge of the Refuge and serves as a local and regional focal point for valuable information about the Refuge and activities and services in the area, with approximately 300,000 visitors annually. This facility is staffed by the Refuge, Bridger-Teton, Grand Teton Association and Jackson Hole Chamber of Commerce

Special Uses
Approximately 50 Special Use Permits (SUPs) are issued and administered by Refuge staff annually. These SUPs allow services that would not otherwise be offered to the public by the Refuge. Special conditions for the activities are assessed by Refuge Management before issuing the SUP. Special uses include guided wildlife-viewing tours, guided hunts and elk and bison retrieval services; commercial photography and filming; Eastern Shoshone and Shoshone-Bannock Tribes bison hunts; non-profit group antler collection; and research.

Access through the Refuge
The Refuge provides access for visitors as well as travel to private land or other Federal land for numerous access needs: general access, nature photography and observation, camping, hiking, hunting, fishing, and Bridger-Teton access.

Visitor Perceptions, Opinions, Motivations, Values
Elements of visitor experience were captured in a 2019 visitor survey of a sample of 145 visitors to the Refuge. The survey was a NWRS-wide effort to monitor visitor characteristics, experiences, and satisfaction with their Refuge experiences. The visitor survey participants shared their experiences in recreational activities; comfort in nature, including feeling safe and welcome; and satisfaction with the Refuge experiences (Dietsch, et al. 2020).

Visitors reported the top three recreational activities at the Refuge over a 12-month timeframe as wildlife observation (93%), photography (50%), and auto tour route/driving (34%). Single-day visitors identified their top three primary activities as wildlife observation (69%), the sleigh ride (12%), and photography (6%). Most of the visitors (78%) accessed the visitor center for the primary activity of viewing exhibits (91%). Other visitors (84%) accessed the gift shop or bookstore.

The visitor experience at the Refuge is deeply rooted in the elk herd. Such valuing of elk on the landscape stretches back to the turn of the nineteenth century, where a deep-seated concern for the wellbeing of the elk among residents and visitors alike is well-documented in historic correspondence, newspapers, letters, and photographs (Morriss 2012). In many ways, this

concern for the elk's wellbeing inspired the founding of the Refuge itself in 1912. This phenomenon is not new, as emerging research documents and explains the human affinity for wildlife and associated positive mental, social, and spiritual health outcomes with actions as simple as observing wildlife (Chavez, et al. 2023)

Hunting, Visitor Use, and Experience: Environmental Consequences

Alternative A: No Action

Hunting

No short term, adverse effects are expected; however, long term, adverse effects to elk hunting are anticipated for Alternative A. In the early years of implementing Alternative A, elk hunting seasons and harvest levels on the Refuge will likely remain similar and continue to support the WGFD population objectives for the Jackson elk herd (currently 11,000 elk) and for the bison herd (currently 500 bison). However, hunting seasons would likely need to be modified, and harvest reduced by WGFD in response to the effects of CWD on the population or other unforeseen factors impacting the Jackson elk herd. As the elk population declines due to the predicted increases in CWD prevalence, the number of hunting permits is expected to fluctuate but with an overall trend of decreasing. In the first 5 years, approximately 6,100 elk are expected to die during winter, while the elk population is projected to be 5,200 by year 20 (USGS SIR, Appendix C, Table B1). The precise impact on hunting opportunities is difficult to predict because the number of hunting permits issued is based on maintaining the Jackson elk herd population objective set by the State of Wyoming and WGFC. However, if permits decrease in proportion to the elk population (a predicted 53% decline in population over 20 years), hunter permits for the Jackson elk herd could drop from approximately 2,700 today to 1,269 in 20 years (Wyoming Game and Fish Department 2023).

As the prevalence of CWD increases in the Jackson elk herd, it is anticipated that more hunters, particularly nonresidents, would stop hunting. Previous studies of hunting patterns following CWD emergence have predicted hunting participation declines as CWD prevalence increases (for example, (Needham, Vaske and Manfredo 2006)). However, effects on participation vary by state, species pursued, and hunters' emotional response to CWD (Schroeder, et al. 2021). Other studies have shown that these declines reverse and hunting returns to normal levels even as CWD prevalence increases (for example, (Holland, et al. 2020)). Therefore, under all alternatives, there may be a decrease in hunter participation initially as CWD prevalence increases to higher levels, but it also may return to previous levels. However, it is difficult to make any quantitative predictions of how CWD prevalence levels will impact hunter participation.

Under Alternative A, CWD prevalence is expected to be around 35% by year 20, the highest among the alternatives (USGS SIR, Appendix C, Table B1). This suggests there may be lower hunter participation compared to alternatives with lower CWD prevalence over the long term.

No short- or long-term adverse effects would be expected for hunting of bison under Alternative A. Because Alternative A would result in a similar bison herd population as there is today, hunting of bison would also likely remain the same. For the bison herd, the proposed number of

hunting permits for 2024 is 70, with 63 allotted to residents and 7 to nonresidents. The proposed hunting days are 750, with 675 for residents and 75 for non-residents.

Other Visitor Use and Experience

No short term, adverse effects to other visitor use and experiences are expected under Alternative A. It is anticipated that visitors would continue to access the Refuge, with many coming for wildlife observation and photography. As discussed above, many visitors come to the Refuge for unique opportunities to view and photograph large numbers of elk up close when elk are being fed during the winter months.

Over the long term, Alternative A is expected to result in the greatest decline in the elk population over the long term due to continued feeding, however, there is still anticipated to be many elk on the Refuge. Visitors will continue to have those unique opportunities to observe and photograph elk up close along the feedlines during feed season. Visitors are expected to continue to view and photograph other popular wildlife species that reside or frequent the Refuge, and the Refuge will continue to offer wildlife educational programs. Environmental education programs would continue, and visitors would maintain access to the Refuge, the visitors center, and nearby Federal lands. Predicted changes in nonhunting visitors and visitor-related spending, and specifically changes to sleigh rides, were evaluated and modeled as part of the SDM process (see USGS SIR, Appendix F); However, the results found minimal differences in changes to non-hunting visitors and visitor-related spending, including effects to sleigh rides, among the alternatives, mostly because there is no data or information that shows that the number of elk on the Refuge area a huge indicator of nonhunting visitation. There was also a high degree of uncertainty regarding these predicted changes. Nonhunting visitation performed slightly higher under Alternative A compared to the other alternatives, but with a large range of within-alternative variation (see USGS SIR, Appendix F, E6-E7).

Visitors' experience is likely to be adversely impacted over the long term as visitors will likely observe the symptoms of CWD in the elk and may see sick and dying elk when CWD prevalence rates become high. It is reasonable to assume that the perceptions of sick and suffering elk will be especially upsetting for people, as a shift in wildlife values throughout the country increasingly finds a growing portion of the public (35%) that views wildlife as part of their community, deserving care and concern similar to humans rather than simply as a natural resource (Manfredo, et al. 2018).

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Hunting

Hunting opportunities and participation are predicted to increase over the first 5–7 years of implementing the plan in the attempt to reduce the SDME segment of the population during feeding phase-out. As elk populations decline in response to CWD effects or feeding cessation, hunt seasons would likely be modified by WGFD and harvest levels reduced compared to the status quo dependent on the WGFC's population objectives. In the first 5 years, approximately 5,900 elk are expected to die during winter, while the elk population is projected to be 6,900 by year 20 (USGS SIR, Appendix C, Table B1). If permits decrease in proportion to the elk population (a predicted 37% decline in population over 20 years), hunter permits for the Jackson

elk herd may drop from approximately 2,700 today to 1,701 in 20 years (Wyoming Game and Fish Department 2023).

Under Alternative B, CWD prevalence is expected to be around 23% by year 20, the lowest among the alternatives (USGS SIR, Appendix C, Table B1). This suggests higher hunter participation compared to alternatives with higher CWD prevalence.

No short term or long-term adverse effects would be expected for hunting of bison under Alternative B as the bison population is expected to stay approximately the same at a minimum of 500 bison. Refuge bison hunting opportunities are likely to be like Alternative A, although timing or duration of bison hunting seasons could be modified by WGFD to reduce conflict situations as necessary.

Other Visitor Use and Experience

Under Alternative B, the population of elk on the Refuge is anticipated to decrease in the short term due to the potential population reduction management option during winter months of the SDME and the cessation of feeding when CWD prevalence reaches 3%. However, there is still anticipated to be many elk on the Refuge in the winter, and it is anticipated that visitors would continue to access the Refuge, with many coming to view and photograph wildlife, including elk, bison, bald eagles, trumpeter swans, wolves, and grizzly bears.

Environmental education programs would continue, and visitors would maintain access to the Refuge, the visitors center, and nearby Federal lands. Visitors would also be expected to continue to enjoy the sleigh ride experience and the elk feeding areas would continue to provide reliable opportunities to view and photograph elk until the refuge stops feeding. At the point where the Refuge stops feeding, which could be soon after implementation of Alternative B, the elk may not reliably be in the location of the feedgrounds. So, the sleigh ride and other environmental education, observation and photography opportunities may need to be adjusted in timing and location as a result. Additionally, the Refuge may, in cooperation with WGFD, alter hunting seasons on the Refuge, which also may result in adjustments to sleigh rides and other visitor use and experiences.

While visitors may see less elk with symptoms of CWD under Alternative B compared to Alternative A over the long term, in severe winters when once the Refuge stops supplemental feeding, visitors may see starving elk, including elk calves, which will adversely impact visitor experience. Animals infected with CWD look very similar to starving animals in the later phases of the disease and so visitors may not realize a difference in adult elk (elk calves rarely, if ever, contract CWD). Similarly to Alternative A, it is reasonable to assume that the perceptions of sick and suffering elk will be especially upsetting for people, as a shift in wildlife values throughout the country increasingly finds a growing portion of the public (35%) that views wildlife as part of their community, deserving care and concern similar to humans rather than simply as a natural resource (Manfredo, et al. 2018).

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Hunting

Alternative C will likely have the most adverse impacts on hunting opportunities for elk and bison over the short term because it does not include the hunter-harvest strategies proposed in Alternatives B and D and because it is predicted to have a sharper population decline in the short term than Alternative A. Like all alternatives, due to decreasing elk population there will also be long term impacts on hunting opportunities. In the first 5 years, approximately 6,200 elk are expected to die during winter, while the elk population is projected to be 6,100 by year 20 (USGS SIR, Appendix C, Table B1). If permits decrease in proportion to the elk population (a predicted 45% decline in population over 20 years), hunter permits for the Jackson elk herd could drop from approximately 2,700 today to 1,485 in 20 years (Wyoming Game and Fish Department 2023).

Under Alternative C, CWD prevalence is expected to be around 26% by year 20, the second lowest among the alternatives (USGS SIR, Appendix C, Table B1). This suggests higher hunter participation compared to alternatives with higher prevalence rates over the long term.

Additionally, the USGS SIR predicted the number of bison on the Refuge after 20 years would be approximately 13% lower than the current population (USGS SIR, Appendix E, Chapter D7), and so we can predict a proportionate decline in hunting opportunities for bison.

Other Visitor Use and Experience

Under Alternative C, elk numbers on the Refuge are expected to decrease in the short term due to the end of supplemental feeding after five years and over the long term due to the potential prevalence of CWD. While bison numbers will also decrease under Alternative C, not to a degree that will impact nonhunting visitor use or experience. Like Alternative B, there is still anticipated to be many elk on the Refuge after year five. Visitors would also be expected to continue to enjoy the sleigh ride experience and the elk feeding areas would continue to provide reliable opportunities to view and photograph elk for five years; however, with the end of elk feeding, reliable opportunities for visitors to view and photograph elk would be reduced. The sleigh ride experience would potentially need to adjust to accommodate more random viewings of elk on the Refuge.

Like all alternatives, it is anticipated that over the long-term visitors will continue to access the Refuge, with many coming to view and photograph wildlife, including elk, bison, bald eagles, trumpeter swans, wolves, and grizzly bears. Visitors would be expected to continue to view and photograph elk throughout the Refuge. Environmental education programs would continue, and visitors would maintain access to the Refuge, the visitors center, and nearby Federal lands.

Like Alternative B, visitors may see less elk with symptoms of CWD under Alternative C compared to Alternative A, but, in severe winters when once the Refuge stops supplemental feeding, visitors may see more starving elk, including elk calves, which will adversely impact visitor experience.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed Hunting

Hunting opportunities of the Jackson elk herd are expected to increase the most under Alternative D compared to other the other alternatives. Hunting opportunities and participation could substantially increase over the first 5–7 years of implementing the plan in the attempt to reduce population with a focus on SDME as authorized by WGFC. As elk populations decline in response to CWD effects or feeding cessation, hunt seasons would potentially be modified by WGFD and harvest levels reduced compared to the status quo dependent on the WGFC's population objectives.

Like Alternative B, no adverse effects would be expected for hunting opportunities of bison under Alternative D.

Other Visitor Use and Experience

Only minor adverse effects to other visitor use and experiences are expected under Alternative D. Like Alternatives B and C, if the Service stops supplemental feeding of the elk, they may not reliably be in the location of the feedgrounds like they are during the feeding season and so the sleigh ride may need to be adjusted as a result. Additionally, efforts to reduce SDME through harvest may result in changing hunting seasons on the Refuge, which could likewise adversely impact the sleigh ride operations.

Even with fewer elk present on the Refuge as the elk population overwintering on the Refuge declines, visitors are expected to continue to have opportunities to view and photograph elk and bison. Environmental education programs would continue, and visitors would maintain access to the Refuge, the visitors center, and nearby Federal lands.

Bison would continue to be fed, as necessary, to maintain at least 500 bison in the population and to minimize human-bison conflict. Opportunities for visitors to view and photograph bison are expected to remain the same for visitors to the Refuge. In addition, visitors are expected to continue to view and photograph other popular wildlife species that reside or frequent the Refuge.

While visitors may see more elk with symptoms of CWD under Alternative D compared to Alternatives B and C over the long term, visitors will likely see fewer starving elk because of the many strategies to reduce starvation proposed under Alternative D. Although, as discussed above, animals infected with CWD look very similar to starving animals in the later phases of the disease and so visitors may not realize a difference. Like all alternatives, visitors would continue to access the Refuge, with many coming to view and photograph wildlife, including elk, bison, bald eagles, trumpeter swans, wolves, and grizzly bears.

Hunting, Visitor Use and Experience: Other Reasonably Foreseeable Effects

Over recent years, there has continued to be a consistent increase in visitors to the Refuge. In 2023, direct travel spending in Teton County was $1.7 billion, with 8.7 million visitors to Wyoming in 2023, a 2.5% increase from 2022 (Wyoming Office of Tourism 2023). Given these upward trends in travel spending and visitation, Teton County is likely to continue to experience increased visits to the Refuge**.** This growth could help mitigate any potential negative visitor use

effects that any of the alternatives may have on visitor use and experience. Additionally, Teton County's increasing population density indicates sustained development, which may continue to attract tourists even with changes in elk population under each alternative. This growing density could offset some economic losses through diversified tourism or recreational activities.

With the Refuge's inclusion in the GYE, visitors also have opportunities to combine additional experiences within Yellowstone, Grand Teton, and several other national forests across Wyoming. Offsetting any decline in sleigh-ride offerings with opportunities for wildlife viewing in the overall ecosystem.

Since 2014, the number of paid hunting license holders in Wyoming has remained stable (U.S. Fish and Wildlife Service 2024a), suggesting that hunting participation will likely continue at a consistent rate. In contrast, paid fishing license holders have increased by 17% from 2014 to 2024, indicating a steady upward trend in fishing participation (U.S. Fish and Wildlife Service 2025). As a result, no significant increase in visitor uses and experience impacts related to hunting is expected. However, rising fishing participation could lead to increased visitation to the Refuge.

4.4. Public Health and Safety

Public Health and Safety: Affected Environment

Disease Transmission

Brucellosis

Brucellosis is a bacterial disease that can spread to humans through the consumption of undercooked meat or unpasteurized dairy products from infected animals. Hunters face an increased risk if they come into direct contact with the blood, tissue, or fluids of an infected animal through their skin, eyes, nose, or mouth. According to the Centers for Disease Control and Prevention (CDC), approximately 500,000 people worldwide are affected by brucellosis each year, with only a few hundred cases reported in the United States. However, experts estimate that the actual number of infections may be much higher—closer to five million—due to underreporting and limited testing capacity (Bosilkovski 2023).

Symptoms of brucellosis often resemble the flu and can be treated with prolonged courses of antibiotics. Most individuals recover within weeks or months, but in rare cases—fewer than 2%—death can occur (U.S. Forest Service 2023). Person-to-person transmission is rare (World Health Organization 2020).

As discussed above in the "Natural Resources" section, in Wyoming, brucellosis remains a concern for wildlife populations. Studies indicate that approximately 32% of elk in feedgrounds test positive for the bacteria, while rates in bison may be as high as 65% (Wyoming Game and Fish Department 2019). Feedgrounds play an essential role in concentrating elk populations, which reduces interactions between elk and cattle, thereby lowering the risk of transmission to livestock. However, this congregation of elk increases the likelihood of the disease spreading within the elk population, making complete eradication difficult (U.S. Forest Service 2023).

CWD

CWD is a fatal neurological disease that affects members of the deer family (Cervidae), including elk. It was first identified in Colorado in the late 1960s and in wild deer by 1981. By the 1990s, the disease had spread more widely across Colorado and into southern Wyoming. As of early 2024, CWD has been reported in 32 states and four Canadian provinces (Centers for Disease Control and Prevention 2024).

Between 2020 and 2023, over 1,400 elk in the Jackson Hole area were tested for CWD, with only one confirmed positive case (Cook, et al. 2024) The disease is caused by prions, abnormally shaped proteins that pass through an infected animal's digestive system and remain in the environment for years—potentially more than a decade (Centers for Disease Control and Prevention 2024). Because infected animals often do not show symptoms until the later stages of the disease, hunters may unknowingly encounter infected elk.

While scientists have not identified all modes of transmission, evidence suggests CWD spreads through direct contact between infected and healthy animals, as well as exposure to contaminated soil, plants, or feed. Currently, there are no effective treatments for CWD at the individual, population, or landscape level, making prevention a critical component of wildlife management (U.S. Forest Service 2023).

To date, there is no confirmed evidence that CWD can be transmitted from wildlife to humans or domestic livestock (U.S. Forest Service 2023). Research suggests there is a significant species barrier that prevents CWD transmission to people, even when consuming meat from infected animals (National Institutes of Health 2024). However, experts warn that new, emerging CWD strains could develop with the potential to infect agricultural production animals and humans, creating serious deleterious effects on human health, food supply, economy, global trade and agriculture (Center for Infectious Disease Research and Policy (CIDRAP) 2025). The potential of spillovers to humans needs to be recognized and additional research is needed (Center for Infectious Disease Research and Policy (CIDRAP) 2025). As a precaution, the CDC strongly recommends that hunters test their harvested animals for CWD before consumption. If an animal tests positive, hunters are advised not to eat the meat (U.S. Forest Service 2023).

In addition, CWD prions have been detected in surface water associated with a CWD endemic area (Nichols, et al. 2009). If CWD spillover occurs in the future this represents a potential environmental transmission vector for agricultural production animals and humans consuming untreated water containing CWD prions. Additional research is needed to evaluate this potential risk.

Although rare, humans can contract other diseases carried by elk, bison, and other ungulates, such as bovine brucellosis, septicemic Pasteurella, bovine tuberculosis, and Johne's disease. Infections typically occur through direct contact with an infected animal's organs or consumption of undercooked meat or unpasteurized dairy. Hunters can reduce their risk by wearing rubber gloves when field-dressing game and avoiding direct contact with lymph tissues and organs (U.S. Fish and Wildlife Service 2007).

Human-Wildlife Conflicts

Rapid residential and commercial development in Teton County has increased the likelihood of human-wildlife conflicts. Over the past decade, approximately 1,600 new residential units have been built, further encroaching on wildlife habitats (Teton County 2020).

Large ungulates, including bison and elk, occasionally leave the Refuge and enter developed areas like Jackson, creating potential safety hazards. Bison, known for their size and bold behavior, can become aggressive, posing risks of trampling, tossing, or goring individuals. While no injuries have been reported at the Refuge, Yellowstone recorded 25 bison-related injuries between 2000 and 2015, often due to visitors ignoring the rule to maintain a safe distance of at least 25 yards (Cherry, et al. 2018).

Although elk are generally tolerant of human presence, bull elk in rut and female elk protecting their calves can display aggressive behaviors, sometimes leading to safety concerns. Incidents have occurred elsewhere in Wyoming, particularly in Yellowstone, where millions of visitors interact with wildlife each year (U.S. Fish and Wildlife Service 2007).

Wildlife-Vehicle Collisions

Elk and bison pose additional safety risks when crossing highways near the Refuge (U.S. Fish and Wildlife Service 2016). The map below (Figure 15) shows which highways are at most risk for wildlife-vehicle collisions in the area. Across Wyoming, 15% of all reported vehicle collisions involve big game, costing nearly $50 million annually in damages, human injuries, and wildlife losses (The WYldlife Fund 2024b).The Wyoming Department of Transportation (DOT) has taken proactive measures to minimize wildlife-vehicle collisions, including tracking crash data, installing fencing, conducting movement studies, and partnering with other agencies and landowners to implement mitigation strategies (U.S. Forest Service 2023).

From 2016 to 2020, an average of 253 elk-vehicle collisions were reported annually in Wyoming, with numbers steadily increasing each year. Studies suggest that actual collision figures may be two to four times higher due to underreporting. The resulting injuries and property damage from elk-related collisions cost approximately $2.5 million per year (Riginos 2022).

In addition, the WGFD maintains an interactive vehicle collision map for every major wildlife species, including elk (Wyoming Game and Fish Department 2017b). The closest of the Refuge's four feeding areas to Highway 191/WY-89 is the Nowlin feedground, the western boundary of which is located approximately 0.3 miles from the highway. The western edge of the Headquarters feedground is 0.4 miles from the highway, while Poverty Flats feedground is 1.4 miles away and the McBride Feedground is 2 miles away. According to the WGFD map, there is a problematic section of the highway that extends from the Refuge to Jackson where vehicle collisions with elk (and mule deer) occur. The map shows that elk-vehicle collisions continue south of Jackson on Highway 191/WY-89 and west of Jackson along state highway WY-22, a section that was the Wyoming Wildlife and Roadways Initiative Priorities List in 2018 for mule deer, elk, and moose vehicular collisions (Wyoming Game and Fish Department 2017b).

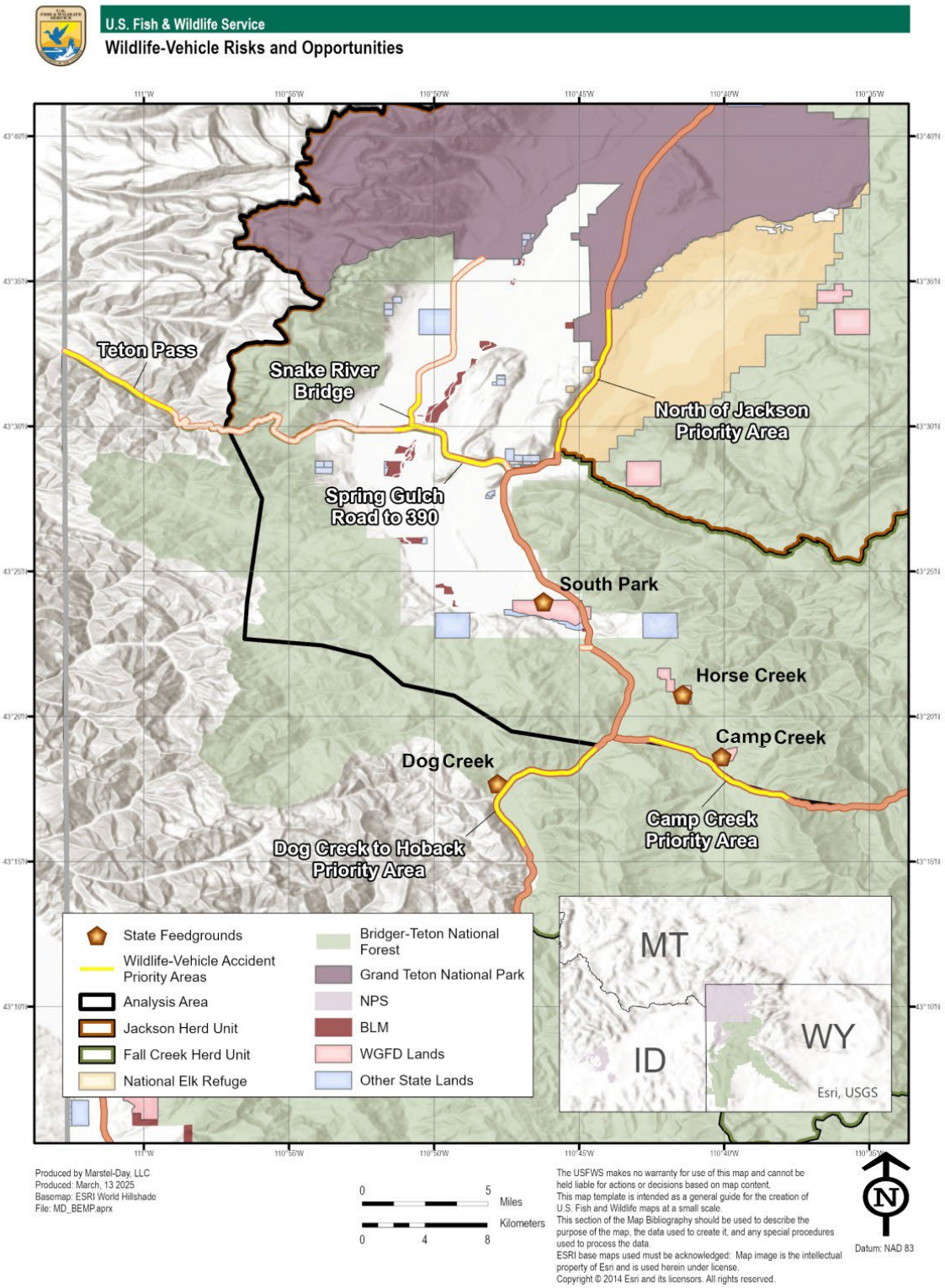

Figure 15. Map showing highway segments in the area that have the highest risk of wildlife-vehicle collisions.

Because the Refuge feedgrounds have been in use since 1910, their historical, long-term effect on wildlife-vehicle collisions is not known.

Supplemental feeding on the Refuge was implemented in part to minimize the movement of elk and bison onto adjacent private lands and roadways, thereby reducing the risk of wildlife-vehicle collisions (U.S. Fish and Wildlife Service 2019a). Refuge staff also use hazing by over snow vehicles as a tool to prevent elk and bison from moving off the Refuge, thereby reducing negative wildlife-human incidences (U.S. Fish and Wildlife Service 2019b).

Figure 16. A road killed elk next to a wildlife jump on the west side of the Refuge. Photo Credit: Kari Cieszkiewicz

Public Health and Safety: Environmental Consequences

Alternative A: No Action
Under this alternative, the supplemental feeding of elk and bison during the winter months would continue, depending on natural forage availability and conflicts in Cache Creek and Spring Gulch. While this approach helps manage wildlife movements, it also increases the long-term risk of disease transmission, particularly brucellosis and CWD. Over time, this could result in more people, especially hunters, encountering infected animals. Although to date, transmission of CWD to humans has not been demonstrated or confirmed, as discussed above, emerging CWD strains represents continued risks for human spillover which would have serious implications to human health and safety (Center for Infectious Disease Research and Policy (CIDRAP) 2025). Continuing supplemental feeding results in the lowest average number of bison conflicts (143 incidents over 20 years, compared to 1,077 under a “no feeding” scenario (USGS SIR, Appendix E, page D-20)), the lowest brucellosis risk to livestock, and the least amount of elk encroachment onto private land. These factors help limit human-wildlife interactions, reducing potential safety concerns. However, because feeding concentrates on the feedgrounds, the prevalence of CWD is expected to rise annually (USGS SIR, Appendix C, Figure B6), making eradication increasingly difficult.

As disease prevalence increases, hunters and residents face a higher chance of encountering infected elk and bison. However, projections indicate that overall elk populations may decline in the long term due to CWD and other factors. This decline could reduce the frequency of human-wildlife encounters over time (USGS SIR, Appendix D, page C-28). Under Alternative A,

current hazing operations would continue, helping prevent elk and bison from migrating into residential areas in Jackson.

Maintaining supplemental feeding would also help reduce wildlife-vehicle collisions and human-wildlife conflicts, which would enhance public safety. By limiting the number of animals leaving the Refuge to search for winter forage, this approach would minimize the risk of accidents on highways and reduce human exposure to diseases such as brucellosis and CWD. Although the potential public health impact of CWD is believed to be minimal, further research is needed to confirm this. In the short term, Alternative A is expected to have a minor but positive effect on public health and safety, though the increasing prevalence of brucellosis and CWD may create future challenges.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold
As with Alternative A, the public health effects of CWD are assumed to be minimal, but additional research is necessary to validate this assumption. As CWD prevalence increases over the seven-year period, more hunters and residents are likely to encounter infected animals, raising potential concerns about disease transmission.

Reducing the SDME herd through increased harvest is projected to decrease elk presence on private property after feeding stop (USGS SIR, Appendix D, Figure C8). This reduction would provide a long-term, minor benefit to public health and safety by decreasing overall elk densities in high-contact areas. However, a rise in hunting activity could lead to an increase in hunting-related accidents. While hunting-related injuries remain relatively rare, approximately 1,000 people are unintentionally shot by hunters each year in the United States and Canada, with nearly 100 fatalities reported annually. (Steven Titus & Associates, P.C. 2018). Other hunting accidents, including falls from tree stands and incidents related to intoxication, can also pose risks. These factors introduce a minor but long-term public safety concern.

When feeding ceases, many elk will migrate to new areas in search of winter forage. Research estimates that approximately 50% of previously fed elk will overwinter on natural winter range or move to state-run feedgrounds within the Jackson or Fall Creek elk herds (Figure 9). This increased movement may elevate the risk of disease transmission and wildlife-vehicle collisions.

The extent of these risks depends on the elk population size when supplemental feeding ends. If the Service successfully partners with the Wyoming Game and Fish Department (WGFD) and other agencies to decrease the number of elk wintering on the Refuge by expanding harvest opportunities before CWD prevalence reaches 3%, the impacts to public health and safety will be minimized. Conversely, if CWD prevalence rises quickly and feeding ceases while elk numbers remain high, more elk will leave the Refuge, increasing the likelihood of human-wildlife conflicts, vehicle accidents, and disease transmission.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk
Under this alternative, the Refuge would provide daily rations to support 5,000 elk during winter for five years before halting supplemental feeding in year six. Additionally, bison would receive a standard ration for the first five years to prevent interference during elk feeding operations. After five years, all supplemental feeding would end.

This strategy is expected to keep elk and bison within the Refuge for the short term, reducing the risk of disease transmission outside the Refuge and minimizing human-wildlife conflicts. Maintaining feeding levels for elk and bison during the transition period would give residents time to prepare for a likely increase in human-wildlife interactions once feeding stops.

After year five, more elk are expected to leave the Refuge in search of winter forage, leading to a rise in encounters between humans and infected animals. Public safety concerns following the end of supplemental feeding would resemble those anticipated under Alternative B, particularly in terms of increased human-elk conflicts and wildlife-vehicle collisions.

Unlike the other alternatives, Alternative C proposes to stop the supplemental feeding of bison after year five, and, as such, presents the greatest risk for human-bison conflict and wildlife-vehicle collisions compared to the other alternatives (USGS SIR, Appendix E, D12), as discussed in more detail in the above "Bison: Environmental Consequences" section.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Expanding hunting opportunities in the Jackson area for SDME would help reduce elk numbers to a more sustainable level for current conditions in the landscape while also minimizing human-wildlife conflicts. As noted earlier, an increase in elk harvesting under this alternative could lead to a short-term rise in hunting-related injuries.

If the Service stops supplemental feeding of elk, elk will be more likely to leave the Refuge during the winter months for the town of Jackson or cross Highway 89 to access other private lands west of the Refuge. Higher elk activity in these areas could potentially increase elk-vehicle collisions compared to Alternative A, but it is not possible to quantify this effect. Hunting strategies designed to reduce the number of SDME in the Jackson elk herd could mitigate conflicts on private land and vehicle collisions because SDME are the elk most likely to exhibit these distribution behaviors (Cole, et al. 2015, Cotterill, Cross, et al. 2025).

These benefits could be further enhanced through additional management strategies designed to mitigate human-wildlife conflicts after feeding ends. However, uncertainty remains about how quickly CWD prevalence will increase and how large the elk population will be when the Service ceases supplemental feeding. If feeding stops while elk numbers are still high, more elk will migrate, leading to an increased risk of disease transmission, negative human interactions, and vehicle collisions.

Compared to Alternative B, the Service could provide supplemental feed for elk for a longer period, which would reduce the risk of human-elk conflict and vehicle collisions, and, by contrast, increase the likelihood humans would encounter diseased wildlife and the associated potential health risks discussed previously and further below.

Public Health and Safety: Other Reasonably Foreseeable Effects

Disease Transmission

The past and continued feeding of elk and bison has contributed to the concentration of animals, which increases the likelihood of disease transmission. Over the past several decades, cases of

brucellosis spreading from elk to cattle and domestic bison herds in the GYA have been rising. Recently, elk testing positive for brucellosis have been detected on the Wind River Indian Reservation, and suspected cases have emerged in Big Horn County—both outside the current Designated Surveillance Area (DSA) (Wyoming Livestock Board 2024). Meanwhile, the risks associated with CWD continue to grow.

If the Service continues elk feeding operations, potentially infected animals will remain near healthy individuals, increasing the likelihood of disease spreading. Without proactive intervention, brucellosis and CWD could extend beyond the region and potentially affect areas across the country. This could pose a public health risk to those who consume meat or dairy products from infected animals or come into direct contact with them while hunting (National Academies of Sciences, Engineering, and Medicine 2020). Additionally, ongoing disease transmission concerns persist within the Jackson elk herd, which winters at the WGFD-managed Gros Ventre River drainage feedgrounds. Each year, an estimated 1,200 to 1,800 Jackson elk winter in these feedgrounds, increasing the risk of continued disease spread (Wyoming Game and Fish Department 2024f).

Because the Refuge feeding program operates within a broader landscape context, its effects extend beyond the Refuge. For this EIS, the Service assumes that WGFD will continue winter feeding at the Gros Ventre River drainage feedgrounds over the next 20 years. If elk feeding is reduced or eventually eliminated on the Refuge, up to 30% of elk from the Refuge may migrate to these state-run feedgrounds (USGS SIR, Appendix B, Figure A-1). Ending supplemental feeding on the Refuge could decrease disease transmission within the Refuge itself, but it may also increase the likelihood of brucellosis and CWD spreading to livestock and people as elk disperse to ranchlands, residential areas, and private properties in the short term prior to the long-term decline of the Jackson elk herd.

Human-Wildlife Conflicts

If supplemental feeding is reduced or eventually discontinued, elk populations may shift beyond Refuge boundaries in search of forage, leading to increased human-wildlife interactions. Addressing these additional conflicts could divert resources away from other WGFD wildlife management priorities across the region and state. Furthermore, if elk migrate toward the Fall Creek herd unit in search of supplemental feed, human-wildlife conflicts may increase south of Jackson.

Wildlife-Vehicle Collisions

The impacts of the Refuge's feeding program extend beyond the Refuge (see Figure 1), influencing elk movement patterns on a larger scale. If feeding levels are reduced or eliminated, more elk are likely to leave the Refuge to find winter forage, potentially increasing the frequency of vehicle collisions with wildlife.

This risk is compounded by the steady growth of the regional human population and increasing Refuge visitation, both of which contribute to higher traffic volumes. As discussed in the Hunting, Visitor Use, and Experience" and "Economics" sections, these trends may further elevate collision risks over time.

Several statewide projects aimed at reducing wildlife-vehicle accidents are currently in development, with efforts underway to secure funding. If these initiatives are successfully implemented, they may help prevent some of the collisions that would otherwise occur following the discontinuation of supplemental feeding on the Refuge.

4.5. Private Lands and Other Public Lands

Private Lands and Other Public Lands: Affected Environment

Private Lands

Only 3-5% of Teton County is private land. Private land in Teton County, Wyoming makes up only a small fraction of the landscape, but it plays an important role in how Jackson Hole functions. Most private parcels lie along the valley floor and include a mix of residential and resort development, working ranches and irrigated hay meadows, and extensive conservation easements that protect open space. These lands frame the Town of Jackson and nearby communities, anchor much of the commercial activity, and serve as key movement corridors for elk, moose, pronghorn, and other wildlife moving between the surrounding Federal lands.

Approximately one-third of the private land in Teton County is permanently protected and actively stewarded open space (Teton County 2020). Teton County has engaged in extensive land use planning (*Jackson-Teton County Comprehensive Plan*) with an emphasis on environmental stewardship. Growth management goals direct growth into neighborhoods where there are existing development, infrastructure and services. Within the last 10 years, just over 1,600 residential units have been built in Teton County, with 65% of this new development having occurred in already developed areas.

With any development can come landscaping that includes plants that are highly palatable to elk and other wildlife, creating the potential for conflicts between landowners and wildlife. Homeowners can spend anywhere from a few hundred dollars to a few thousand dollars to plant flowers, shrubs and trees. For new homes, professional landscaping costs may be 10% of the home's purchase price (Angieslist.com). Homeowners in some subdivisions pay $100,000 or more for a complete landscaping package, in which plant material could be $13,000 or more (Jeremy Berrian, Feathered Gardens and Home, Jackson, WY, personal comm., 2024). As real-estate costs increase, so do the landscaping costs. It is not uncommon for property owners with larger lots (5-10+ acres) to spend between $300,000–500,000 or more. (Sam McGee, Fredericks Landscaping, Jackson, WY, personal comm., 2024). Protecting landscape investments from the wildlife that they often attract is becoming a larger maintenance cost every year and, depending on neighborhood rules, property owners will sometimes build high fence exclosures to surround vegetable gardens and protect them from grazing wildlife. (Sam McGee, Fredericks Landscaping, Jackson, WY, personal comm., 2024)

Golf courses can also be especially attractive to elk for foraging and loafing, and bison may occupy golf courses for short periods. There are currently five golf courses in Jackson Hole.

Ranching has a long history and enduring cultural presence in Jackson Hole, where cattle typically graze on private pastures or on State and Federal grazing allotments through the summer, with hay grown on-site for winter feeding. Ranching in Teton County has become more

consolidated over time, with fewer ranches operating today but with somewhat larger herds. In 2022, the county supported 19 ranches and 5,229 cattle, compared to 24 ranches and 4,464 cattle in 2007, reflecting a shift toward fewer but generally larger operations (U.S. Department of Agriculture 2024) (U.S. Department of Agriculture 2007).

Traditional fencing allows elk and bison to pass but poses entanglement risks, causing injury, death, and fence damage. Teton County Land Development Regulations require or encourage wildlife-friendly fencing, allowing animals to jump over, pass under, and avoid entanglement (Teton County 2024).

Brucellosis is a key concern in Wyoming due to the potential transmission from elk and bison to cattle resulting in adverse effects on livestock production, an important economic activity in Teton County. Among diseases affecting elk and bison, brucellosis poses the greatest risk to ranchers. As previously mentioned in this EIS, brucellosis is a contagious bacterial infection that spreads when cattle or swine ingest or inhale bacteria left behind by infected elk or bison that have aborted fetuses or given birth. The disease causes decreased milk production, weight loss, infertility, loss of young (abortions) and lameness. There is no cure for brucellosis in animals, and existing vaccines are not 100% effective. Transmission risk is highest from March to May, following elk and bison calving season although the brucella bacteria can persist in the environment for up to 81 days or longer (Schumaker, Peck and Kauffman 2012, Wyoming Game and Fish Department 2024f). Detection in cattle herds triggers costly management protocols, including quarantine, testing, and potential herd culling (Schumaker, Peck and Kauffman 2012, Wyoming Livestock Board 2024). The Wyoming Livestock Board conducts risk assessments, mandatory testing, and Brucellosis Mitigation Plans to contain outbreaks and limit spread beyond DSAs (Animal and Plant Health Inspection Service 2023, Wyoming Livestock Board 2024).

Before 2003, Wyoming had no reported brucellosis cases in cattle, but after 2003 to 2004, brucellosis was confirmed in two Wyoming herds, resulting in the loss of "Class-Free" status (state was free from the disease) and downgrade to Class A status—leading to stricter cattle movement regulations and higher costs for rancher to ensure the continued absence of brucellosis. Wyoming regained its "Class-Free" status, but later experienced additional disease outbreaks. From 2004 to 2010, Wyoming, Idaho, and Montana each temporarily lost Class-Free status due to exposure to brucellosis-affected wildlife in the Greater Yellowstone Ecosystem (GYE). In 2010, the USDA Animal and Plant Health Inspection Service issued an interim rule (75 FR 81090) allowing Idaho, Montana, and Wyoming to create Designated Surveillance Areas (DSAs) to monitor brucellosis in specific zones and reduce the economic impact. DSA boundaries were drawn by each state based on past wildlife surveillance and recent livestock cases.

The regional DSA approach concentrates resources on high-risk areas, allowing adaptive boundary modifications in response to disease changes. This ensures trading partners maintain confidence in the state's brucellosis-free status while minimizing broader economic impacts (National Academies of Sciences, Engineering, and Medicine 2020). Wyoming's DSA frequently identifies brucellosis-positive cattle, including a Park County herd in 2024. Cattle

within DSAs are subject to Animal Health Rules, governing testing, vaccination, movement restrictions, quarantine procedures, and compensation for affected producers (https://wlsb.state.wy.us/public/animal-health). These measures help Wyoming (and Montana and Idaho) maintain Class-Free status, safeguarding cattle exports.

No documented cases of brucellosis transmission from bison to cattle were recorded in the GYE from 1998 through 2016 (National Academies of Sciences, Engineering, and Medicine 2020). Elk pose a higher risk to cattle, as their free-ranging behavior increases opportunities for cattle exposure (Roberts, Peck and Ritten 2012, Schumaker, Peck and Kauffman 2012, National Academies of Sciences, Engineering, and Medicine 2020).

Efforts to reduce elk-to-cattle transmission focus on:

- Minimizing commingling through habitat enhancements and low-density feeding
- Elk population management via targeted hunting
- Disease surveillance in elk and cattle feedground relocation and carcass removal to disrupt bacteria persistence (Wyoming Game and Fish Department 2024f).

Elk feedgrounds operated by WGFD and the Refuge reduce commingling with cattle, lowering transmission risks. However, high elk densities at feedgrounds can facilitate disease spread within elk populations. The long-term brucellosis seroprevalence rate in feedground elk averages 22% among yearlings and females (Wyoming Game and Fish Department 2024f).

Even though elk concentrate on the feedgrounds, they have been found to frequently move onto private lands, increasing the risk of commingling with cattle. WGFD prioritizes hazing elk away from cattle, requiring significant personnel hours and specialized equipment (Wyoming Game and Fish Department 2024f, Wyoming Livestock Board 2024). Additional mitigation strategies include providing game-proof fencing to protect hay and stored crops, disease surveillance in both elk and cattle, end feeding earlier, low-density feeding, habitat enhancements, increase winter range, elk population management hunting, test and slaughter, vaccination, carcass removal and feedground relocation (Wyoming Game and Fish Department 2024f). Despite the numerous brucellosis management efforts described above, spillovers from elk to cattle still occur occasionally, with the most recent occurrence in 2024 in Park County (Wyoming Livestock Board 2024).

To date, CWD has not been found to infect other non-cervid wildlife or agricultural production animals. However, as new prion strains emerge, coupled with elk-livestock co-mingling, the risk of spillover continues to be a concern.

Other Public Lands

Grand Teton and John D. Rockefeller, Jr. Memorial Parkway (NPS)

Grand Teton borders the Refuge to the north and west, dedicated to preserving the Teton Range and its surrounding landscapes, ecosystems, and cultural resources. The John D. Rockefeller, Jr. Memorial Parkway spans 82 miles from West Thumb in Yellowstone to Grand Teton's south entrance, covering 23,778 acres, including 7.5 miles of roadway between the two parks.

Wildlife viewing, particularly bison, is a key attraction in Grand Teton. For migratory species like elk and bison, NPS policies promote resource preservation strategies that maintain natural population dynamics. However, due to historical disruptions to ecosystem function, management actions such as livestock grazing and elk herd reductions are implemented to fulfill conservation objectives and legal requirements.

Private cattle and horse grazing occurs under Public Law 81-787 and Public Law 105-81, which authorized the continuation of grazing permits pre-dating September 14, 1950. These permits allow ranchers outside the park to graze livestock for 25 years, extending indefinitely for permit holders and their heirs alive in 1950. In 1950, 29 permit holders grazed approximately 4,230 animals on 67,640 acres. Since then, the number of permittees has declined to two due to permit expirations and operational changes among ranches. Additionally, two horse-grazing operations remain within the park. While Grand Teton's legislation originally intended for grazing to be phased out when land ownership is transferred to the Federal Government in the future, a recent purchase of a 640-acre state trust land parcel from the State of Wyoming adjacent to the park allows continued grazing (https://www.gtnpf.org/kelly/). This property also provides critical habitat for numerous species of wildlife and is within a key migration corridor for pronghorn, elk, and mule deer in the GYE.

Bridger-Teton (USFS)

Bridger-Teton is managed for multiple uses, including recreation, rangeland management, wildlife habitat preservation, and watershed protection. The USFS is currently revising the 1990 Land Management Plan for Bridger-Teton, which guides forest management decisions (U.S. Forest Service 2024b).

Rangelands within Bridger-Teton support both wildlife and domestic livestock while maintaining water quality and recreational access. The USFS oversees grazing allotments within the area of potential impacts, issuing permits that regulate cattle numbers and grazing periods. Permittees may choose whether—and to what extent—to use their allotments. (U.S. Forest Service 2024a). In 2024, there were four active allotments with a total of up to 712 cow-calf pairs permitted to graze When the previous BEMP was developed, there were eight active allotments with a total of over 2,000 cattle permitted to graze (U.S. Fish and Wildlife Service 2007). Permits typically allow cattle to be moved onto the allotment in mid-June until the fall (September/October) when cattle are then returned to their home ranches, where hay sources are more accessible.

Wyoming Game and Fish Department (WGFD)

WGFD manages 21 elk feedgrounds statewide and recently updated its Elk Feedgrounds Management (Wyoming Game and Fish Department 2024f). The program aims to promote elk health by limiting disease transmission, reducing reliance on supplemental feeding, and implementing strategic management to balance wildlife preservation with land use considerations. These strategies include:

- Setting elk herd unit population objectives
- Prioritizing hunting opportunities
- Minimizing elk-related property damage

- Reducing disease transmission to livestock
- Limiting competition with other wintering wildlife

Further details on feedground operations, history, and future management directions are outlined in the plan (Wyoming Game and Fish Department 2024f).

There are five active WGFD elk feedgrounds within the area of potential impacts:

- Jackson Herd Unit: Patrol Cabin & Fish Creek
- Fall Creek Herd Unit: South Park, Horse Creek & Camp Creek
- Nearby Feedground: Dog Creek (just outside the impact area)

From 2020 to 2023, an average of 5,000 elk utilized WGFD feedgrounds each winter. Within the Jackson herd unit, 1,544 elk were observed on WGFD feedgrounds, while 7,500 elk used Refuge feedgrounds during this period (Wyoming Game and Fish Department 2024e).

The Camp Creek, Horse Creek, and South Park feedgrounds are located within WGFD Wildlife Habitat Management Areas. The Fish Creek and Patrol Cabin feedgrounds operate on Bridger-Teton under a Special Use Permit valid through 2028. In 2019, WGFD closed the Alkali Creek feedground, with elk formerly fed there now utilizing Patrol Cabin and Fish Creek. (Wyoming Game and Fish Department 2024f).

WGFD investigates damage claims from big game impacts and compensates landowners for verified losses. The agency also works to prevent elk-cattle commingling during winter to curb Brucellosis transmission. Management strategies include:

- Targeted hunting seasons
- Hazing and emergency feeding
- Fencing materials for hay stackyards
- Lethal removal of problem elk
- Developing additional mitigation solutions as needed

Fencing near feedgrounds provides barriers to reducing conflicts (e.g. Horse Creek (1.6 miles), Camp Creek (0.4 miles), and South Park (2.5 miles) feedgrounds) (Wyoming Game and Fish Department 2024f).

From 2011 to 2021, six damage claims in Jackson Hole totaled $4,600.63, averaging $418.24/year. From 2018 to 2022, 2,967 WGFD hours were spent managing elk-related conflicts in Jackson Hole and Pinedale, ranging from 458 to 710 hours annually (Wyoming Game and Fish Department 2024f). WGFD credits the feedground operations for reducing the overall costs and time required to handle damage claims from elk on private lands.

In addition to the three Wildlife Habitat Management Areas with elk feedgrounds (South Park, Horse Creek and Camp Creek), the WGFD also manages two other Wildlife Habitat Management Areas just east of the Refuge: Teton and Woods Canyon. These areas support hunting, trapping, hiking and wildlife viewing (subject to seasonal closures in the winter).

Within the area of potential impacts, the State of Wyoming also owns 5,500 acres of state trust lands managed to optimize revenue to support public education and beneficiary institutions while ensuring long term conservation.

Finally, there are 3 active grazing leases for a total of 2,851 animal unit months (AUMs) (the amount of forage to fulfill the metabolic requirements for one animal for one month) on 1,300 acres of state trust lands within the northern portion of the area occupied by the Jackson elk herd and 3 active grazing leases with a total of 519 AUMs on 1,303 acres in the area used by the Fall Creek herd (Wyoming Office of State Lands and Investments 2024).

Bureau of Land Management (BLM)

The BLM administers 968 acres along the Snake River in Jackson Hole, divided into 15 parcels. These lands are proposed for transfer or management by other public entities to preserve scenic, wildlife, habitat, and open space values (Bureau of Land Management 2004, Teton County 2021). The Snake River Corridor is cooperatively managed by BLM, Snake River Fund, Bridger-Teton, Teton County, WGFD and Jackson Hole Land Trust (Teton County 2019).

There are four grazing allotments on the BLM Snake River corridor with 300 AUMs authorized across a total of 544 acres. Most of the grazing occurs during the summer with limited spring grazing authorized. If BLM transfers the parcels to other entities, livestock grazing may or may not be permitted in the future (Bureau of Land Management 2004). The remaining BLM lands within the area are unallotted public lands, with some popular for recreation and river access.

The river corridor supports seasonal elk migration and limited crucial winter range, though elk do not use BLM parcels for summer foraging or calving (Bureau of Land Management 2004).

Private Lands and Other Public Lands: Environmental Consequences

Alternative A: No Action

As part of the SDM process and report, USGS predicted how land use by elk and bison could change based on various management strategies, with one of the three technical teams of experts with specific, local knowledge focused on these landscape effects (SMD Report, Appendix D, C-39 and Figure C1.1) Under Alternative A, the movement patterns and migration of LDME and SDME described in the affected environment above would not be expected to change. Most of the elk herd would continue to winter on the Refuge, and most of the remaining herd would winter in the Gros Ventre River drainage on the Bridger-Teton and utilize the WGFD feedgrounds. In general, feedgrounds can impact elk distribution and migration by attracting elk off native winter range, short-stopping historic migration routes and shortening the time spent by fed elk on summer range (Wyoming Game and Fish Department 2024f).

Similarly, the bison herd would be expected to continue to use the feedgrounds on the Refuge or native winter range on the Refuge and in Grand Teton, as described above.

Private Lands

Continuing to feed elk and bison on the Refuge at the same levels as current management is expected to minimize the cumulative time spent by elk and bison on private property compared to the other alternatives (USGS SIR, Appendix D, C-24 and Figure C6; D-22 and Figure D5).

Under Alternative A, the time elk spend on private property may decrease over the long term because of population declines projected in the elk herd due to CWD and other factors. Model simulations predict a reduction of elk days on private property of over 50% by year 20 (USGS SIR, Appendix D, C-25, C-28 and Table C2).

The WGFD would continue to respond to damage to private property caused by big game. According to the most recent WGFD damage claim report, the Jackson Region paid out $24,579 in elk damage claims in 2023. The Jackson Herd Unit accounted for $8,831.25 of this amount. From 2011 to 2021, there were only six damage claims in the Jackson Region with an average cost of $418.24/year. (WGFD 2023).

Between 2018 to 2022, a total of 2,967 WGDF hours were spent on the prevention and management of elk damage and elk/cattle co-mingling in the Jackson and Pinedale Regions, averaging and 458 to 710 personnel hours annually. The WGFD typically distributes fencing materials for around 20 stack yards to local cattle producers annually (Wyoming Game and Fish Department 2024f). Because the cumulative number of elk days on private lands over the next 20 years is projected to be the lowest under Alternative A, this alternative is likely to have the lowest overall cost to WGFD with costs per year predicted to decline by year 20 as the elk herd population decreases (USGS SIR, Appendix D, Figure C5 and Table C2).

Turf on a golf course can be damaged by elk through their hoof action, foraging, urine and defecation, and bison may occupy a golf course for short periods and cause minor damage. Bunkers can also be especially attractive to elk; they can disturb the surface and puncture liners. Elk, and occasionally bison, can also come in conflict with golfers, especially during the rut. Targeted fencing of golf course greens and sand traps fall through spring has also been successful in some situations for mitigating elk and bison presence and associated damage in these areas. However, the cumulative damage over 20 years by elk to landscaping on golf courses would be the lowest under this alternative and by year 20 the amount of damage per year would likely be less than current levels due to declines in the elk herd population (USGS SIR, Appendix D, Figure C5 and Table C2).

Residents in some subdivisions currently have landscaping companies install temporary devices to protect plants from elk, moose, and other wildlife (Sam McGee, Fredericks Landscaping, Jackson, WY, personal comm., 2024). Average annual costs are $500–$1,000, but some costs run as high as $2,500–$4,000 per year (Jeremy Berrian, Feathered Gardens and Home, Jackson, WY, personal comm., 2024). In areas where elk and other wildlife cause damage, mortality of trees and shrubs typically does not exceed 10–15% of the plants, but in some situations, it can be as high as about 30% (Jeremy Berrian, Feathered Gardens and Home, Jackson, WY, personal comm., 2024). Like the situation for golf courses, the cumulative damage over 20 years by elk would be the lowest under Alternative A and less than current levels in 20 years due to the decline in elk herd populations.

The probability of bison coming into conflict with private property through any means, including moving onto private lands, is considered low (0.015) (USGS SIR, Appendix E, D-12). As a result, Alternative A would result in the lowest bison use of private land, the lowest potential for

commingling with livestock during the winter months, and the lowest potential for other negative consequences on private land surrounding the Refuge. However, if bison do move onto private lands, their large size can result in more damage to property than elk.

In modeling the potential for brucellosis transmission from elk to cattle across the alternatives, WGFD assisted in identifying private properties with cattle operations that were potentially at risk. The estimated number of brucellosis-caused abortions was calculated by multiplying the predicted number of elk on the identified cattle properties in each month by the monthly brucellosis abortion hazard for elk, assuming a constant pregnancy rate of 0.8 in sexually mature females and an average brucellosis seroprevalence of 0.3 (USGS SIR, Appendix D, C-13).

The cumulative brucellosis risk to livestock in the Jackson area from elk over the next 20 years was assessed to be lowest under Alternative A (USGS SIR, Appendix D, C-24 and Figure C-6), although the median estimates across all alternatives were similar considering the uncertainty across simulations. Under Alternative A, the time elk spend on private property may decrease over the long term because of population declines projected in the elk herd due to CWD and other factors (USGS SIR, Appendix D, Table C2).

Maintaining the area feedgrounds, including the Refuge feeding program, would help to maintain separation between elk and bison and cattle which would lower the brucellosis transmission risk (USGS SIR, Appendix D, C-24 and Figure C-6) (Schumaker, Peck and Kauffman 2012, Wyoming Game and Fish Department 2024f). However, congregating elk and bison on feedgrounds facilitates the transmission of brucellosis among these populations and may increase the seroprevalence in the GYE (Schumaker, Peck and Kauffman 2012, National Academies of Sciences, Engineering, and Medicine 2020, Wyoming Game and Fish Department 2024f). Within the GYE, counties with and without feedgrounds have a similar history of brucellosis outbreaks in cattle, which suggests that although feedgrounds may contribute to maintaining spatial separation between cattle and elk, they potentially exacerbate disease in the elk population which counteracts this benefit (Wyoming Game and Fish Department 2016).

There has not been a documented case of brucellosis transmission from elk or bison to cattle in Jackson Hole. Currently, livestock producers incur multiple potential expenses related to brucellosis management including vaccination, spaying, on-going herd testing, fencing haystacks, and modifying winter feeding practices (Schumaker, Peck and Kauffman 2012). The Wyoming Livestock Board and WGFD assist with some of these expenses; however, the producers are likely to still bear costs in both time and money. Producers within the DSA also may experience decreased revenue from lost market access or price discounts (National Academies of Sciences, Engineering, and Medicine 2020).

The presence of CWD in the region and state affects the resources available to address brucellosis. For example, the Brucellosis-Feedground-Habitat program initiated by WGFD in 1989 to address brucellosis in elk and transmission to cattle was disbanded in 2017 in recognition of the potential larger influence that CWD and other diseases could have on future feedground management (Wyoming Game and Fish Department 2024f).

Other Public Lands

Continuing current management operations on the Refuge would not be expected to impact land use on Grand Teton, including the two cattle grazing allotments and grazing on the newly acquired state trust land parcel from the State of Wyoming. Similarly, under Alternative A, the management of rangelands and grazing allotments on the Bridger-Teton and BLM lands would not be impacted. There would be no effects to uses on public lands.

In the short term, Alternative A would not impact WGFD feedground operations. The Refuge would continue to provide feed to support the majority of the Jackson elk herd (7,500 elk) and an average of 1,500 elk would be expected to continue to use the Patrol Cabin and Fish Creek feedgrounds (Wyoming Game and Fish Department 2024f). Even if the Refuge continues to feed elk at current levels, the elk herd population may decline due to increased CWD prevalence. As discussed above, Alternative A could result in an average decline of the elk population of 53% (USGS SIR, Appendix C, B-20 and Table B1). A decline in the overall Jackson elk herd population may mean that fewer resources would be needed by WGFD to maintain the winter feedgrounds for the Jackson elk herd over the long term.

Under Alternative A, the Service is proposing to continue to supplementally feed bison. As a result, bison distribution would likely be like current conditions with most bison seasonally using Refuge feedgrounds during the winter months.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Under Alternative B, when the 3% CWD threshold is crossed and the Refuge stops feeding elk in winter, some redistribution of animals is expected. This could occur at any point between years 1 and 7. However, the current CWD model predicts the disease threshold could be crossed in year 3 (USGS SIR, Appendix C, B-22, Figure B7c and C-19). The USGS SIR modeled that 50% of the elk that were fed on the Refuge are predicted to continue to use the Refuge during winter and feed on natural forage stopped (USGS SIR, Appendix D). The other previously fed elk are predicted to transition to areas in the Gros Ventre River drainage surrounding WGFD feedgrounds, other native winter range or developed areas used by fed elk previously (Figure 9).

Because the Service is proposing to continue to supplementally feed bison as necessary to avoid human-wildlife conflict, little change is predicted for bison distribution as compared with Alternative A.

Private Lands

The degree of the impacts to the surrounding landscape are primarily a function of how soon the Refuge stops feeding and how abruptly. The greatest potential for adverse effects to private land uses in the surrounding landscape would be under Alternative B, if the CWD threshold is crossed early (USGS SIR, Appendix D, C-24 and Figure C6). If the 3% CWD threshold is crossed in the first few years of implementing Alternative B, the Jackson elk herd population will still be very high and so the abrupt end of supplemental feeding under these conditions is expected to create the largest potential increase in elk use of private lands among the alternatives. The average number of cumulative elk use days on private land predicted for Alternative B would be 14% higher over 20 years than for Alternative A. However, as discussed above in "Elk:

Environmental Consequences," by year 20 the number of elk days on private property each year is predicted to be on the decline (USGS SIR, Appendix D, Table C2).

The higher the number of elk use days on private lands, the higher the likelihood for adverse effects to current land uses. So, Alternative B could have the greatest impact on private land in the area, especially in the short term. There could be other effects on landowners. Additional elk on land used for cattle could lead to reductions in winter forage, damage to fences and the need to install fencing to protect hay stackyards. Where fencing is considered a viable option, special consideration must be given to how wildlife migration and habitat permeability may be hampered, plus the initial cost of construction and long-term maintenance costs (Wyoming Game and Fish Department 2024f). Elk damage to residential and commercial landscaping, and golf courses, may also increase. WGFD provides some support for these damage and mitigation efforts and so costs of responding to damage claims would likely increase. Ranchers would likely still incur additional costs in money or time. The cost of this is likely to vary widely and not all instances of elk on private lands results in damage. If there was a proportional increase in elk damage on private lands, then the total costs to WGFD and landowners to address conflicts on private lands could increase by 14% over the life of the BEMP. The costs incurred by ranchers to manage their operations with increased conflicts with elk could have implications for land use planning in Jackson Hole. In a statewide assessment, the vulnerability of the study area to residential development was considered moderate to high (Pocewicz, et al. 2014). Additional pressure or strain on the already low profit margins from agriculture may lead producers to sell their ranchlands for what is likely a large financial return. This could lead to a reduction in privately owned wildlife habitat and open space if these lands are converted to residential and commercial uses (Wyoming Game and Fish Department 2017a). Teton County does seek to direct any new development into areas that are already developed; however, Teton County planning regulations do not prevent development in rural areas, which means some loss of current ranchlands is still possible (Teton County 2020).

If the CWD threshold is not reached by year three, each additional year of gradually reducing feeding would likely reduce the adverse effects of ending supplemental feeding described above. If feeding does not end until year seven, the number of elk wintering on the Refuge would be closer to the number that can be sustained on natural forage.

The highest risk of brucellosis transmission among the alternatives was predicted to occur under Alternative B if feeding stops due to CWD in the first few years of BEMP implementation. The risk of brucellosis (expressed as the number of *Brucella*-caused abortions on private properties used for overwintering cattle) is predicted to increase by 11% over continuing current management; however, the brucellosis risks across all alternatives were similar considering the substantial variation in model outputs across simulations (SDM Report, Appendix D, Figure C6).

The risk for cattle is estimated to be highest in the years immediately following the end of feeding (whether due to CWD or after year 7) and then would notably decrease as over 20 years (SDM Report, Appendix D, C-28, Table C2). Factors that would contribute to this decline include overall declines in the elk population due to CWD, targeted harvest of the elk herd, and potentially reduced seroprevalence in elk (SDM Report, Appendix D, C-28 and C-29) (National

Academies of Sciences, Engineering, and Medicine 2020). However, because increases in brucellosis seroprevalence have been documented in elk populations that do not overwinter on feedgrounds, brucellosis would still be expected to persist in the elk and bison populations after feeding ends on the Refuge (National Academies of Sciences, Engineering, and Medicine 2020).

Under this alternative, the WGFD would continue to work with producers and landowners to prevent elk and cattle commingling, reduce the risk of brucellosis transmission (Wyoming Game and Fish Department 2024f), However, the potential for increased brucellosis risk may lead producers to take additional actions and incur the associated costs. Producers would need to weigh the cost of additional risk reduction with the expected benefits (Roberts, Peck and Ritten 2012, Schumaker, Peck and Kauffman 2012), as discussed in more detail in "Economics: Environmental Consequences."

The impact of elk on private lands under Alternative B may be reduced by expanding hunting opportunities. Strategic management that targets SDME may be beneficial because the short-distance migrants are more likely to cause conflicts on private land. This option may be particularly helpful for agricultural, residential and commercial landowners in the areas around the Refuge, as this is where SDME spend the summer (Cole, et al. 2015). Reducing this portion of the elk herd could result in less damage to hay resources, residential landscaping and commercial businesses, such as golf courses.

However, more research is needed to understand the behaviors and patterns of these SDME (e.g., increasing elk tracked with GPS collars) and identify appropriate management actions. Previous research has suggested that affecting the proportion of SDME and LDME within the herd may not be effective given the highly consistent survival rates among both migrant groups (Cole, et al. 2015). Model simulations did find that increasing the overall harvest of the Jackson elk herd would result in fewer elk-days on private property once feeding stopped (USGS SIR, Appendix D, Figure C6).

One of the challenges to Alternative B is changing land use patterns in Jackson Hole. As some private lands previously used for farming and ranching are sold and potentially subdivided, hunting access can change. These properties may be large enough to serve as elk refugia, but not available for hunting either due to safety concerns due to nearby housing or new landowner preferences. To counteract this, the Service could work with WGFD to authorize additional hunting opportunities on the Refuge to specifically target SDME. The Refuge could also pursue culling, management hunts, or other strategies like fertility control.

Engaging in management activities to prevent bison from leaving the Refuge, such as hazing and periodic supplemental feeding as proposed in Alternative B could reduce the probability of conflicts in those years. If these strategies are successful in preventing all additional bison conflicts above those under current management, then effects due to bison management under Alternative B would be like Alternative A.

<u>Other Public Lands</u>

Under Alternative B, as feeding decreases and when it ends, elk may move to other winter range on Grand Teton, the Bridger-Teton or BLM parcels. This winter use may overlap with allotments

used by ranchers for cattle in the summer. Since ranchers typically move their cattle onto allotments in mid-June, it is likely that by that time, the elk would likely have already moved to the same summer range that they currently use. Therefore, this alternative would not have adverse effects on the opportunity for grazing operations by ranchers in Grand Teton, Bridger-Teton, or BLM lands. However, this overlap could affect the potential for brucellosis transmission. Please see the discussion below.

In the short term, Alternative B could adversely impact WGFD feedground operations. As the number of elk being fed in the winter on the Refuge decreases from 7,500 to 5,000, some elk may move off the Refuge and begin using WGFD feedgrounds. These feedgrounds could include the Patrol Cabin and Fish Creek feedgrounds in the Jackson Elk herd unit along the Gros Ventre River or it may even include feedgrounds in the northern portion of the Fall Creek herd unit (See Figure 1). The number of elk that may move to a particular feedground is unknown. These feedgrounds currently operate at or slightly above WGFD's quota (Wyoming Game and Fish Department 2024f). Increases in the number of elk using these feedgrounds could have an adverse effect on WGFD's operations by increasing costs for feed, personnel and equipment needed to manage the sites.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

The feeding ration for 5,000 elk over the first 5 years is expected to be sufficient to keep elk and bison from leaving the Refuge but in most winters. The changes to elk distribution when feeding ceases in year five would be like when feeding ceases in Alternative B (see Figure 9). However, the timing of the changes would be more certain than in Alternative B, because the feeding would stop at year five under this alternative, rather than at any time between years one and seven.

Predicting how bison will move across the landscape when feeding ends is more challenging. There is not as much data, such as GPS collar movements, as is available for elk. To evaluate the effects of stopping feeding bison, SDM the modeling placed greater reliance on expert opinion representing the current understanding of bison ecology in Jackson Hole (USGS SIR, Appendix E, D-9 and Appendix D2). However, it is reasonable to assume that most conflicts would occur should bison leave public lands such as the Refuge, Grand Teton or Bridger-Teton and venture onto private lands.

<u>Private Lands</u>

Reduced feeding for five years and then stopping as proposed under Alternative C may result in increased time elk and bison spend on private property over the long term as compared to Alternative A (USGS SIR, Appendix D, Figure C6). Although feeding at least 5,000 elk for the first 5 years is expected to be sufficient to keep elk from leaving the Refuge, the average number of elk use days on private land would increase by 8% over the life of the plan (20 years) compared to Alternative A (USGS SIR, Appendix D, Table C2).

Bison will likewise be fed for the first five years, but after feeding stops the USGS SIR model found that in an average winter, approximately 21% of the previously fed bison could encounter conflict with humans in an average winter. In a severe winter, which occurs 1 in every 4 years

historically, human/bison conflicts may increase by 48% (USGS SIR, Appendix E, Appendix D2-34 and Figures D2.1 and D2.2). In the long term, experts agree that while conflicts would change as compared to the current management alternative, it is uncertain whether conflicts will increase or even decrease over time as humans and bison learn better strategies to co-exist (USGS SIR, Appendix E, D-21 and Appendix D3).

Like Alternative B, the WGFD would continue to respond to damage to private property caused by big game. If there was an increase in elk damage on private lands proportional to the predicted increase in elk use of private lands, then the total costs to WGFD to address conflicts on private lands could increase by 8% over the life of the plan.

Additional effects to private landowners, including ranches and residential and commercial development would be like Alternative B. This alternative would likely have less impact on private lands than Alternative B if feeding stops abruptly due to CWD before year five. However, this alternative would be very similar to Alternative B if feeding ends in years 5–7.

The highest risk of brucellosis transmission among the alternatives was predicted to occur under Alternative B if feeding stops due to CWD in the first few years of BEMP implementation, but Alternative C would have very similar impacts to Alternative B because supplemental feeding would stop at year five. As discussed above, the median estimates of brucellosis risk across all alternatives were similar considering the substantial variation in model outputs across simulations (SDM Report, Appendix D, Figure C6) with the risk of brucellosis in cattle is estimated to be highest in the years immediately following the end of feeding and then notably decreasing over a 20 year-period (SDM Report, Appendix D, C-28, Table C2). As discussed under Alternative B, main factors that contribute to this decline in brucellosis risk include overall declines in the elk population due to CWD and/or starvation and potentially reduced seroprevalence in elk (SDM Report, Appendix D, C-28 and C-29) (National Academies of Sciences, Engineering, and Medicine 2020). However, as discussed above, because increases in brucellosis seroprevalence have been documented in elk populations that do not overwinter on feedgrounds, brucellosis would still be expected to persist in the elk and bison populations after feeding ends on the Refuge (National Academies of Sciences, Engineering, and Medicine 2020).

Other Public Lands

The effects to land uses on Grand Teton, Bridger-Teton, BLM land and WGFD feedground operations when feeding ceases in year 5 would be like Alternative B if feeding ends in years 5–7. In both scenarios, the number of elk wintering on the Refuge would be like the number that can be sustained on natural forage, thus reducing the number of elk that are displaced on to the surrounding lands, including public lands. The timing of the changes would be more certain under Alternative C because the feeding would stop at year five, rather than any time between years one and seven.

Experts predict that in year five when feeding ceases, more bison that were previously using Refuge feedgrounds may be in conflict situations (USGS SIR, Appendix E, D-22 and Figure D4 and D5). Bison are assumed to come into conflict primarily when they move onto private lands (e.g. destruction of fences, landscaping, golf courses) in the study area, however there could also

be increased conflicts on public lands such as greater bison activity in the areas where sleigh rides operate on the Refuge and moving onto roadways in Grand Teton National Park

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

If the Refuge stops feeding elk in winter as part of its adaptive management strategy, some redistribution of animals would be expected. The current CWD model predicts the CWD prevalence could reach 7% in the next 5 years approximately (USGS SIR, Appendix G, Figure F2). The changes to elk distribution and migration when feeding ceases would be like those described in Alternative B (see Figure 3)

If the Service stops supplemental feeding of elk, elk will be more likely to leave the Refuge during the winter months for the town of Jackson or cross Highway 89 to access other private lands west of the Refuge. As discussed above, hunting strategies designed to reduce the number of SDME in the Jackson elk herd could mitigate conflicts on private land and vehicle collisions because SDME are the elk most likely to exhibit these distribution behaviors (Cole, et al. 2015, Cotterill, Cross, et al. 2025).

Because the Service is proposing to continue to supplementally feed bison as necessary to avoid human-wildlife conflict, there is predicted to be little change to bison movement and conflict situations as compared to Alternatives A and B.

Private Lands

The degree of the impacts to private lands in the surrounding landscape are primarily a function of if/when the Refuge stops feeding and the Refuge elk herd population at that time. If increased harvest efforts are not successful and the Service stops supplemental feeding of elk sometime in the first 10 years of implementation, the total elk use days on private land could increase by 14%, which is very similar to Alternative B. If SDME harvest is successful, this increase may only be 8%, (USGS SIR, Appendix G, Table F4). Should the Refuge continue to keep supplemental feeding elk, there will be less total elk use days than the status quo as the Jackson elk herd population decreases. Damages to private lands would be similar to those discussed above in Alternatives B and C.

Due to the adaptive nature of Alternative D, it is difficult to predict the risk of brucellosis transmission. However, as noted earlier, the median estimates of brucellosis risk across all alternatives remain similar due to significant variability in model projections (USGS SIR, Appendix D, Figure C6). For cattle, the highest risk of brucellosis transmission would be in the years immediately following the end of supplemental feeding and depending on the size of the elk herd when supplemental feeding ended. After this initial phase, the risk is expected to decline as elk populations decrease as discussed under Alternative B.

However, under Alternative D, we would be working cooperatively across all agencies to change bison and elk management to avoid human-wildlife conflict, through changes to hunting opportunities, exploring options to expand winter range of the elk, continued feeding and hazing of bison, and more. Additionally, targeting SDME—as we also propose in Alternative B—will also reduce human-wildlife conflict as SDME are more likely to come into contact with livestock

than LDME. Under this option, the Service may determine to continue supplemental feeding if necessary to avoid commingling of elk and bison with cattle, so the risk of the Jackson elk and bison herds spreading brucellosis or other diseases to domestic cattle, and the associated costs for nearby cattle producers, could be lower. Likewise, damage to private property would generally be predicted to be lower under Alternative D.

Private Lands and Other Public Lands: Other Reasonably Foreseeable Effects

Regional Elk Management

WGFD is currently developing a Jackson elk herd Feedground Management Action Plan that will re-evaluate how it operates feedgrounds in the Region. Additionally, the Bridger-Teton is planning on re-evaluating the permits for all the WGFD feedgrounds on the National Forest in coming years. The NPS also has an important role in managing the bison and elk herd segments that migrate through Grand Teton. All these agencies' programs, plans and decisions related to bison and elk management, as well as grazing, hunting and other land uses in the Region will impact elk and bison herd distribution and disease management on both public and private lands in the Region. At this time, the Service is cannot exactly predict the extent of any changes in the region that will result.

Disease Transmission Beyond the Study Area

Brucellosis risk to elk, bison and cattle is of concern beyond the study area of the project including the DSAs, the GYE, the State of Wyoming, other parts of the United States, and U.S. trading partners. There is an increasing trend of seroprevalence in non-fed elk east of the continental divide in the GYE (Wyoming Game and Fish Department 2024f). Brucellosis seropositive elk have been recently found on the Wind River Indian Reservation, and it is suspected in elk in Big Horn County, and both locations are outside of the current DSA (Wyoming Livestock Board 2024). This situation is expected to encourage producers to conduct brucellosis risk assessments and to develop official Brucellosis Mitigation Plans. Although a low risk, brucellosis must be managed to prevent its spread beyond the GYE into other parts of the United States that could result in serious economic and potential public health consequences (National Academies of Sciences, Engineering, and Medicine 2020).

The feeding program at the Refuge fits within this larger landscape context. The effects within the study area described above for disease transmission also apply at a broader scale. By continuing to feed on the Refuge there would be no change in the current risk of brucellosis transmission from elk and bison to cattle. By ending feeding, brucellosis transmission may decrease among elk and bison but may result in increased risk to cattle as elk and bison move onto private lands. Costs to manage the disease at a statewide (Wyoming Game and Fish Department 2024f, Wyoming Livestock Board 2024) and national level (Animal and Plant Health Inspection Service 2024) may also increase, as well as the costs to producers outside the DSA.

4.6. Economics

Economics: Affected Environment

The economic effects resulting from changes in elk management are considered in the context of local recreational and agricultural industries, including effects on residents. The economic study area for this analysis includes Sublette County, Fremont County, Park County, and Teton County (See Figure 17). These counties encompass the Jackson elk and bison herd ranges and elk feedgrounds.

Local Population Setting

The four counties in the economic study area had a total population of 25,469 in 2020 (U.S. Census Bureau 2020b), comprising about 4% of the population of the state of Wyoming. Although Wyoming's growth rate between 2010 and 2020 was notably lower than the national rate (U.S. Census Bureau 2010c, 2010d, 2020c, 2020e), the population of both Park County and Teton County grew significantly, with Park County's population increasing at more than twice the state rate, and Teton County's over four times the state rate. Meanwhile, Fremont County and Sublette County experienced population decreases (U.S. Census Bureau 2010b, 2020c). More recent population estimates for Park County and

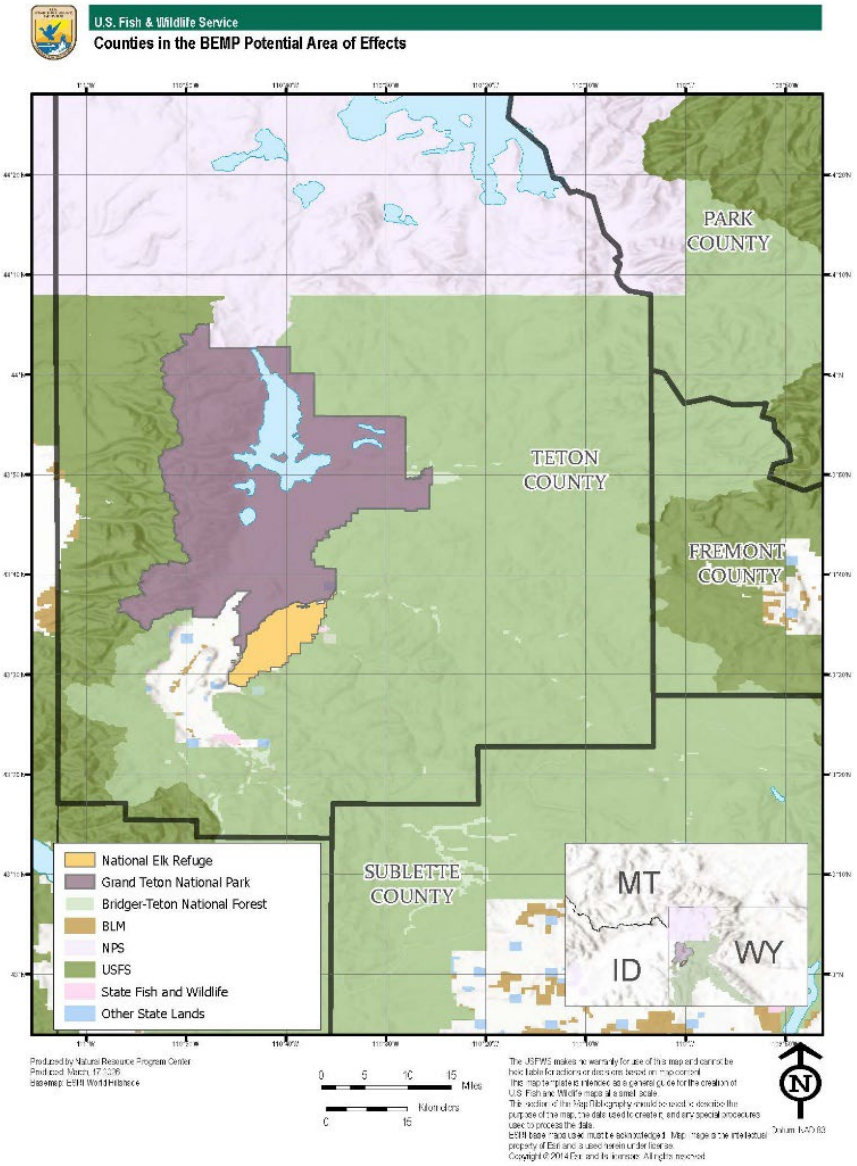

Figure 17. Map showing the counties in the potential area of effects.

Sublette County show slight population increases between 2020 and 2023, while Fremont County and Teton County have seen slight population decreases during the same time period (U.S. Census Bureau 2020c, 2023a). Teton County is the only county to see an increase in population density between 2010 and 2020 (U.S. Census Bureau 2010a, 2020a).

Of note is the fact that land ownership in all four counties is dominated by the Federal, State, and local governments. More than 80% of the land area of Fremont, Sublette, and Park counties are owned by the public, and about 97% of Teton County is in public ownership. Median household incomes in Sublette and Teton Counties are above the national average while median incomes in the other counties are slightly below the national average. Notably, Teton County's median household income is nearly 1.5 times higher than the national figure (U.S. Census Bureau 2022a, 2022b). (U.S. Census Bureau 2022e, 2022f).

The agriculture, forestry, fishing and hunting, and mining industry represents less than 3% of employment in Teton County, but accounts for 25% of all employment in Sublette County (U.S. Census Bureau 2022a). Data available from the USDA for 2022 shows that there were 987 farms in Fremont County, 871 farms in Park County, 274 farms in Sublette County, and 111 farms in Teton County (USDA, National Agricultural Statistics Service 2022). In 2023, Fremont County had the most cattle (86,000 head), followed by Park County with 40,000 cattle, Sublette County with 55,000 cattle, and Teton County with 3,500 cattle (U.S. Department of Agriculture 2023).

Table 2. Employment Characteristics: Industry Employment by County

Industry	Fremont County	Park County	Sublette County	Teton County	Wyoming
Agriculture, forestry, fishing and hunting, and mining	8.4%	8.3%	25.0%	2.7%	9.1%
Construction	7.1%	8.4%	6.0%	8.5%	9.4%
Manufacturing	3.2%	5.0%	1.0%	1.5%	4.5%
Wholesale trade	1.8%	1.6%	0.2%	1.3%	1.5%
Retail trade	10.6%	11.4%	9.1%	15.1%	9.9%
Transportation and warehousing, and utilities	5.3%	5.3%	8.1%	2.7%	6.1%
Information	1.2%	0.8%	0.6%	3.0%	1.5%

Finance and insurance, real estate and rental and leasing	2.4%	5.6%	14.2%	7.1%	4.5%
Professional, scientific, and management, and administrative and waste management services	6.3%	8.2%	4.5%	13.5%	7.4%
Educational Services, and health care and social assistance	27.6%	25.2%	12.2%	17.5%	24.5%
Arts, entertainment, recreation, and accommodation and food services	12.6%	10.9%	8.8%	19.8%	9.9%
Other services, except public administration	5.9%	4.3%	4.2%	5.3%	5.3%
Public administration	7.5%	5.1%	6.1%	2.2%	6.3%

Sources: (U.S. Census Bureau 2022a, 2022b)

Recreation and Tourism Setting

In 2023, tourism was Wyoming's top-earning industry, generating $1.3 billion in revenues. Direct travel spending in the state grew by 6.5%, rising from $4.5 billion in 2022 to $4.8 billion in 2023. This includes spending by visitors at destinations and other expenses like payments to Wyoming travel companies, convention operations, and airfare for residents leaving the state. Of the total spending, $1.2 billion went to accommodations, $1.3 billion to food services and stores, $889 million to local transportation and gas, $572 million to arts, entertainment, and recreation, and $547 million to retail sales. Tourism directly supported 33,470 jobs in Wyoming. About 71% of visitors were from other states, 26% were Wyoming residents, and 3% were international tourists. In 2023, direct travel expenditure reached $170 million in Fremont County, $507 million in Park County, about $51 million in Sublette County, and nearly $1.7 billion in Teton County. Fremont County earned around $70 million from direct travel, Park County earned $136 million, Sublette County earned $17 million, and Teton County earned nearly $493 million (Wyoming Office of Tourism 2023).

There is no fee to visit the Refuge. As discussed above, according to the 2019 National Wildlife Visitor Survey, the Refuge attracts over 472,000 visitors annually with 93% of visitors participating in wildlife observation (Dietsch, et al. 2020). Survey results also showed that local visitors (living within 50 miles of the Refuge) made up 3% of total expenditures, while non-local

visitors contributed 97%. Food and drink were the largest expenses for all visitors. For residents, transportation was also a major cost, whereas non-locals incurred significant expenses on accommodation. On average, locals spent $84 per day, while non-locals spent $230 per person per day. Typically, non-local visitors stayed in the area for about five days during each visit (Dietsch, et al. 2020).

Winter sleigh rides are available through a Refuge contractor from mid-December to early April, depending on conditions. Tickets cost $40 for adults, $25 for children ages 5–12 and are free for toddlers and infants. Revenue from the Refuge's share of sleigh ride ticket sales supports education and maintenance, but it does not fund supplemental feeding (Double H Bar, Inc. 2024). In FY 2023, the Refuge collected about $151,443 from concession operations.

Hunting

The cost of Wyoming hunting licenses varies by animal, residency, and license type. Currently, nonresident wild bison licenses cost $2,752 for females or calves and $6,002 for any bison, while residents pay $260 for females or calves and $414 for any bison. Elk licenses for nonresidents range from $100 to $1,950, and for residents, they range from $5 to $43. Additionally, nonresidents must pay a $15 application fee, and residents pay $5 (Wyoming Game and Fish Department 2024c). In FY 2022, Wyoming bison hunting licenses generated a revenue of $241,673 while Wyoming elk hunting licenses generated a revenue of $11.3 million (Wyoming Game and Fish Department 2022c). All revenue from Wyoming hunting licenses is collected by the WGFD; the Refuge does not receive any portion of this revenue. Hunting on the Refuge is provided via a free access permit through the WGFD Jackson office. If the number of hunters applying for Refuge access permits exceeds the available spots for a specific hunt period, permits are distributed through a random selection process (Wyoming Game and Fish Department 2022c).

In addition to hunting licenses, hunters also spend money on equipment, transportation, food, accommodation, guides, and other services. In 2020, Wyoming big game hunters spent $250 million on these expenses. Nonresident hunters spent over $45 million on guides and outfitters, while resident hunters spent nearly $8 million. Elk was the most hunted species by both resident and guided nonresident hunters that year (Wyoming Outfitters & Guides Association 2021). According to a 2017 report, resident hunters in Wyoming spend an average of $144 per day, while unguided nonresident hunters spend about $184 per day, and guided nonresident hunters spend around $1,140 per day (Southwick Associates 2017). These amounts may have increased since this report was published due to inflation and other economic factors.

As shown in Table 1 (Hunting Season Characteristics) above, from 2018 to 2022, an average of 2,612 hunters targeted the Jackson elk herd each year, with 1,101 elk harvested annually, like the proposed numbers for 2024. For the Jackson bison herd, an average of 154 hunters participated, with 103 bison harvested per year, but the 2024 proposal lowers these numbers to 70 hunters and 60 harvested. Hunters spent an average of 16,894 recreation days hunting the Jackson elk herd, which aligns with the proposed days for 2024. For hunting the Jackson bison herd, the average between 2018 and 2022 was 1,403 recreation days, with 750 proposed for 2024. Recreation days

include all time spent hunting, whether successful or not (Wyoming Game and Fish Department 2023).

Agricultural Setting

Brucellosis seroprevalence in elk on Wyoming feedgrounds averages around 32%, while it can reach up to 75% in bison. WGFD's main management issue is the potential spread of brucellosis from elk or bison to domestic cattle (Wyoming Game and Fish Department 2024a). Brucellosis can have an economic impact on cattle producers and agencies due to the cost of testing, treating infected cattle, loss of cattle, and other factors (Wyoming Department of Administration and Information, Economic Analysis Division 2004). According to a 2012 report on brucellosis in the GYA, quarantining a 400-head herd for one to six months could cost a producer between $2,000 to $8,000 (Schumaker, Peck and Kauffman 2012). If a herd contracts brucellosis, costs could range from $35,000 to $200,000, depending on whether the herd is destroyed and whether compensation is provided for the herd's market value (Schumaker, Peck and Kauffman 2012). These amounts have likely increased since this report was published due to inflation and other economic factors. In 2023, for instance, the value per head for all cattle and calves in Wyoming was $1,430, which represents an increase of $170 per head since 2019 (U.S. Department of Agriculture 2023).

Property Owner Setting

In FY 2022, the WGFD received 155 damage claims related to wildlife, resulting in over $1.5 million paid out in claims. This involved damage to land, crops, or improvements caused by big game animals, trophy animals, or gray wolves. The total cost of the damage program for FY 2022 exceeded $2.8 million. Of the $1.5 million in claims, $401,285 was for 35 claims related to elk damages. The remaining claims were for damages caused by pronghorn, black bears, game birds, grizzly bears, gray wolves, mountain lions, moose, mule deer, and white-tailed deer (Wyoming Game and Fish Department 2022b).

For elk damages, the costs were distributed as follows: 48% was for alfalfa, 24% for native grass and hay, 22% for corn, 3% for wheat, 2% for grain hay, and 1% for fence and improvements. In Jackson Hole, there were 11 claims related to elk damages, with $801 paid out—down from $6,420 in FY 2021. Over the past three years, Jackson Hole averaged $2,432 per year in elk damage payouts. In comparison, gray wolves caused the greatest average damages over the last three years, at $32,371 annually (Wyoming Game and Fish Department 2022b).

Regarding vehicle damages, data from the Wyoming DOT Highway Safety reveals that nearly 20% of vehicle collisions in Wyoming from 2017–2021 involved wildlife. Of the wildlife-involved crashes, about 4.6% involved elk (Wyoming Department of Transportation Highway Safety 2022). Elk-vehicle collisions in Wyoming are estimated to cost nearly $4 million per year, including almost $2.5 million in injury and property damage costs and $1.5 million in lost wildlife value, calculated at $6,000 per elk. The estimated cost per elk collision is $21,723 (Riginos 2022).

Economics: Environmental Consequences

Alternative A: No Action

Recreation and Tourism

As discussed above in "Hunting, Visitor Use, and Experience: Environmental Consequences," under Alternative A, it is likely that tourists would continue to visit the Refuge, with many coming for wildlife observation because there is limited evidence that Refuge visitation rates are correlated with historical elk counts at the Refuge (USGS SIR, Appendix F, E-21) and there is still predicted to be a high density of elk on the landscape. So, there is little evidence that recreation and tourism dollars will be impacted by the decreasing population of elk overtime because we don't anticipate visitor use will change due to the decreasing elk population. One potential beneficial effect of the continued feeding of elk under Alternative A is that elk will be more consistently present the feedgrounds of the Refuge (USGS SIR, Appendix D, C-24), ensuring a more predictable viewing experience that that could result in more stability for winter sleigh ride ticket sales to the benefit of the Refuge contractor providing the service and the revenue the Refuge uses for education and maintenance. Section 4.3 provides further discussion on Alternative A's effects on visitor use and experience.

Hunting

As discussed above in "Hunting, Visitor Use, and Experience: Environmental Consequences," under Alternative A, as the elk population declines due to increasing CWD prevalence, the number of hunting permits and hunter participation is expected to decrease, leading to reduced hunter generated revenue. The reduced spending would negatively affect the local economy, reducing revenue from hunting-related activities such as license sales, transportation, lodging, food, equipment, and guiding services, and could cause job losses. Over a 20-year period, Alternative A is expected to generate approximately $5.5 million in cumulative revenue from elk tag sales. In addition, hunter spending during the same period is projected to contribute a cumulative revenue of about $88.5 million (USGS SIR, Appendix F, Table E3).[9]

The permitted hunting outfitter operating on the Refuge would likely to be particularly affected, as the decline of the Jackson elk herd would reduce business and profits from guiding elk hunters on the Refuge. The cumulative outfitter revenue over a 20-year period is predicted to be approximately $12.6 million (USGS SIR, Appendix F, Table E3).

Because Alternative A would result in a similar population as there is today, hunting for bison would also likely remain the same. Total spending from hunters targeting the Jackson bison herd is projected to be between around $110,952 and $182,609 annually, with $97,139 expected from residents and $13,812 to $85,470 from nonresidents (Southwick Associates 2017).

Agriculture

Under Alternative A, supplemental feeding would continue to prevent elk and bison from leaving the Refuge for surrounding private lands (USGS SIR, Appendices D and E, Figure C6 and Table

[9] The elk and bison hunter spending estimates do not account for inflation or other factors that may have affected prices since the time the average daily spending by hunters in Wyoming was studied.

D3). Additionally, in the long term, high CWD mortality under Alternative A would lead to the smallest elk population compared to all other alternatives (USGS SIR, Appendix C, Table B1). These factors would reduce the risk of Jackson elk and bison herds damaging fencing and other agricultural infrastructure, as well as spreading brucellosis or other diseases to domestic cattle (USGS SIR, Appendix D, C-24 and Figure C6). As a result, Alternative A is predicted to result in an even lower financial burden to agriculture producers over time than currently.

Property Owners

Although property damages from wildlife would continue to vary from year to year, the cost averages around $2,432 per year in Jackson Hole (Wyoming Game and Fish Department 2022a). In the short term, implementation of Alternative A would result in similar costs. However, as the elk population declines over the long term, the likelihood of elk causing damage to private property will also likely decline from current conditions (USGS SIR, Appendices D and E, Figure C6 and Table D3.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold

Recreation and Tourism

Similarly to Alternative A, under Alternative B, it is anticipated that many tourists would continue to visit the Refuge because there is little evidence that general recreation and tourism is correlated to the number of elk on the Refuge (USGS SIR, Appendix F, E-21). Therefore, there are predicted to be minimal impacts to recreation and tourism dollars because of implementing Alternative B. However, in contrast to Alternative A, as the Refuge phases out feeding, there will be less predictability in where the elk may be distributed, which could affect the sleigh-ride experience, resulting in a negative impact on the contractor revenues providing the service. However, there is little data or information to quantify this impact (USGS SIR, Appendix F, E-21). Also, changes in hunting seasons on the Refuge, may necessitate changes to the sleigh-ride experience, but the Service will work with the sleigh ride operator to minimize impacts as much as possible.

Hunting

The impacts of Alternative B on hunter-driven revenue could vary widely depending on the success of implementation of the hunter-harvest strategies proposed under this alternative. If there were no increased hunting opportunities in the short term and the Service stopped feeding elk at 3% CWD prevalence, this alternative would be expected to generate approximately $5.25 million in cumulative revenue from elk tag sales over a 20-year period, a decrease of approximately $220,000 compared with Alternative A. In addition, hunter spending during the same period is projected to contribute a cumulative revenue of about $82 million, a $6.5 million decrease compared to Alternative A (USGS SIR, Appendix F, Table E3)[10]. The cumulative outfitter revenue over a 20-year period is predicted to be $11.7 million, a $900,000 decrease compared to Alternative A (USGS SIR, Appendix F, Table E3).

[10] The elk and bison hunter spending estimates do not account for inflation or other factors that may have affected prices since the time the average daily spending by hunters in Wyoming was studied.

However, if WGFD, the Service, NPS, and USFS increase harvest opportunities for the Jackson elk herd to target SDME as proposed, a short term 5-year bump in revenue generated from hunting and guiding is predicted. With these increased hunting opportunities, cumulative tag revenues could be as high as approximately $6.4 million over 20 years (USGS SIR, Appendix F, Table E3), an increase of approximately $1.13 million compared to Alternative A, with a higher percentage of that revenue coming in the first years of implementing the Alternative and annual tag revenue decreasing over time as the elk population decreases.

Another area of uncertainty regarding how Alternative B may affect tag revenue and hunter spending is the degree to which WGFD, the Service, and other cooperating agencies can effectively reduce SDME numbers. As noted in the "Hunting, Visitor Use, and Experience" section, SDME are not the elk typically targeted by hunters and outfitters. Consequently, lowering SDME numbers is likely to reduce competition for resources and improve the overall health and survival of LDME, the segment of the herd that hunters and outfitters rely on. Over the long term, a management shift that decreases SDME in favor of LDME could help maintain or even strengthen hunting opportunities and associated revenue. Therefore, impacts to hunting and outfitting revenue under Alternative B may be less substantial than under Alternative A.

Overall, CWD prevalence is expected to rise at a slower rate under Alternative B compared to supplemental feeding conditions (USGS SIR, Appendix C, Table B1) with a slightly higher and healthier elk population after 20 years. As a result, the long-term effect of Alternative B on hunting and outfitting in the Jackson elk herd and the corresponding impact on the local economy is expected to be less severe than under Alternative A.

For revenue generated by hunting bison under Alternative B, the number of hunting permits and recreation days is expected to remain similar to Alternative A because we expect the bison herd population to remain at a minimum of 500 bison. Therefore, the revenue generated from hunting bison would be like Alternative A.

Under Alternative B, as supplemental feeding continues, elk and bison would largely be contained within the Refuge (USGS SIR, Appendices D and E, Figure C6 and Table D3), reducing the risk of herds spreading brucellosis or other diseases to domestic cattle and raising potential costs for nearby cattle producers. Once the supplemental feeding of elk stops, elk are more likely to leave the Refuge (USGS SIR, Appendix D, C-24), increasing the risk of disease transmission and associated economic costs. Because the Service is predicted to stop feeding elk sooner under Alternative B than the other alternatives, the impacts to the agricultural industry are predicted to be higher than the other alternatives. The exact impacts will depend on the number of elk overwintering on the Refuge when the Service stops feeding, and the severity of the winter, which will determine how many elk leave the Refuge and have the potential to damage property each year and over the long term.

Under Alternative B, the cumulative number of elk days on private lands is projected to be 13,800 over 20 years, an increase of 1,600 days compared to Alternative A (USGS SIR, Appendix B, Table A2). The cumulative number of elk abortions on private lands is projected to be 181 over 20 years, an increase of 20 compared to Alternative A (USGS SIR, Appendix B,

Table A2). The financial burden on producers will depend on what actions they take in response to the increased risk. Producers must weigh the cost of additional risk reduction with the expected benefits (Roberts, Peck and Ritten 2012, Schumaker, Peck and Kauffman 2012). Actions such as hazing elk, fencing haystacks and vaccination are generally lower cost to the producers whereas spaying heifers, changing grazing schedules or hiring a rider are strategies that can be more costly relative the benefit of reducing brucellosis risk (Roberts, Peck and Ritten 2012). If brucellosis is detected in a herd, USDA's livestock indemnification program pays ranchers the fair market value of infected animals (Animal and Plant Health Inspection Service 2024). However, the uncompensated costs to producers (e.g., business interruption, feeding and care costs for animals, and loss of markets) can be considerably higher, ranging from tens of thousands to hundreds of thousands of dollars (Schumaker, Peck and Kauffman 2012, National Academies of Sciences, Engineering, and Medicine 2020)

Quarantining a 400-head herd for one to six months could cost a producer between $2,000 to $8,000. If a herd contracts brucellosis, costs could range from $35,000 to $200,000, depending on whether the herd is destroyed and whether compensation is provided for the herd's market value (Schumaker, Peck and Kauffman 2012). These amounts have likely increased since this report was published due to inflation and other economic factors. In 2023, for instance, the value per head for all cattle and calves in Wyoming was $1,430 (U.S. Department of Agriculture 2023). This means a 400-head herd would be worth approximately $572,000, which is a $68,000 increase compared to its value in 2019.

In the long term, across all the alternatives, the Service expects fewer elk days on private property due to the elk population decreasing over time, reducing the risk of disease transmission to local cattle and associated costs (USGS SIR, Appendix D, Figure C6).

Therefore, implementing Alternative B would increase the risk of local cattle producers facing brucellosis-related costs compared to Alternatives A in the short term when the Refuge stops feeding elk, but these effects will decrease over time as the population declines.

Property Owners

Under Alternative B, once the Service stops supplemental feeding of elk, the likelihood of elk causing property damage, such as to crops, fencing, and other improvements, would likely increase from the current average of approximately $2,432 per year (USGS SIR, Appendices D and E, Figure C6 and Table D3) in the short term. This will likely lead to higher compensation payments from the WGFD to private property owners. Additionally, elk-related vehicle collisions are expected to rise as elk, no longer influenced by supplemental feeding, are more likely to leave the Refuge and cross roadways (USGS SIR, Appendices D and E, Figure C6 and Table D3), increasing the risk of collisions and associated costs. In the long term, across all alternatives, the Service expects fewer elk days on private property due to the elk population decreasing over time, reducing the risk of property damage. (USGS SIR, Appendix D, Figure C6). Under Alternative B, if efforts to increase harvest the SDME (who are responsible for much of the property damage) are successful there be a decline in property damage costs. The exact impacts of Alternative B on property damage and associated costs are difficult to calculate because of the uncertainty.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Recreation and Tourism

As discussed above, it is likely that tourists would continue to visit the Refuge, with many coming for wildlife observation because there is limited evidence that Refuge visitation rates are correlated with historical elk counts at the Refuge (USGS SIR, Appendix F, E-21) and there is still predicted to be a high density of elk on the landscape. Therefore, there is predicted to be minimal impacts to recreation and tourism dollars because of implementing Alternative C. However, like Alternative B, as the Refuge phases out feeding, there will be less predictability in where the elk may be distributed, which could affect the sleigh-ride experience, resulting in a negative impact on the contractor revenues providing the service. However, there is little data or information to quantify this impact (USGS SIR, Appendix F, E-21)

Hunting

Alternative C could lead to a quicker reduction in the Jackson elk population, which could result in fewer elk hunting permits and a decline in hunting-related revenue sooner than under Alternatives A and B. The reduced spending would negatively affect the local economy, reducing revenue from hunting-related activities such as license sales, transportation, lodging, food, equipment, and guiding services, and could cause job losses. The permitted hunting outfitter operating on the Refuge would likely be particularly affected, as the decline of the Jackson elk herd would reduce business and profits from guiding elk hunters on the Refuge.

Over a 20-year period, Alternative C is expected to generate approximately $4.77 million in cumulative revenue from elk tag sales. (USGS SIR, Appendix F, Table E3). In addition, hunter spending during the same period is projected to contribute a cumulative revenue of about $73 million, a $15.5 million decrease compared to Alternative A (USGS SIR, Appendix F, Table E3). Additionally, the cumulative outfitter revenue over a 20-year period is predicted to be $10.4 million under Alternative C, a $2.4 million decrease compared to Alternative A (USGS SIR, Appendix F, Table E3).

For the Jackson bison herd under Alternative C, the number of hunting permits and recreation days is expected to decrease slightly because the bison population is predicted to decline under Alternative C. Over the next 20 years, the median herd size is projected to be 473 bison with a cumulative harvest of 1,508 (USGS SIR, Appendix E, Table D3). Annual hunter spending would likely be less than Alternatives A and B with a decrease of about $14,752 to current estimates.[11]

Agriculture

In the short term, the economic effects on agriculture under Alternative C would be like those described under Alternative B when the Service stops supplemental feeding of elk after year five. While there could be a potential increased brucellosis transmission risk from bison to cattle under Alternative C because the Service is proposing to stop feeding bison after year five too, the

[11] The elk and bison hunter spending estimates do not account for inflation or other factors that may have affected prices since the time the average daily spending by hunters in Wyoming was studied.

potential increase costs to agriculture is expected to be minimal. It is expected that WGFD will take management actions to reduce the commingling of bison with cattle.

The cumulative number of elk days on private lands is projected to be 13,100 over 20 years, an increase of 700 compared to Alternative A (USGS SIR, Appendix B, Table A2). The cumulative number of elk abortions on private lands is projected to be 173 over 20 years, an increase of 12 compared to Alternative A (USGS SIR, Appendix B, Table A2). cost to agriculture producers based on this increased risk of brucellosis transmission will be the same as those discussed under Alternative B. In the long term, across all alternatives, the Service expects fewer elk days on private property due to the elk population decreasing over time, reducing the risk of disease transmission and associated economic costs (USGS SIR, Appendix D, Figure C6).

Property Owners

The economic effects on property owners under Alternative C would be greater than those under Alternatives A and B. Depending on when supplemental feeding ends under Alternative B, the risk of elk and bison causing property damage could start sooner or later under Alternative C than under Alternative B. However, as there is no proposal to target SDME elk under Alternative C, there will continue to be more property damage from SDME particularly as they leave the Refuge when supplemental feeding ends. Additionally, in the long term, Alternative C is expected to result in fewer elk days on private property (USGS SIR, Appendix D, Figure C6), reducing the risk of elk causing property damage, including vehicle collisions, compared to Alternative B.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

Recreation and Tourism

Similarly to all alternatives, it is anticipated that many tourists would continue to visit the Refuge because there is little evidence that general recreation and tourism is correlated to the number of elk on the Refuge (USGS SIR, Appendix F, E-21). Therefore, there are predicted to be minimal impacts to recreation and tourism dollars because of implementing Alternative D. If the Refuge phases out feeding or changes hunting seasons, this could affect the sleigh-ride experience as discussed under Alternative B, resulting in a negative impact on the contractor revenues providing the service. However, there is little data or information to quantify this impact (USGS SIR, Appendix F, E-21). Also, as discussed under Alternative B, changes in hunting seasons on the Refuge may necessitate some operational changes to the sleigh-ride experience.

Hunting

Hunting opportunities could increase substantially in the short term as authorized by the WGFC to reduce the number of SDME in the Jackson elk herd, leading to a temporary boost in hunting-related revenue and a short-term benefit to the local economy. In the long term, as the elk population declines and if CWD prevalence rises in the herd, hunting opportunities, participation, and hunter-generated revenue could decline.

The exact impact of Alternative D on the revenue generated by hunting is also difficult to predict because it will depend on if the Service stops feeding and the long-term impacts of that decision

on the Jackson elk herd population. This alternative, with increased hunter-harvest opportunities, could generate approximately $6.4 million over 20 years (USGS SIR, Appendix G, Table F4), an increase of approximately $1 million compared to Alternative A, with a higher percentage of that revenue coming in the first years of implementation of the Alternative. Like all alternatives, annual tag revenue would likely decrease over time as the population decreases. In addition, hunter spending during the same period is projected to contribute a cumulative revenue of about $100 million, an $11 million increase compared to Alternative A (USGS SIR, Appendix G. Table F4). The cumulative outfitter revenue over a 20-year period is predicted to be $14 million, a $1 million increase compared to Alternative A (USGS SIR, Appendix G, Table F4).

As discussed above under Alternative B, SDME are not the elk typically targeted by hunters and outfitters. Consequently, lowering SDME numbers is likely to reduce competition for resources and improve the overall health and survival of LDME, the segment of the herd that hunters and outfitters rely on. Over the long term, a management shift that decreases SDME in favor of LDME could help maintain or even strengthen hunting opportunities and associated revenue. So, there will likely be even less impacts on hunting and outfitting generated revenue under Alternative D (with increased harvest) than under Alternative A.

CWD prevalence could rise at a slower rate under Alternative D with increased harvest of the SDME portion of the herd, and at an even slower rate depending on if/when the Service stops feeding compared to Alternative A (USGS SIR, Appendix G). Therefore, Alternative D has the potential to have less long-term adverse effects on hunter-revenue, because the Jackson elk herd population could be higher in the long term than Alternative A (USGS SIR, Appendix G. Table F4). Overall, Alternative D, depending on the success of the hunter/harvest strategies and if/when the Service decides to stop supplementally feeding elk, could have the least adverse effects on hunting and outfitting than the other alternatives in both the short and long term (USGS SIR, Appendix G, Table F4).

For revenue generated by hunting bison under Alternative D, the number of hunting permits and recreation days is expected to remain similar to Alternatives A and B because we expect the bison herd population to remain at a minimum of 500 bison. Therefore, the revenue generated from hunting bison would be like Alternative B.

Agriculture

The risk of the Jackson elk herd spreading brucellosis or other diseases to domestic cattle, and the associated costs for nearby cattle producers under Alternative D would likely be less than Alternatives B and C. Under Alternative D, we would be working cooperatively across all agencies to change bison and elk management to avoid human-wildlife conflict, through changes to hunting opportunities, exploring options to expand winter range of the elk, continued feeding and hazing of bison, and more. Additionally, targeting SDME—as we also propose in Alternative B—will also reduce human-wildlife conflict as SDME are more likely to encounter livestock than LDME. Under this option, the Service may determine to continue supplemental feeding if necessary to avoid commingling of elk and bison with cattle, so the risk of the Jackson elk and bison herds spreading brucellosis or other diseases to domestic cattle, and the associated costs for nearby cattle producers, could be lower.

Under Alternative D, as supplemental feeding continues, elk and bison would likely be contained within the Refuge (USGS SIR, Appendix D, Figure C6 and Appendix E, Table D3), reducing the risk of herds spreading brucellosis or other diseases to domestic cattle and raising potential costs for nearby cattle producers. If/when supplemental feeding of elk stops, elk are more likely to leave the Refuge (USGS SIR, Appendix D, C-24), increasing the risk of disease transmission and associated economic costs. The exact impacts of Alternative D on agriculture costs are difficult to calculate. First, there are many uncertainties including: when the Jackson elk herd will reach 3-7% CWD prevalence; if/when the Service will stop feeding as a result; the number of elk overwintering on the Refuge when the Service stops feeding; and the severity of the winter. All these factors will impact how many elk leave the Refuge and have the potential to damage property each year and over the long term. Alternative D proposes an adaptive management approach where we would work with the other cooperating agencies to address these uncertainties in their future management decisions. For example, if the Service decides to stop supplementally feeding after CWD prevalence reaches 3%, the cumulative number of elk days on private lands is expected to be like Alternative B (approximately 13,800 cumulative elk days on private land over a 20-year period). If hunter-harvest strategies are successful and the Service decides to stop supplementally feeding elk when CWD prevalence reaches 7%, then the cumulative number of elk days on private lands is projected to be about 13,500 over 20 years (USGS SIR, Appendix G, Table F4), an increase of about 1,600 and 1,200, respectively, compared to Alternative A.

The cumulative number of elk abortions on winter cattle properties could be between approximately 160-180 over 20 years under Alternative D, varying slightly depending on the success of hunter-harvest strategies and if/when the Service stops supplemental feeding (USGS SIR, Appendix G, Table F4).

As discussed above, brucellosis-related costs to local cattle producers can vary greatly depending on actions an agricultural producer chooses to take in response (e.g., hazing and infrastructure costs, the length of quarantine, the cost of treating infected cattle, cattle losses, market value, and other factors). This increased disease risk would negatively affect local cattle producers and the broader local economy most in the time after the Refuge ceases feeding elk, but these effects will decrease over time as the population declines. However, as mentioned above, Alternative D prioritizes strategies to prevent this co-mingling, and therefore the impacts to the agricultural industry are predicted to be lower than Alternatives B and C.

Property Owners

If the Service stops supplemental feeding of elk, the likelihood of elk causing property damage, such as to crops, fencing, and other improvements, would likely increase from the current average of approximately $2,432 per year in the short term (USGS SIR, Appendix D, Figure C6 and Appendix E, Table D3). As discussed above, this will likely lead to higher compensation payments from the WGFD to private property owners.

In the long term, across all the alternatives, the Service expects fewer elk days on private property and fewer vehicle collisions due to the elk decreasing over time, reducing the risk of property damage (USGS SIR, Appendix D, Figure C6). However, under Alternative D, we

would be working cooperatively across all agencies to change bison and elk management to avoid human-wildlife conflict, through changes to hunting opportunities, exploring options to expand winter range of the elk, continued feeding and hazing of bison, and more. Additionally, targeting SDME—as we also propose in Alternative B—will also reduce human-wildlife conflict as SDME are more likely migrate onto private land and be involved in vehicle collision, causing damage and associated costs to private property.

Economics: Other Reasonably Foreseeable Effects

Recreation and Tourism
From 2014 to 2023, travel-related spending in Wyoming grew at an average annual rate of 4.2%. In 2023, these expenditures reached $4.8 billion, marking a 6.5% increase from the previous year (Wyoming Office of Tourism 2023). Teton County led the state in direct travel spending, accounting for $1.7 billion of the total. That same year, Wyoming welcomed 8.7 million visitors, a 2.5% increase from 2022 (Wyoming Office of Tourism 2023). Given these upward trends in both visitation and spending, tourism in Wyoming is likely to continue growing, including increased visits to the Refuge**.** This positive growth could help mitigate any potential negative economic effects that any of the alternatives may have on recreation and tourism. Additionally, Teton County's increasing population density indicates sustained development, which may continue to attract tourists even with changes in elk population under each alternative. This growing density could offset some economic losses through diversified tourism or recreational activities.

Hunting
The Jackson elk herd is projected to decline 37–47% over a 20-year period depending on Refuge management actions (USGS SIR, Appendix C, Table B1). Lower elk numbers in the Jackson elk herd are expected to have the greatest economic effects in the Jackson Hole area primarily through decreased hunting opportunity (USGS SIR, Appendix F, Chapter E), but direct effects of the proposed action on State-wide elk numbers will be modest. There are approximately 110,000 elk in Wyoming according to WGFD estimates, and the Jackson elk herd currently represents only 10% of this total; therefore, even significant reductions to Jackson elk herd numbers will not result in large reductions in State-wide elk hunting opportunities or tag revenue unless State-wide elk populations experience a concurrent decline.

Agriculture
As discussed in the "Public Health and Safety: Other Reasonably Foreseeable Effects" section, incidences of brucellosis transmission from elk to cattle and domestic bison herds in the GYA have increased over the past few decades (Wyoming Livestock Board 2024). The risk of CWD is also rising. Continued feeding practices exacerbate the issue by bringing potentially infected animals into close contact with healthy ones, increasing the likelihood of disease spread to other parts of the region and the county (National Academies of Sciences, Engineering, and Medicine 2020). Addressing this issue requires a coordinated and well-funded effort, which could lead to negative socioeconomic consequences. Furthermore, the heightened disease risk associated with brucellosis poses significant challenges for cattle producers and could harm the broader economy.

However, the number of agricultural producers across Fremont, Park, Sublette, and Teton Counties has decreased over time. In 2007, there were a total of 2,722 farms across these counties, of which 1,838 involved animal production (USDA, National Agricultural Statistics Service 2007). By 2022, the number of farms declined to 2,243, with only 1,380 involved in animal production (USDA, National Agricultural Statistics Service 2022). In Teton County specifically, there were 180 farms in 2007, 139 of which involved animal production (USDA, National Agricultural Statistics Service 2007). By 2022, the number of farms had declined to 111, with only 62 involved in animal production (USDA, National Agricultural Statistics Service 2022). Given this trend, it is likely that the number of agricultural producers in the region will continue to decline. This reduction in agricultural operations could lower the potential risk of brucellosis transmission from elk to cattle and domestic bison herds in the region, thereby reducing the risk of negative economic effects on agricultural producers and the broader economy.

Property Owners

A continued increase in the number of housing units in Park and Teton Counties could increase the likelihood of elk causing property damage in these areas. However, this potential effect could be offset by the planning efforts by the counties to reduce development in rural areas coupled with the projected decrease in the elk population under each of the alternatives, resulting in lower compensation payments from the WGFD to private property owners. Additionally, a continued decrease in the number of housing units in Fremont and Sublette Counties could decrease the number of housing units where elk cause property damage in these areas.

As discussed in the "Public Health and Safety: Other Reasonably Foreseeable Effects" section, elk ramps and other highway wildlife crossings assist migrating elk in reaching the Refuge while minimizing the risk of collisions with highway traffic. Potential construction of additional elk ramps (Jackson Hole Wildlife Foundation 2024) or other highway wildlife crossings would decrease the likelihood of elk-vehicle collisions and could thereby decrease associated costs to property owners. Thus, the potential negative economic effects from the implementation of any of the alternatives could be mitigated by the construction of new elk ramps or other highway wildlife crossings.

4.7. Management Costs and Operations

Refuge Management Costs and Operations: Affected Environment

The total cost of the Refuge supplemental feeding program is not fully budgeted into the annual budget for the Refuge and depending on feed season length, which varies annually, must be supplemented by regional funds, which detracts from other regional Refuge management and operations. The 2021–2022 supplemental feeding season on Refuge lasted 42 days and the total cost was approximately $623,717. This equates to an average feeding cost of around $14,850 per day. In 2022–2023, the supplemental feeding season lasted 88 days and the total cost was approximately $1.4 million. This equates to an average feeding cost of around $16,261 per day. The average cost per day across both seasons equated to $15,805 per day. These totals included costs for feed, feed testing, supplies, fuel, equipment parts and repair, and labor. Annually, labor involved with actual feeding operations includes a mix of permanent and volunteer Refuge staff.

Equipment, maintenance and repairs, feeding preparations, and feed testing are primarily conducted by permanent Refuge staff.

Supplemental feed suppliers are determined through bidding on government contracts. The current contract is for a five-year period. In recent years, there has only been one supplier, based in Terrenton, Idaho, that is able to meet the Refuge's needs. Annual costs of feed per ton can fluctuate within the contract based on annual availability of alfalfa used to manufacture the pellets. In recent years this price has been $325–$440/ton. The Refuge purchases alfalfa feed pellets annually based on the previous year's usage with the goal of, at a minimum, maintaining a supply capable of providing bison and elk feed for a severe winter-feeding period.

Management Costs and Operations: Environmental Consequences

Alternative A: No Action

Alternative A is the most expensive alternative to the Service for management and operation costs. For evaluating costs, the USGS SIR calculated that managing the feedground program requires the Service to expend between $15,213 and $16,448 per day of feeding activities for the direct costs of feed, labor, fuel, and maintenance of machinery. These daily cost estimates were used to predict that the continued feeding alternative will have an average cumulative cost of $19,335,000 over 20 years (USGS SIR, Appendix B, Chapter A), with the annual costs declining over the 20-year period as the elk population declines due to CWD. Using the average cost of feeding across the 2021–2022 and 2022–2023 supplemental feeding seasons ($15,805 per day) and the historic range of supplemental feeding days (0–147 supplemental feeding days), the cost of supplemental feeding to the Service would likely range from $0 ("no feeding") to around $2.3 million (147 supplemental feeding days) per year. The average supplemental feeding cost per year would be around $1 million (64 supplemental feeding days). This cost would fluctuate each year based on the number of feeding days, cost of feed, cost of labor, inflation, and other economic factors. Feeding would continue to be executed by approximately half long-term volunteers and half Service employees.

Figure 18. Refuge biologist loading elk carcasses onto a trailer for transport to incinerator. Photo Credit: Kari Cieszkiewicz

This cost estimate for Alternative A does not include costs of the Service to respond to CWD under the Refuge's CWD protocol, which includes the management-intensive and expensive process of locating, testing and disposing of carcasses. Under current conditions (2025) the Service estimates the cost of CWD sampling to be approximately $49,000

annually. This cost includes labor, sampling materials, equipment and vehicle maintenance, and fuel. As CWD prevalence increases there will be a direct relationship between cost of sampling and prevalence rate, plus the annual addition of inflation. Long-term costs are unknown but will likely be significant.

Alternative B: 7 Year Adaptive Management with 3% CWD Elk Prevalence Threshold
The Service will no longer incur the costs of supplemental feeding as the herd reaches 3% CWD prevalence or after year 6. It is predicted that the Jackson elk herd will reach 3% CWD prevalence in the first few years of implementation, so costs could decrease drastically in the short term. While feeding continues, it would continue to be carried out by a workforce of approximately half long-term volunteers and half Service employees. After the last supplemental feeding season, the Service would save approximately $1 million annually in supplemental feeding costs, which could be redirected to habitat restoration efforts on former prairie/shrub feedground locations and riparian areas along Flat and Nowlin Creeks or other management and operation costs of the NWRS. Volunteer positions involved in feeding would either be eliminated or reassigned to other tasks, and Service staff responsible for supplemental feeding would be moved to different duties. Since the alfalfa used for supplemental feeding has not been purchased locally in recent years, discontinuing its purchase would not negatively affect local producers. The effect on the local economy would also be negligible, as the only local effect would come from a slight reduction in fuel purchases used for transporting the alfalfa.

Also, under Alternative B, hunting opportunities would increase in the short term to reduce the number of SDME in the Jackson elk herd and help lower the herd size to a target population of 5,000. Reducing the elk population would decrease the amount and cost of supplemental feed needed each year. As a result, the Service would similarly save more money annually, and those savings could again be redirected to habitat restoration efforts or other management and operation costs of the NWRS. According to the USGS SIR, this Alternative, due to the

Figure 19. Refuge staff cleaning out the incinerator after disposing of a carcass. Photo Credit: Kari Cieszkiewicz

aggressive harvest of SDME and reducing the need to supplementally feed elk, is predicted to have an average 20-year cost estimate of $4,839,000 and the disease threshold would cost $2,189,000. (USGS SIR, Appendix B, Chapter A — "Aggressive Harvest Alternative)

The cost estimate for Alternative B does not include costs of the Service to respond to CWD under the Refuge's CWD protocol, which as discussed above currently costs approximately $49,000 annually. Nor does this cost estimate include costs to dispose of carcasses in the event of a severe winter starvation event post cessation of feeding which is predicted to occur in one out of every four winters. Under the Refuge's CWD protocol, carcasses or their parts found in the Refuge (no matter the suspected cause of mortality) will be incinerated. In the event of a large-scale winter die-off on the Refuge, the number of carcasses may exceed the capacity of Refuge resources needed to operate the incinerator as well as the actual capacity of the incinerator over time. This could result in a need to remove carcasses from the Refuge and haul them to a disposal site suitable for wildlife carcasses. Under the Refuge's CWD protocol, carcasses or their parts found in the Refuge (no matter the suspected cause of mortality) will be incinerated.

The additional cost for this effort is unknown, likely significant and related to the population of elk using the Refuge at the time that supplemental feeding is ended — fewer elk will result in relatively lower disposal costs. As with all the alternatives, as CWD prevalence increases, CWD response costs will increase and over the long term could be significant. However, because Alternative B predicts the lowest CWD prevalence over the long term, these costs would be lower under Alternative B than the other alternatives.

Alternative C: 5 Year Supplemental Feeding for 5,000 Elk

Cost savings from the reduced ration and eventual discontinuation of supplemental feeding could be higher or lower than under Alternative B, depending on factors such as how many years supplemental feeding occurs under Alternative B, the number of feeding days each year, feed prices, labor costs, inflation, and other economic factors. Once supplemental feeding ends, the cost savings under Alternatives B and C would be the same. According to the USGS SIR, this Alternative would have an average 20-year cost estimate of $4,839,000 and the disease threshold would cost $2,189,000. This cost estimate does not include costs of the Service responding to CWD under the Refuge's CWD protocol, nor does this cost estimate include costs to dispose of carcasses in the event of a severe winter starvation as the Service reduces rations and eventually stops feeding. As discussed above, the exact additional cost for these efforts is unknown and will depend on multiple variables (CWD prevalence, severity of winters, etc.) but likely significant.

Alternative D: Adaptive Population Management to Reduce Overwintering Elk Population on the Refuge and Elk Reliance on Feed

If efforts to reduce the population overwintering on the Refuge are successful, the need to supplementally feed elk will decrease under this alternative, and the management and operations costs to the Service will decrease substantially (from $19.3 million over 20 years to approximately $9.7 million over 20 years). If the Service determines to stop supplementally feeding, the costs could decline even further (to anywhere between approximately $2.2-3.9 million over 20 years depending on when the Service decides to stop). (USGS SIR, Appendix G, Table F4) This cost estimate does not include costs of the Service to respond to CWD under the Refuge's CWD protocol. Nor does this cost estimate include costs to dispose of carcasses in the event of severe winter starvation if the Service stops feeding when the elk herd population is still so high that the natural forage on the Refuge cannot sustain the number of elk present. As discussed above, the exact additional cost for these efforts is unknown and will depend on multiple variables (CWD prevalence, success of hunting-harvest strategies, severity of winters, etc.) but could be potentially significant.

Management Costs and Operations: Other Reasonably Foreseeable Effects

The Refuge budget is part of the larger Congressionally allocated budget for the NWRS. The Region 6 refuge budget, which includes the Refuge, for FY 2010 was $63,734,567 and has fluctuated annually since that time with a low occurring in FY 2013 of $56,482,181 and a high of $63,934,749 in FY 2023. These fluctuations and minimal increases typically fail to keep up with the inflation rate and result in a net loss of purchasing power. Any future increases in budget for Region 6 and the Refuge would help keep up with the cost of inflation which impacts the cost of all aspects of the irrigation program and supplemental feeding of elk and bison—labor (staffing), fuel, feed pellets, equipment parts, maintenance and repairs. Conversely, flat or declining budgets will negatively affect the Refuge's ability to adequately maintain and support the irrigation and supplemental feeding program. Based on the past 10 years of budget and the foreseeable future, it is likely that the budget will be flat or decreasing, which will result in a negative impact to the feeding program and bison and elk management on the Refuge.

Chapter 5: Summary of Analysis

Below we summarize how the different alternatives compare in how they impact each affected resource analyzed above. The table below is a comparison of how the different alternatives impact the affected environment over a 20-year period. While there are varying potential outcomes for Alternative D, for the purposes of comparison, the following table assumes hunter-harvest strategies are successful and the Service stops supplemental feeding of elk once 7% CWD threshold is reached. These numbers are derived from the models used to develop the USGS SIR, Appendices B-G. Below the table, is a summary on the differences and similarities in how the alternatives will impact each affected resource in both the short and long term.

Table 3. Comparison of impacts of Alternatives A-D over 20-year period.

Performance Metric (over a 20-year period)	Alt. A (continued feeding)	Alt. B (3% CWD threshold)	Alt. C (reduced feeding)	Alt D (7 % CWD threshold & increased harvest)
Jackson Elk Herd CWD Prevalence	35%	23%	26%	26%
Jackson Elk Herd Population	5,200 elk	6,900 elk	6,100 elk	6,100 elk
Elk Harvest in Analysis Area (cumulatively)	13,181 elk	13,215 elk (or higher depending on increased hunter-harvest strategies)	11,834 elk	14,753 elk
Elk Harvest Tag Sales (cumulatively)	$5.5 million	$5.2 million (or higher depending on increased hunter-harvest strategies)	$4.8 million	$6.4 million
Hunting Revenue	$88.6 million	$82 million (or higher depending on increased hunter-harvest strategies)	$73 million	$100 million

Elk Days on Private Lands in Analysis Area (cumulatively)	12,400	13,800 (or lower depending on increased hunter-harvest strategies)	13,100	13,500
Brucellosis Risk on Private Lands in Analysis Area (cumulatively)	161 elk abortions	181 elk abortions (or lower depending on increased hunter-harvest strategies)	173 elk abortions	179 elk abortions
Service Cost of Management (cumulatively)	$19.3 million	$2.2 million	$4.8 million	$6.3 million

5.1. Natural Resources

Elk

The number of elk predicted to die in the short term is similar under Alternatives B, C, and D (around 6,000 elk), but how they die differs. Under Alternatives B and C, winter starvation is the greatest cause of mortality. Whereas under Alternative D, the greatest cause of mortality is hunter-harvest. All proposed alternatives that end feeding on the Refuge are expected to result in higher numbers of elk in the Jackson elk herd in the long term than if feeding continues, with Alternative B having the lowest CWD prevalence over a 20-year period. However, the Jackson elk herd population is predicted to decrease significantly over a 20-year period under all alternatives. Projected differences in CWD prevalence and elk population size between feeding and non-feeding alternatives would be even greater if feeding were to end on all regional feedgrounds.

Under any alternative where the Service ends supplemental feeding, the wildness of the elk herd will return with improvements to stress levels, foraging and migration patterns, and overall health.

Bison

Continuing to supplementally feed bison as proposed under Alternatives A, B, and D will avoid increasing human-bison conflict and ensure long term persistence of the Jackson bison herd. Alternatives B and D propose to stop supplementally feeding bison if it is determined that the continued supplemental feeding could increase the risk that new and/or emerging diseases could threaten the bison herd. Continuing to supplementally feed bison will impact the wildness of the

Jackson bison herd, including changes in the bison's gut biome and digestive health, migration patterns, behavior and social structure.

Other Wildlife, Including Threatened and Endangered Species
Across all alternatives, the long-term reduction in elk numbers on the Refuge is expected to benefit most other wildlife species by reducing competition for forage, decreasing disease transmission risk, and allowing for habitat recovery, particularly in riparian and aspen communities. Despite the significant predicted decline in the Jackson elk herd under all alternatives, elk are still expected to remain abundant on the landscape and continue to play a vital ecological role as prey for carnivores, as competitors with other ungulates, and in influencing vegetation and nutrient cycling in the GYE. The significant decline in the elk population predicted under all alternatives will result in less elk biomass being available as a food source for predators and scavengers (e.g., wolves, coyotes, bears, eagles, ravens) and may result in some decline in these populations. However, predators and scavengers are generally adaptable and are expected to shift to alternative food sources as elk carcass availability declines over time.

In the short term, Alternatives B and C that phase out or end supplemental feeding, and potentially Alternative D depending on strategies chosen, may temporarily increase competition among ungulates (such as mule deer and moose) as elk redistribute, and could lead to a short-term increase in carcass availability for predators and scavengers due to higher elk mortality from starvation or hunting.

Notably, the strategy in Alternatives B and D to target the SDME for increased harvest helps maintain or increase the proportion of LDME, which are especially important as a food resource for large carnivores (e.g., wolves, grizzly bears) throughout the GYE. By focusing harvest on SDME, these alternatives help sustain a more resilient prey base for carnivores and reduce the risk of abrupt declines in key food resources.

Alternative A, which maintains the highest elk densities and continued feeding, is predicted to sustain the greatest risk of disease transmission to other ungulates and slowest pace of habitat recovery, but results in the least short-term redistribution of elk and associated competition.

Habitat restoration efforts following the cessation of feeding under Alternatives B, C, and D are expected to further benefit a wide range of wildlife, including birds, small mammals, and native fish, by improving vegetation structure and stream conditions.

Vegetation/Habitat/Soils
Due to the reduction in the elk population overwintering on the Refuge under all alternatives, there are predicted to be beneficial effects to vegetation, habitat, and soils in the long term. Short term impacts will differ between alternatives depending on the years it takes to reduce the population overwintering on the Refuge and when habitat restoration and recovery can begin. In the long term, the height and cover of woody plant communities on the Refuge are expected to increase, with subsequent benefits to bird and invertebrate species that depend on these habitats. Under all alternatives, soil erosion and compaction would be reduced. The contamination of soil will differ depending on the long-term prevalence in the herd and the efficacy of the Refuge's

CWD disease protocol of incinerating elk carcasses to avoid soil contamination. As elk distribute off the Refuge, there may be adverse effects to sensitive vegetation off the Refuge; however, these adverse effects should decline as the elk herd population declines.

Water Resources

Due to the reduction in the elk population overwintering on the Refuge under all alternatives, there are predicted to be beneficial effects to water resources in the long term, such as decreased fecal matter and reduced browsing of vegetation. The timing of the beneficial effects differs between alternatives depending on the years it takes to reduce the population overwintering on the Refuge and when restoration of riparian areas can begin.

Cultural and Historic Importance Resources

Impacts on cultural and historic resources are not expected under any of the alternatives. Ensuring the continued persistence of bison, elk, and other culturally important resources on the Refuge will ensure the continued cultural importance of the Refuge to Tribes, as well as continued opportunities for the tribal bison hunt and other cultural activities on the Refuge. Alternative C is the only alternative that is predicted to result in a decline in the bison population, which could impact the bison hunt.

5.2. Hunting, Visitor Use and Experience

Hunting opportunities and participation are expected to decline over the long term across all alternatives as the Jackson elk herd population decreases, depending on WGFC population objectives. However, hunter-harvest strategies proposed under Alternatives B and D will temporarily increase hunting opportunities and participation in the short term. Among the options, Alternative D is projected to have the most favorable outcomes for hunting, guiding, and outfitting both short term and long term. It provides the greatest immediate increase in hunting opportunities while also offering the best chance of preserving the LDME portion of the Jackson elk herd, which is essential for hunters, guides, and outfitters. In contrast, Alternative C is expected to have the most negative impact on hunting, as it would result in a sharp short-term decline in elk population without an accompanying increase in hunting opportunities.

There are not expected to be significant effects to other visitor uses of the Refuge. It is anticipated that visitors would continue to access the Refuge, with many coming for wildlife observation and photography. Environmental education programs would continue, and visitors would maintain access to the Refuge, the visitors center, and nearby Federal lands. The winter sleigh ride may have to be adjusted as the Service modifies or offers new hunting opportunities on the Refuge under Alternative B or as the elk distribution on the Refuge changes due to the cessation of supplemental feeding.

Ultimately, all proposed alternatives will shift the way that visitors experience elk on the Refuge. Regardless of the Service's actions, the herd size will change, and elk movement patterns and habitat use may change as well. While the Refuge's CWD protocols will all but ensure that the public does not see elk actively dying or elk carcasses, the public will see sick elk. Both starvation and CWD will present as emaciation and suffering to visitors, and these ill animals

will negatively impact the visitor experience. It is reasonable to assume that the perceptions of sick and suffering elk will be especially upsetting for people.

5.3. Public Health and Safety

Under any alternative where supplemental feeding of elk ceases, it is likely that elk will spread to new areas of the landscape increasing the likelihood of human-elk conflict and adverse effects, such as vehicle accidents, damage to private property, and brucellosis transmission to cattle. This impact may be reduced under Alternatives B and D by increasing overall harvest of the SDME herd resulting in fewer elk days on private property once feeding has stopped. This impact will also likely be reduced over the long term as the elk population decreases.

5.4. Private Lands and Other Public Lands

Under any alternative where supplemental feeding of elk ceases there will be a short-term increase of elk on private land during winter after the Service stops feeding elk. However, under all alternatives, there will be a decreasing presence of elk on private lands over the long term as the elk population declines. Additionally, under Alternatives B and D, there will be a further decrease of elk on private lands if hunter-harvest strategies are successful at reducing SDME portions of the herd that frequent private lands.

Under Alternative A, brucellosis transmission risk from elk to cattle will also be lowest compared to the other alternatives, although the differences in brucellosis transmission risks between the alternatives are minor. Alternative D has the least impacts to private lands and other public lands compared to the other action alternatives due to strategies to reduce the SDME portion of the herd most responsible for private land and property conflicts and the longer time that the Service would continue to provide supplemental feed to elk.

5.5. Economics

Alternative A would preserve the current economic conditions in the short term. Alternatives B and D would provide short term benefits, boosting hunting opportunities, reducing disease risks, and reducing property damage. However, in the long term, the reduction in the elk population could result in decreased hunter generated revenue under all alternatives, particularly as CWD prevalence increases, potentially adversely impacting the local economy. Compared to Alternatives B and C, Alternative D has the most measures to avoid bison and elk commingling with cattle and leaving the Refuge for private property where they cause property damage, so the costs to the agricultural industry and private property would be lower under Alternative D.

5.6. Management Costs and Operations

As the number of elk overwintering on the Refuge decline and/or as feedground practices come to an end on the Refuge, the Service's costs associated with bison and elk management will significantly decline. The yearly cost of continuing to provide supplemental feed would vary under each alternative and would vary each year depending on factors like the number of elk on the Refuge, feeding days, feed prices, labor costs, inflation, and other economic factors. After the last supplemental feeding season, the Service would save approximately $1 million annually in supplemental feeding costs. Due to the Service's disease management protocols, the Service

incinerates elk carcasses on the Refuge. This cost could be significant as elk die from CWD and/or winter starvation.

Chapter 6: Disclosures

6.1. Unavoidable Adverse Effects

As described for each resource in the environmental consequences sections of Chapter 4, Affected Environment and Environmental Consequences, there would be unavoidable adverse effects from the proposed action and all alternatives.

Feedground practices create the following unavoidable impacts on the Refuge and on the landscape:

- Increased probability of disease and parasite transmission among elk and bison, including brucellosis, CWD, and other diseases.
- Increased probability of elk mortality due to CWD.
- Alteration of historic elk and bison migration routes.
- Elk population sizes beyond what the landscape can support.
- Damage to sagebrush, riparian, and aspen habitat and associated wildlife.
- Decline in vegetation species richness, diversity, and vigor.
- Detrimental soil disturbance because of compaction and erosion caused from cross country travel by machinery and equipment, and trampling by bison and elk; and
- Decreased water quality due to wetland and stream-bank damage, erosion, and potential sediment delivery to streams.

Cessation of feedground practices also create unavoidable impacts on the Refuge and in the landscape:

- Winter mortality of elk due to starvation.
- Increased probability of human-wildlife conflicts because of elk and bison leaving the Refuge for adjacent lands.
- Increased probability of damage to private property from changing distribution of elk on the landscape; and
- Decreased probability of wildlife observation opportunities due to less reliable presence of elk around feedgrounds.

Despite strategies to minimize adverse effects from the proposed action and alternatives, there will still be unavoidable adverse effects.

6.2. Relationship Between Local Short-Term Uses and Long-Term Productivity

NEPA requires that an EIS consider "the relationship between short term uses of man's environment and the maintenance and enhancement of long-term productivity" (42 U.S.C. 4332(2)(C)). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Continued feedground practices on Refuge lands affect the long-term productivity of vegetation and habitat on the Refuge. As described in previous resource sections, the vegetation and habitat on the Refuge support a variety of wildlife and fish populations. Concentrating large numbers of elk on feedgrounds would be projected to affect the prevalence of CWD in elk herds as well as elk population numbers. The rates of CWD prevalence are predicted to be higher should the Service continue feedground practices, compared to the phasing out and eventual cessation of supplemental feeding. Over time, as CWD becomes more prevalent, elk populations will decline. This will result in reduced economic output, particularly related to hunter opportunity, in the Jackson Hole region.

6.3. Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those resources that may be degraded or lost due to a proposed action and cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those resources that may be lost for a period, such as temporary destruction of native habitat during construction of a temporary road but could be restored later.

The potential exists for irreversible commitments of both elk and deer resources if CWD prevalence continues to increase in western Wyoming and substantially reduces these populations. While the arrival of CWD is beyond the control of wildlife managers, the potential effect would be greater under any alternative where large numbers of animals are concentrated on feedgrounds. The loss would be irretrievable because in addition to always being fatal to infected animals, CWD contaminates the environment for long periods of time. Soil on the feedgrounds could become a reservoir of CWD that would continue to infect animals many years into the future. This is considered an irretrievable loss (a loss for a period) rather than an irreversible loss (a loss that cannot ever be reversed) because it is not known how long contamination of the environment would persist. Decontamination methods on game farms and research facilities have been unsuccessful, and animals introduced to these facilities years after a CWD outbreak and depopulation have subsequently become infected.

Irretrievable losses occur in willow habitat within and adjacent to feedgrounds due to loss of root stock as continued heavy browsing by elk during winters prevents suppressed willow plants in wet meadow habitat from recovering to a healthy condition. Irretrievable losses of aspen habitat could occur due to heavy browsing. As discussed above, enclosures that have been constructed in wet meadow habitat and around aspen habitat on the Refuge have successfully demonstrated the ability of willow and aspen to recover if completely protected from ungulate browsing. However, other sensitive plant species like serviceberry and chokecherry may not ever recover.

6.4. Certification of Compliance

This draft EIS has been developed pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 et seq.), the Department of the Interior NEPA (DOI) NEPA Regulations (43 CFR 46), the U.S. Department of the Interior Handbook of NEPA Implementing Procedures (516 DM 1), the Service policy (550 Service Manual, or FW), and other applicable Federal and State laws and regulations.

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