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ENVIRONMENTAL IMPACT STATEMENT FOR THE INTERAGENCY BISON MANAGEMENT PLAN FOR THE STATE OF MONTANA AND YELLOWSTONE NATIONAL PARK

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DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE INTERAGENCY BISON MANAGEMENT PLAN FOR STATE OF MONTANA AND YELLOWSTONE NATIONAL PARK

Bison are an essential component of Yellowstone National Park because they contribute to the biological, ecological, eultural, and aesthetic purposes of the park. However, Yellowstone National Park is not a self-contained ecosystem for bison, and periodic migrations into Montana are natural events. Some bison have brucellosis and may transmit it to cattle outside the park boundaries in Montana. Left unchecked, the migration of brucellosis-infected bison from Yellowstone National Park into Montana could have not only direct effects on local livestock operators, but also on the cattle industry statewide. The cooperation of several agencies is required to fully manage the herd and the risk of transmission of brucellosis from bison to Montana domestic cattle.

The purpose of the proposed interageney action is to maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the eeonomic interest and viability of the livestock industry in the state of Montana.

The U.S. Department of the Interior, National Park Service, and the U.S. Department of Agriculture, Forest Serviee, are the federal lead ageneies. The state of Montana is the state lead. The U.S. Department of Agrieulture, Animal and Plant Health Inspeetion Serviee, is a cooperating agency.

This environmental impaet statement examines seven alternative means of minimizing the risk of transmitting the disease brueellosis from bison to domestie eattle on publie and private lands adjaeent to Yellowstone National Park. These alternatives eaeh inelude a full range of management techniques, although they focus on one or two in partieular. For instanee, alternative 3 manages the bison herd primarily through hunting but includes provisions for quarantine. Alternative 5 proposes an extensive eapture, test, and slaughter of bison that test positive for brueellosis. Alternative 6 is similar to alternative 5 but requires 10 years of vaccination before the test and slaughter phase begins. Alternative 1 is the no-aetion alternative. It continues the present plan of capture and slaughter of all bison erossing the north end and most bison erossing the west boundary of the park. Alternative 4 is similar to alternative 1, but would add quarantine, so that bison testing negative for brucellosis would not be slaughtered. Alternative 2 eenters on ehanges in eattle operations and allows bison to range over the largest portion of their historie range. Alternative 7, the agencies' preferred alternative, focuses on maintaining the bison population below about 2,500 animals to minimize migration into Montana. Alternatives 2, 3, and 7 also include a framework for eonsidering the aequisition of lands from willing sellers for use as winter range and for other bison management aetivities. Deeisions to implement management aetions on acquired lands will be supported with additional National Environmental Poliey Aet and/or Montana Environmental Policy Act analyses.

Implementation of the preferred alternative would result in adverse impacts on the bison population size, wildlife viewing opportunities, soeial values of some people, groups, or tribes, a few ranchers using publie allotments on the Gallatin National Forest should those allotments be closed, wildlife species (particularly the pronghorn antelope, grizzly bear, and gray wolf), and visual resources of the area. Other alternatives might have these same impaets but eould also affeet winter reereation (partieularly snowmobiling), nonmarket values, livestoek operations, publie funds (to aequire winter range), the trumpeter swan, bald eagle, lynx, and wolverine, and the historie landseape of the area. Alternative 2 would have signifieant benefieial impacts associated with the nonmarket values attributed to the well-being of bison, while this alternative would also present the greatest potential for the transmission of brueellosis from bison to eattle. Were that to oeeur, there would be major negative eeonomic effeets on Montana's livestock industry. Alternatives 2, 3, and 7 would have signifieant benefits for ungulates (elk, deer, pronghorn, and bison) if additional winter range could be acquired. Mitigating measures and some monitoring would be needed to avoid impacts on threatened or endangered speeies in alternatives 5 and 6.

Written comments on this draft environmental impact statement will be taken for a period of 120 days. The review period for this doeument ends October 1, 1998. Comments should be sent to Sarah Bransom, Interagency Bison Management Plan, DSC-RP, P.O. Box 25287, Denver, CO 80225-0287

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SUMMARY

PROPOSED ACTION

This environmental impact statement analyzes impacts of several different means (alternatives) for the interagency, long-term management (assumed for purposes of analysis to be 15 years) of Yellowstone area bison to ensure domestic cattle in portions of Montana adjacent to Yellowstone National Park are protected from brucellosis, a disease some of these bison carry, and to ensure the viability of the bison herd. Each alternative requires the cooperation of the U.S. Department of the Interior's National Park Service (NPS), the state of Montana, and the U.S. Department of Agriculture's Forest Service (USFS) and Animal and Plant Health Inspection Service (APHIS), as all have jurisdiction over a portion of the management effort, either directly or indirectly. At this time alternative 7, maintaining a specific bison population range, is the agencies' preferred means of management.

PROJECT LOCATION

The analysis area is a part of what is often described as the Greater Yellowstone Area, the largest and most nearly intact ecosystem in the contiguous United States (Greater Yellowstone Coordinating Committee 1991). The portion specifically subject to analysis includes those areas in Yellowstone National Park habitually occupied by bison (approximately 1.75 million acres) and adjacent federal, state, and private lands outside the park in southwestern Montana (parts of Park and Gallatin Counties) that have been periodically occupied by Yellowstone bison over the past 12 years.

The area outside the park includes approximately 568,994 acres, of which about 97% is managed by Gallatin National Forest, 1% by state or local government, and 2% by private owners.

NEED FOR ACTION

Bison are an essential component of Yellowstone National Park because they contribute to the biological, ecological, cultural, and aesthetic purposes of the park. However, Yellowstone National Park is not a self-contained ecosystem for bison, and periodic migrations into Montana are natural events. Some bison have brucellosis and may transmit it to cattle outside the park boundaries in Montana. As bison migrate out of the park and into Montana, they move from one jurisdiction with management objectives to a different jurisdiction with different management objectives. Therefore, the cooperation of several agencies is required to fully manage the herd and the risk of transmission of brucellosis from bison to Montana domestic cattle.

Bison exiting Yellowstone National Park through north entrance near Gardiner, Montana.

PURPOSE OF ACTION

The purpose of the proposed interagency action is to maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana.

BACKGROUND

The Yellowstone Area Bison Herd

Bison are native to the Greater Yellowstone Area and were observed there by early travelers both before and after the creation of Yellowstone National Park in 1872 and the Yellowstone Timber Land Reserve in 1891.

Hunting and poaching of bison in the late 1800s substantially reduced the number of bison in the Yellowstone herd, and by 1902, only 23 were counted. Fearful the small wild herd might vanish, park managers imported 21 bison from captive herds into the park. These bison were raised using livestock techniques on the "Buffalo Ranch" in Lamar Valley until the 1930s, when the National Park Service gradually began efforts to restore the bison to a more natural distribution (NPS, USDI, Meagher 1973). However, artificial feeding of the Lamar Valley herd, herd reductions to achieve range management goals, and other manipulation of the population continued from the 1920s until the late 1960s, and were often quite intensive. The highest reported bison count during this period was 1,477 in 1954.

In 1967, when herd reductions in the park ceased as part of a larger redirection of park policies, 397 bison were counted. Since that time bison, elk, and other animals have been allowed to reach population levels dictated by environmental conditions.

In 1968, in response to livestock industry concerns over brucellosis, the National Park Service proposed a program to control bison at the boundary of the park. More recently, a series of four interim bison management plans (the latest in 1996) put specific boundaries and lethal control measures in place. In 1996–97, a particularly harsh winter with deep snow and ice conditions sent hundreds of bison toward park boundaries, seeking accessible forage at lower elevations. Implementation of the interim plan, combined with the severe winter conditions, resulted in the slaughter or shooting of 1,084 bison in the five months between November 14, 1996, and April 15, 1997. Others died of starvation or other natural causes inside the park, bringing the total population down from an estimated 3,500 in fall 1996 to an estimated 2,000 animals by early spring 1997.

Brucellosis in Cattle and Bison

Brucellosis is a contagious bacterial disease, caused by various species of the genus, *Brucella*, that infects domestic animals, wildlife, and humans worldwide. *Brucella abortus* is the species that infects both cattle and bison. There is no cure for brucellosis. Vaccines developed so far are not 100% effective, and are to date less effective with bison than with cattle. The first known case of brucellosis in the bison herd was reported in 1917. It is generally agreed that the transmission of brucellosis to the Yellowstone bison herd was from cattle, and occurred either through contact with infected cattle or from infected cows' milk fed to captive bison calves.

In cattle, the organism is shed primarily in aborted tissues, reproductive tissues, and discharges, especially just before, during, or soon after abortion or live birth. Ingestion by other cattle of contaminated material is the primary route of infection. Cows infected with brucellosis characteristically abort their first calf after the fifth month of gestation.

Less is known about the disease in bison, particularly free-ranging bison. Transmission from bison to cattle has occurred under experimental conditions in confined spaces, but has not been documented under free-ranging conditions.

Diagnosis. In cattle, diagnosis is based on the results of blood tests, herd history, clinical signs, and other information. The only sure way to know if an animal has the disease is to slaughter it and culture tissues from several locations for bacteria. In Yellowstone bison, agencies have used a blood test for the presence of *Brucella* antibodies. For a number of reasons, these blood tests tend to overestimate the number of bison actually harboring the bacteria. Difficulties in

isolating the bacteria from tissues and other factors have also meant fewer positive culture tests than the number of infected bison.

Risk of Transmission. Scientists and researchers disagree on even some of the most basic factors influencing the risk of transmission. These include whether studies on cattle are applicable to bison, whether controlled studies are applicable in the field, and the best ways to conduct additional research to determine the risk of transmission.

These disagreements and a paucity of information on brucellosis in bison make it impossible to quantify the risk of *B. abortus* transmission from bison (and elk, although this environmental impact statement does not analyze brucellosis in elk) in the Yellowstone area to domestic livestock. Instead, the agencies have identified factors that affect risk. They include the following:

1. The degree of association between potentially infectious and susceptible animals. Management actions emphasize separation to minimize risk.

2. The number and density of infectious animals in the host population.

3. The number of susceptible animals that may associate with infectious animals.

4. Environmental factors such as weather, sunlight, and other factors that determine the viability of the organism outside its host.

5. The class of the infectious animals. Because the disease is transmitted in cattle through ingestion of contaminated birth materials, pregnant bison are considered higher risk than other classes.

6. Vaccination and neutering reduce the transmission of the disease.

7. Some animals are naturally resistant to infection.

Alternative Interpretation of Risk. The above information represents areas where scientists generally agree on the interpretation of available data. However, considerable debate and need for additional research remain. The bulk of brucellosis research and disease management has focused on domestic livestock, yet limited published information suggests the disease may be transmitted differently and have different clinical, pathological, and population effects in bison (Williams, Cain, and Davis 1994; Meyer and Meagher 1995a).

Those who suggest the risk is negligible point out that there have been no documented cases of brucellosis transmission from wild, free-ranging bison to cattle.

It is possible that, although brucellosis may be endemic in the Yellowstone area bison herd, few of the animals are capable of transmitting the disease. This suggestion is supported by noting the discrepancy between the number of bison that test seropositive for brucellosis but culture tissue negative (Rhyan et al. 1997). This discrepancy and the infrequency of observed abortions in the Yellowstone bison herd (usually required for transmission of the disease between cattle) has led to the theory that the primary route of transmission among cattle (abortions and birthing events) may be different from that among bison. In bison, the bacteria may be transmitted through milk (Meyer and Meagher 1995a).

Bison Distribution

The Yellowstone bison population uses three different wintering areas in the park: Pelican Valley (the smallest), Mary Mountain (the largest, in the Hayden Valley-Firehole River area), and the northern range. Yellowstone National Park grooms roads in the winter for snowmobile use, which allows bison to easily traverse the park. Bison seem to use the roads to exit in severe winters, such as the 1975–76 and 1996–97 winters, and retain the memory of the access routes (Meagher 1989a). While experts agree that bison traveling on groomed routes are

traveling in a more energy-efficient manner than bison traveling through deep snow, there is disagreement about what bison would do if grooming ceased. What result this would have on bison numbers and distribution is not known. Bison migrate across the north and west ends of the park during the winter into Montana. In the north they exit primarily across the Reese Creek boundary of Yellowstone National Park, and move immediately onto adjacent private land where several hundred cattle are present year-round.

Bison may also enter national forest land in the Eagle Creek/Bear Creek area east of Reese Creek, where they occasionally enter private lands in the Gardiner area by traveling along the Maiden Basin hydrographic divide and Little Trail Creek drainage. These lands are collectively referred to as the Eagle Creek/Bear Creek "special management area" (areas outside the park where bison are allowed) in this document. To the east of these lands (and north of the park) lie Hellroaring and Slough Creek drainages and the Absaroka-Beartooth Wilderness, part of the national forest where cattle are not present. A few bison use these higher elevation, more rugged lands in winter and summer.

From the west side of the park, bison move along the Madison River, Duck Creek, and Cougar Creek in the vicinity of West Yellowstone. From here, bison infrequently move north (usually along Highway 191) onto public lands administered by the U.S. Forest Service in the Cabin Creek Recreation and Wildlife Management Area and the Monument Mountain Unit of the Lee Metcalf Wilderness. The western special management area (SMA) in this document includes these lands south to the West Yellowstone area. Up to a few hundred cattle may occupy select public and private lands in the West Yellowstone area in the summer months. No cattle are present in the winter.

Economic Impacts of Brucellosis in Cattle

Brucellosis (*B. abortus*) has the following direct impacts on the livestock industry:

- Abortion of calves
- Decreased weight gain by calves
- Delays in calf production
- Increased rates of culling and replacement
- Increased testing and vaccinating costs

The presence of livestock disease may also affect each state's classification by the Animal and Plant Health Inspection Service. Montana is currently "class-free" and can transport its cattle across state lines without testing for brucellosis. Downgrading would have extensive economic ramifications throughout the livestock industry in Montana by restricting ranchers' access to interstate and international livestock markets. Interstate limits on Montana producers' ability to market livestock may also come about from actions of state veterinarians whose states import Montana cattle and who see Yellowstone cattle as a potential disease threat. The potential for such widespread economic consequences is a primary motivating factor in taking management actions described in the alternatives in this environmental impact statement.

OBJECTIVES AND CONSTRAINTS IN TAKING ACTION

In addition to the above-stated purpose, the agencies have agreed that nine objectives would guide them in determining whether an alternative is reasonable, and in selecting the preferred alternative. Each alternative must meet the following objectives:

1. Address bison population size and distribution; have specific commitments relating to size of bison herd.

2. Clearly define a boundary line beyond which bison will not be tolerated.

3. Address the risk to public safety and private property damage by bison.

4. Commit to the eventual elimination of brucellosis in bison and other wildlife.

5. Protect livestock from the risk of brucellosis.

6. Protect the state of Montana from risk of reduction in its brucellosis status.

7. At a minimum, maintain a viable population of wild bison in Yellowstone National Park, as defined in biological, genetic, and ecological terms.

8. Be based on factual information, with the recognition that the scientific database is changing.

9. Recognize the need for coordination in the management of natural and cultural resource values that are the responsibility of the signatory agencies.

Another important factor in deciding the reasonableness of alternatives are agency constraints imposed by laws, regulations, or other requirements. All alternatives must be within these constraints to be a viable choice. A summary of legislative and regulatory requirements of each of the four agencies involved in bison management is provided in part 1, "Purpose of and Need for Action."

ISSUES

Public scoping identified several environmental problems (issues) that should be addressed in a cooperative bison management plan. Scoping also identified other objectives and alternatives the public wished agencies to consider in their planning. The resources that agencies believed would experience more than negligible impacts are listed below, and each is analyzed in the environmental impact statement:

- the Yellowstone area bison population size, distribution, and seroprevalence
- recreation
- socioeconomics, including the regional economy, minority and low-income populations, social values, and nonmarket values
- livestock operations in the region
- threatened and endangered species, such as the grizzly bear, and sensitive species or species of special concern
- other wildlife
- human safety
- cultural resources
- visual resources

Bison calf.

ALTERNATIVES

This environmental impact statement evaluates seven alternatives for the long-term management of bison. Alternative 1 is the no-action alternative (continue with existing interim plan), and alternative 7 (manage for specific bison population range) is the agencies' preferred alternative at this time. Each of the seven alternatives has several features in common, including the following:

- All alternatives require the cooperation of the state of Montana, the U.S. Forest Service, the National Park Service, and the Animal and Plant Health Inspection Service.
- Every alternative envisions the bison population would be managed primarily through natural processes inside Yellowstone National Park.
- In all alternatives (except alternative 5 in the short term), the use of lethal controls to manage bison is minimized as the population size approaches 1,700 animals.
- All alternatives include large geographic areas where bison are able to range with little human intervention. In alternative 5, this area is limited to Yellowstone National Park.
- Monitoring is an integral part of every alternative, especially as bison approach designated border areas in Montana.
- All alternatives define a management boundary beyond which agencies would take action to ensure bison do not remain.
- If a capture facility is sited as part of an alternative, it would meet certain environmental criteria and comply with requirements of the Endangered Species Act and the National Historic Preservation Act before construction began.
- All alternatives include humane treatment of bison held in capture or quarantine facilities.
- All alternatives except alternative 5 allow bison outside the park. To do so and not affect Montana's class-free status, special management areas (SMAs) would be created. The creation of these SMAs would not require changes to current APHIS regulations, but would require the approval of the state of Montana as specified by Montana law.
- Slaughtered bison could be auctioned or distributed to social service organizations. Bison shot in the field may be released to tribes. Live bison would be available if they had completed the approved quarantine protocol.
- In Montana, private landowners may shoot bison on their land with permission from the Department of Livestock, or they may ask the department to remove bison.
- All alternatives include the suggested vaccination of female cattle calves in areas adjacent to the park or in SMAs, as well as surveillance testing of these herds should contact with bison be suspected or occur. All alternatives also assume vaccination of bison calves and captured adult bison when a safe and effective vaccine is available.
- All alternatives include future research efforts.

Alternative 1: No Action – Continuation of the Current Interim Bison Management Plan

Adopting this alternative would continue current bison management as set forth in the 1996 *Interim Bison Management Plan* as defined by National Environmental Policy Act (NEPA) guiding regulations (40 CFR 1502.14). The interim plan relies on strict border enforcement to keep bison and cattle separate, and has no provision for the quarantine of bison. Bison are prevented from crossing the northern park boundary at Reese Creek because the adjacent land is private and occupied by cattle throughout

the year. All bison captured at the Stephens Creek facility are shipped to slaughter.

Bison are allowed in the Eagle Creek/Bear Creek area, a large tract of public (U.S. Forest Service) land north and east of Reese Creek. The Department of Livestock, with help from the agencies, maintains a boundary at Little Trail Creek/Maiden Basin hydrographic divide in the Eagle Creek/Bear Creek area. Bison moving north of this boundary and approaching private land in the Gardiner area are removed by agency personnel with the permission of the landowner.

In the West Yellowstone area, public lands administered by the U.S. Forest Service are adjacent to the park. Cattle are more dispersed than at Reese Creek and are not grazed during the winter months. Up to 50–100 seronegative nonpregnant bison in the West Yellowstone area are able to overwinter successfully outside the park without coming in contact with cattle. Seropositive, untested, or any pregnant bison are removed. Bison are excluded from the West Yellowstone area from May through October to prevent contact while cattle occupy the region. Bison located outside the park in the west boundary area would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. In addition, a handful of bison (usually single bulls) use the Cabin Creek/Lee Metcalf area on the west, or Hellroaring and Slough drainages to the north and east of Eagle Creek/Bear Creek. Those few that do move beyond the borders of either of these large tracts of public land would be hazed or shot.

Although agencies have made subsequent changes to the interim plan, these are not reflected in the description or analysis of the no-action alternative. In other words, existing conditions were assumed to begin when the analysis in this environmental impact statement began in spring 1997. Changes in the interim plan made since this time are included in appendix A for the reader's information.

Alternative 2: Minimal Management

The purpose of this alternative is to restore as near-natural conditions as possible for bison, including a small portion of their historic nomadic migration patterns. The area outside Yellowstone National Park over which bison would be able to range (e.g., the SMAs) without interference from agencies is the largest of all alternatives.

In each alternative, including alternative 2, many changes, such as land acquisition, changes in cattle operations, and a safe and effective bison vaccine, are described. Each of these involves some unknowns, as well as time to implement. Therefore, until these changes were in place, relevant management tools in the interim plan would remain in effect. The description below assumes these changes have been made.

The primary means to minimize the risk of disease transmission would be changes in cattle operations in the SMAs. This alternative would provide for lethal control of bison only in cases where human safety was in immediate danger, on private property at the request of the landowner, or outside the SMA border. Bison would not be captured or slaughtered by agencies. A key tool available to restore natural conditions and help control bison distribution would be the closure (e.g., discontinuing grooming) of winter groomed roads in Yellowstone National Park that the animals now use to traverse the park. Bison have "discovered" these pathways from the interior to both the northern and western boundaries of the park, and can use them routinely during the winter to access areas they would otherwise have more difficulty reaching. It is hypothesized that the energetic cost of traveling long distances on groomed roads would be low, and they in effect could be allowing bison to access other foraging areas, leave the interior, and move to boundary areas. Alternative 2 would be the only alternative to propose changes in winter operations in some segments of park roads to control bison distribution, although other alternatives include research on the use of roads and potential barriers to bison travel (alternative 3), and

plowing to access capture facilities (alternatives 5 and 6).

In addition to leaving road segments ungroomed, the agencies would maintain boundary lines through hazing and shooting. Landowners could request bison on their property be removed, or could shoot them with permission of the Montana Department of Livestock. Cattle operators on private lands inside designated SMAs might be offered incentives to remove susceptible (breeding) cattle, or grazing rights, easements, or property in bison winter range might be purchased from willing sellers to remove cattle altogether. In addition, public grazing allotments might be modified to accommodate bison.

Alternative 3: Management with Emphasis on Public Hunting

Alternative 3 would rely on hunting of bison to regulate population numbers and distribution of bison outside the park, and on separation of bison in time and space to preclude contact of bison with cattle. Where hunting was infeasible or inappropriate, capture and shipment of seropositive bison to slaughter and seronegative bison to quarantine would be used to maintain separation and manage the risk of disease transmission. As in other alternatives, bison would be vaccinated when a safe and effective vaccine was developed to further reduce this risk. This alternative would have both a distinct short-term (phase 1) and a long-term (phase 2) management strategy.

In the short term, the separation of cattle and bison on the northern (Reese Creek) boundary would be maintained through capture at Stephens Creek and the shipment of seropositives to slaughter and seronegatives to quarantine (or slaughter until the quarantine facility was built). Under the provisions of the interim management plan, the agencies now ship some of the bison captured at Stephens Creek to slaughter. A quarantine facility would give the agencies flexibility in the disposition of seronegative bison they do not now have. Bison that completed the entire quarantine procedure would be shipped live to requesting tribes or organizations, or used to repopulate herds on public lands. The location, design, and operation of a quarantine facility has not been determined, and an appropriate range of alternatives with different features would be evaluated before one was built. Additional NEPA and other compliance would be required to build such a facility on federal land or use federal money. Until the time a quarantine facility was constructed (assumed for the purposes of analysis to begin in 1999), all seronegative bison captured at Stephens Creek would be sent to slaughter.

The Department of Livestock, with help from the agencies, would maintain a boundary at Little Trail Creek/Maiden Basin hydrographic divide similar to alternative 1. Bison moving north of this boundary would be removed by agency personnel with the permission of the landowner.

Bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. As in alternatives 1 and 4, agencies would also maintain a boundary at the north end of the Cabin Creek Recreation and Wildlife Management Area/Monument Mountain Unit of the Lee Metcalf Wilderness. Hunting would be used in both the Eagle Creek/Bear Creek and western SMAs to help control population numbers and distribution. Research on the degree to which the winter grooming of park roads contributed to migration out of the park would continue, and changes in road grooming practices would be made in the long term if research showed they were warranted. These changes would be implemented through amendments to the park's winter use plan and appropriate NEPA documentation.

In the long term, alternative 3 would call for acquisition of bison winter range through purchase of grazing rights, easements, or

property from willing sellers, alterations in cattle allotments, and/or changes in livestock operations to remove susceptible cattle. This newly acquired winter range would be designated as the Reese Creek SMA, and would include lands on the west side of the Yellowstone River between Reese Creek and Yankee Jim Canyon. If suitable land north of the park was acquired through purchase or easement, the Stephens Creek capture facility might be moved to a different location. The Department of Livestock, with help from the agencies, would maintain a boundary at Yankee Jim Canyon, and hunting in the Reese Creek SMA would be used to help control population size and distribution of the bison herd.

If this alternative was selected, the agencies would request the 1999 Montana Legislature to authorize a fair-chase hunt for bison. Public hunting would then become the primary tool for agencies to control population sizes in the new Reese Creek SMA, and would also be allowed in the Eagle Creek/Bear Creek area and western SMA.

Modifications in grazing allotments, acquisition or easement of private land, or conversion from cow-calf to steer or spayed heifer production are options in this alternative for the West Yellowstone area to further reduce the risk of bison commingling with susceptible cattle.

Alternative 4: Interim Plan with Limited Public Hunting and Quarantine

The interim plan (no action, or alternative 1 in this analysis) has served to ensure spatial separation of the bison herd from domestic cattle on the northern and western borders of Montana. However, it has given agencies few options when harsh winters force more than the average number of bison toward the boundaries of Yellowstone National Park. For this reason, alternative 4 includes a quarantine facility to preserve seronegative bison captured at Stephens Creek. Bison completing the quarantine protocol would be released to tribes, requesting organizations, or to repopulate herds on public lands. The location of the facility has not been determined, and locating it on federal land or using federal money would mean subsequent NEPA analysis, including public input, would be required.

Hunting, should it be approved by the Montana Legislature, would be another tool proposed to help agencies control population numbers and distribution. A limited hunt, primarily for recreation, would be allowed in the West Yellowstone and Eagle Creek/Bear Creek areas.

Except for these differences, alternative 4 would be identical to the interim management plan, alternative 1.

Alternative 5: Aggressive Brucellosis Control within Yellowstone National Park through Capture, Test, and Removal

This alternative would implement an aggressive three-year capture and test program for all bison in the park, including those in its interior. Those testing negative would be released in the park, and seropositives would be shipped to slaughter. If a safe and effective vaccine was available, seronegative bison would also be vaccinated. Bison would not be allowed outside the park anywhere in Montana, and agencies would maintain northern and western boundaries. Bison at these boundaries would be hazed back into the park if possible, but shot if they were unresponsive to hazing. Capture facilities would be set up in nine areas. All untested bison would be shot in the latter stages of the capture, test, and slaughter program. When subsequent testing indicated brucellosis had been eradicated from the bison population, a new bison management plan would be prepared.

Alternative 6: Aggressive Brucellosis Control within Yellowstone National Park through Vaccination

This alternative, like alternative 5, would pursue the aggressive reduction of brucellosis from the Yellowstone bison herd. However, the entire

bison herd would first be vaccinated (when a safe and effective vaccine was available), primarily through remote means, and tested as they attempted to exit at park boundary locations. When tests showed the incidence of exposure to *B. abortus* had stabilized as a result of vaccination, (estimated to occur in 10 years) the herdwide capture, test, and slaughter of seropositive bison outlined in alternative 5 would begin.

Unlike alternative 5, bison would be allowed in the Eagle Creek/Bear Creek and western SMAs, although the majority of bison in the western SMA would be tested and released seronegatives. The National Park Service would construct and operate a capture facility at Seven-Mile Bridge inside the park on the west side. Nearly all bison migrating toward the West Yellowstone area cross through this narrow area. These facilities (at Duck Creek and the Madison River) would be dismantled, although a small, backup capture facility near Horse Butte, might be maintained.

Alternative 7: Preferred Alternative – Manage for Specific Bison Population Range

The preferred alternative departs from all other alternatives in that a range of bison population numbers would be the focus, and specific management scenarios would be put in place as the population approached either end of that range. This range would be from 1,700 to 2,500 bison. Agency controls would decrease as the bison population approached 1,700 and would cease at 1,700 bison in certain areas as described in management sections for each area. Additional measures to remove increasing numbers of bison would be implemented near the 2,500 mark if bison left the park or SMAs described in this alternative. Because bison removals occur at or outside the park boundary, the bison population could at times exceed 2,500 inside the park.

In the long term, the agencies might acquire access to additional winter range in the Gardiner Valley on the west side of the Yellowstone River through purchase of grazing rights, easements, or property from willing sellers. If acquired, this tract would be designated an SMA subject to the approval of the state of Montana as specified by Montana law. The capture facility now located at Stephens Creek could be dismantled and moved to an appropriate location in the SMA. No modifications in grazing allotments or acquisitions of property, easements, or grazing rights in the western SMA would be anticipated.

Although the preferred alternative (alternative 7) is distinct, it has elements similar to other alternatives. Capture and slaughter of seropositives would be the primary means of managing risk, as it is in alternatives 1, 4, and 5. Most seronegative bison would be shipped to quarantine, as described in alternative 4. Also like alternative 4, low levels of hunting would be allowed in one or more of the SMAs outside the park. As in alternative 3, the preferred alternative has a long-term phase that proposes the acquisition of winter range north of the park boundary. However, as described above, this alternative is much more specific in defining a population size and management tools to keep it at that size. It is also true that alternatives 1 through 6 are unique, as each emphasizes a particular strategy to manage bison or combination of strategies not analyzed in alternative 7.

Stephens Creek capture facility.

ENVIRONMENTAL CONSEQUENCES

The environmental impacts of each alternative were analyzed and compared to existing conditions. Below is a summary of those impacts.

Impacts on Bison Population

A simple model based on averages (deterministic) was used to predict changes in bison populations and/or seroprevalence rates should a given alternative be implemented. Because a single severe winter, such as the 1996–97 winter, could alter estimates of bison numbers significantly, the analysis also includes a section on the effects of small, average, and large-scale migrations out of the park in response to these "stochastic" events on the population size.

The deterministic model predicts the continued implementation of alternative 1 would result in a growing bison population. From 1997 to 2006, the bison population would increase at 4% per year to approximately 3,100. Management actions in this alternative would not measurably affect the age/sex distribution or reproductive rates of bison in this or any alternative except for alternative 5. Bison distribution outside the park is indicated in chart 1. In this, and all other alternatives except alternative 5, 100–200 bison would freely range on public lands in the Eagle Creek/Bear Creek area.

Alternative 2 would result in the largest and fastest growth of the bison population of all alternatives. From 1997 to 2006, the population is expected to increase to 3,500, moderately more bison (14%) than in alternative 1.

Alternative 3 would result in growth of the bison population, with numbers controlled primarily through hunting. From 1997 to 2006, the bison population would be expected to increase from about 2,200 to 3,500 (average increase 6%/year). Limited capture operations, agency shooting, hunting, and periodic severe environmental conditions would likely maintain the bison population near the upper management range of 1,700 to 3,500. It is estimated that alternative 3 would result in moderately more bison in the population (14% increase) compared to alternative 1.

In alternative 4, bison population numbers would be controlled through capture, shipment of seropositive bison to slaughter, and hunting. This alternative would result in a slowly increasing bison population with lower population numbers than alternatives 1, 2, 3, or 6. From 1997 to 2006, the bison population would be expected to increase from about 2,200 bison to 2,800 (average increase 3%/year). This would be a minor decrease (8% lower) in bison population size relative to alternative 1.

For alternative 5, the bison population would be expected to decline from 2,200 bison to approximately 1,250 bison by 1999. The bison population would be expected to number approximately 2,000 by 2006, and approximately 2,900 bison by 2011, 10 years after capture, test, and slaughter operations have ceased. No bison would be expected in Reese Creek, Eagle Creek/Bear Creek, or West Yellowstone in this alternative. The bison population would experience a major decrease in this alternative, representing a nearly 47% reduction, compared to alternative 1, over a period of only three years.

No bison would be allowed anywhere outside Yellowstone National Park boundaries under alternative 5. Management actions in alternative 5 could affect the age/sex distribution or reproductive rate of the bison population. Bison distribution within the park would likely be affected, and several areas would likely have few or no bison for as long as 10 years.

In alternative 6, all bison would be vaccinated for approximately 10 years (beginning in the year 2000) to reduce seroprevalence in the population. After whole herd vaccination, bison would be captured, tested, and seropositives slaughtered, similar to alternative 5. Two different estimates of population size were calculated based on the effectiveness of the vaccine. Assuming a 70% effectiveness, the

bison population would be expected to increase during the vaccination phase from 2,200 bison to approximately 3,500 bison in 2010, a negligible to minor increase compared to alternative 1. After 10 years of vaccination (2010), capture and slaughter would begin, and the population would drop from 3,500 to about 2,900 in a single year, a moderate (17%) decrease compared to alternative 1. If the vaccine was only 25% effective, the population would drop from 3,500 animals in 2010 to 2,500 the following year, when parkwide capture and slaughter began. This would represent a major short-term adverse impact (28% reduction) on the population. The herd would begin to increase following completion of the test and slaughter program; from 2,900 to 3,400 bison by 2014 (assuming 70% effectiveness), or from 2,500 to about 3,000 animals (assuming 25% effectiveness) by 2014.

Unlike other alternatives, in alternative 7 the agencies would attempt to manage the bison population within the more narrow range of 1,700 to 2,500 animals. Given the mix of management tools described above in "The Alternatives," the model predicts the bison population would be expected to increase from about 2,200 bison to 2,700 (average increase 2.6%/year) in 2004, and level off at or about 2,700 throughout the remainder of the 15-year plan. This alternative would result in a bison population 12% lower than alternative 1 in 2006 and 23% lower in 2011. However, because of limitations with the deterministic model, the differences between alternatives 1 and 7 might be less. Slaughter, quarantine, agency shooting, and hunting are predicted to remove an average of 132 to 137 bison per year. If bison exited the park in larger numbers during severe winters, more would be killed if the bison population was near or above 2,500 animals. During mild winters, fewer bison would exit the park and thus fewer bison would be killed.

Stochastic Influence on Bison Population. Chart 2 indicates how alternatives would vary in handling a large migration (975 bison) out of the park in response to a stochastic or periodic event, such as severe winter weather. Additional removals might include shipment of sero-negative bison to slaughter or quarantine, or additional agency shooting or increases in the number of hunting permits issued, and would depend on the bison management tools available in a given alternative. Each action assumes all elements of the alternative would be in place (e.g., phase 2 of the alternative).

Seroprevalence Rate. Modeling efforts for this environmental impact statement assumed 50% seroprevalence in the bison population. The model also assumed either a 70% rate of effectiveness of the bison vaccine (based on current success with cattle) or 25% rate of effectiveness (based on effectiveness in bison calves). Bison calves were assumed to be vaccinated with a safe and effective vaccine beginning in 2000.

Assuming a vaccine that was 70% effective and calfhood vaccinations began in 2000, the population seroprevalence rate under alternative 1 would be expected to decline from a starting point of 50% seropositive in 1997 to at least 33% seropositive in 2006 (see chart 3). If the vaccine was 25% effective, seroprevalence was predicted to drop from 50% to 40% by 2006. Continued management efforts and calfhood vaccination (assuming 70% efficacy) would reduce seroprevalence to 24% in 2011.

In alternative 2, the population seroprevalence rate would be expected to decline to at least 34% seropositive in 2006 (assuming 70% efficacy) or to 42% by 2006 (assuming 25% efficacy). Continued management efforts and calfhood vaccination (70% efficacy) would reduce seroprevalence to 26% in 2011. This would represent a minor adverse impact (3% to 8% less reduction) compared to alternative 1.

In alternative 3, the population seroprevalence rate would be expected to decline to at least 36% seropositive in 2006, assuming a 70% vaccine efficacy. With calfhood vaccination and a vaccine efficacy of 25%, seroprevalence was predicted to drop to 45% by 2006. Continued management efforts and calfhood vaccination

Chart 1: Population Changes Predicted to Occur Using Deterministic (Averaging) Model

Alternative	Population Size (1997)	Population Size (2006)	Population Size (2011)	Number of Bison in Western SMA	Number of Bison in Reese Creek SMA
1	2,200	3,100	3,500	18–52	0
2	2,200	3,500	3,500	20–60	0–120
3	2,200	3,500	3,500	16–120	60–80
4	2,200	2,800	3,200	1–52	0
5	2,200	2,000	2,900	0	0
6	2,200	3,100	2,900	22–60	0
7	2,200	2,700	2,700	13–51	0–100

Chart 2: Number of Bison Slaughtered, Hunted, Quarantined, and Ranging in Special Management Areas if 975 Bison Were to Leave the Park (Represents 90% of the Highest Number of Bison to Historically Leave the Park -1,084)

Alternative	Slaughtered	Hunted	Quarantined	Additional Removals[a]	Total Removed	Number Ranging in SMAs
1	829	0	0	0	829	146
2[b,c]	0	0	0	0	0	975
3[b]	0	60–70	0	705–715	765–785	200
4[b]	498–823	20	331–6	26	875	100
5	975	0	0	0	975	0
6	810	0	0	65	875	100
7[b]	166	20	23	566	775	200

a. According to the alternative, additional removals might include bison shipped to slaughter, quarantined, hunted, or shot by agency personnel.

b. Assumes all elements of the alternative were in place (phase 2).

c. If 975 bison were to exit the park, the possibility exists that some bison might move onto private land or attempt to move beyond SMA boundaries and be shot, if hazing were unsuccessful. Predicting the total number of bison that may move beyond the boundaries of the SMAs and be shot is not possible, but it might likely be greater than zero.

Chart 3: Predicted Seroprevalence Rates for Each Alternative Using Deterministic (Averaging) Model

Alternative	Seroprevalence 2006 (assuming 70% efficacy)	Seroprevalence 2006 (assuming 25% efficacy)	Seroprevalence 2011 (assuming 70% efficacy)
1	33	40	24
2	34	45	26
3	36	45	28
4	34	42	26
5	0	0	0
6*	32	40	0
7	32	40	23

* For both vaccine efficacies, seroprevalence would be 0% after completion of capture, test, and slaughter operations by 2013.

(70% efficacy) would reduce seroprevalence to 28% in 2011. This would be a minor to moderately higher seroprevalence (9%–17% higher) than that predicted for alternative 1.

In alternative 4, capture and removal of seropositive bison, and calfhood vaccination (70% efficacy) was predicted to decrease seroprevalence to at least 34% in 2006 and 26% in 2011. Assuming a 25% vaccine efficacy, seroprevalence would drop to 42% by 2006. This would be a minor adverse impact (3%–5% higher seroprevalence) compared to alternative 1.

In alternative 5, the seroprevalence rate in bison would be expected to drop from 50% in 1997 to 0% in 2001, assuming 70% vaccine efficacy, capture, test, slaughter operations, and whole-herd vaccination. In the 25% vaccine efficacy model the seroprevalence rate dropped to 0% by 2001. This would be a significant decrease in the seroprevalence rate and a major beneficial impact compared to alternative 1.

In alternative 6, the seroprevalence rate would remain similar to alternative 1 during the vaccination phase (2000–2010), and then drop to 0% by 2013. This would be a major reduction in seroprevalence compared to alternative 1.

In alternative 7, the population seroprevalence rate would be expected to decline from a starting point of 50% seropositive in 1997 to at least 32% seropositive in 2006 due to removal of seropositive bison leaving Yellowstone National Park in the West Yellowstone and Reese Creek area, and calfhood vaccination (70% efficacy) beginning in 2000. Continued management efforts and calfhood vaccination (70% efficacy) would reduce seroprevalence to 23% in 2011. With calfhood vaccination and a vaccine efficacy of 25%, seroprevalence was predicted to drop from 50% to 40% by 2006. This would be a negligible to minor beneficial impact (0–4% lower seroprevalence rate) compared to alternative 1.

Impacts on Recreation

United States citizens and people from all over the world spend more than 9 million visitor days of recreation in developed sites of the Yellowstone area each year. In Yellowstone National Park, recreational visitation has grown by more than 25% in the last 14 years. As is common in most other western national parks, visitor use in Yellowstone is concentrated in the summer months, with 66% of the visitation in June, July, and August. By the year 2003, estimated visitation is expected to range from 3.6 million to 4.3 million visitors per year (NPS 1994a). An additional nearly 2.8 million recreation visitor days on the adjacent Gallatin National Forest were logged in 1992.

Wildlife and Bison Viewing. When Yellowstone National Park was set aside in 1872 as the world's first national park, the "wonders of the Yellowstone" were the primary motivation — spectacular geysers, colorful hot pools, and the Grand Canyon of the Yellowstone (Meagher 1974). However, in modern times, wildlife viewing is the primary activity for many visitors who come to Yellowstone National Park. Bison are ranked as one of the top 10 animals visitors hope to see on a visit to the park.

Increases and reductions in bison numbers in and around the park could directly affect visitor wildlife-viewing experiences. Alternative 1 would lead to a moderate growth in bison numbers over the next 10 years (42% increase in population by 2006). Alternatives 2 and 3 populations would be 14% greater than alternative 1 populations and lead to a minor to moderate increase in viewing opportunities. Alternative 4 would be expected to result in a population of 2,812 bison in 2006. This is 8% smaller than under alternative 1 and would lead to a minor decrease in viewing opportunities. Alternative 5 would lead to a 35% decrease in bison populations compared to alternative 1 by 2006 and a moderate to major adverse impact on associated viewing opportunities. Alternative 6 would lead to very similar populations as alternative 1 through 2009 until seroprevalence stabilizes from vaccination (estimated at roughly

10 years), then would reduce them temporarily by 17%, a minor to moderate adverse impact. Alternative 7 calls for the lowest long-range (15+ years) bison population of all the alternatives. By 2006, the population would be nearly 23% lower. These reductions in population size would likely lead to minor to moderate reductions in bison viewing opportunities relative to alternative 1.

Winter Recreation. Winter use in the park has been growing at an accelerating rate, nearly doubling in the decade between 1984 and 1994, to 140,000 in the 1994–95 winter season. An estimated 46% of winter visitors liked viewing the scenery most, and 17% specifically identified wildlife viewing as what they liked most about the park in the winter (NPS 1990b). In addition, snowmobiling has become a popular sport in the town of West Yellowstone.

Winter recreational use of Yellowstone National Park would be affected under alternatives 2, 5, and 6. Alternative 2 would lead to long-term closure of winter access to the park from the popular snowmobiling town of West Yellowstone and possibly restrict access from Mammoth to the park interior. Proposed alternative 2 road and trail closures would likely affect well over 50% of current winter oversnow visitors to the park, and either displace their activities to other roads and trails in the area or cause them to go to areas other than Yellowstone for winter recreation. Alternative 2 would likely have a minor to moderate effect on winter recreation users in the Yellowstone region. During the three to four years of capture and slaughter operations, alternative 5 would have a higher negative impact on winter recreation than alternative 2 in that the west, north, and east entrances would all be cut off from winter access to the popular Old Faithful area. For the first 10–12 years alternative 6 would have similar negative impacts on winter recreation to alternative 2. During the following two to three years, the impacts on winter recreation under alternative 6 would be similar to those for the capture and slaughter period of alternative 5.

Hunting. The five-week elk general rifle season in the study area takes place in late October and November. Mean harvest of elk in and near the affected environment is 3,044. By comparison, deer harvest is 2,564, moose is 93, bighorn sheep is 22, mountain goat is 10, and pronghorn is 23.

The American bison is a trophy animal for big-game hunters. Bison hunting takes place on both public lands and private game ranches in North America. Private ranches charge relatively high prices (ranging from $2,250 to $4,000 in the Northern Rocky region) for hunting a trophy-sized bull.

Limited hunting of bison would be allowed under alternatives 3, 4, and 7. Under alternative 3 between 75 and 85 bison hunting permits would be issued per year. Under alternative 4 the number of permits would be approximately 35. Under alternative 7 between 25 and 35 permits would be issued. This change in hunting opportunities in the area would represent a minor increase in overall big game hunting in the Greater Yellowstone Area, but would be a minor to moderate benefit for those receiving permits. No hunting of bison would occur under alternatives 1, 2, 5, or 6.

Impacts on Livestock Operations

In the Yellowstone area, the livestock industry is composed mainly of cow-calf operations with the exception of a few sheep producers. Cow-calf pairs are grazed on national forest allotments that can include adjacent private land, and on private holdings not associated with grazing allotments. In addition to risks of disease transmission, bison can harm livestock, as well as damage structures.

To the north of Yellowstone National Park, grazing allotments located in the broadest area included in this environmental impact statement have about 434 cow-calf pairs on national forest land and about 191 pairs on adjacent private land included as part of the allotments. When only the Reese Creek area is considered, cow-

calf pairs on national forest land number about 86, with about 130 pairs on allotted private land. In the West Yellowstone area, about 364 cow-calf pairs are grazed on national forest land in the Horse Butte and Wapiti areas. An additional 128 pairs (and 2 pairs on allotted private land) are found on allotments to the west and south of Hebgen Lake.

Cattle near Whitehall, Montana, by G. Wunderwald. (NPS photo)

Privately owned lands that are not part of allotments include both livestock holdings and nonranch residences. North of Yellowstone National Park, the largest of the livestock operations is in the Reese Creek area on the Royal Teton Ranch. It has about 100 cow-calf pairs on unallotted private land, in addition to 150 on allotted private and public land.

In the West Yellowstone area, there are four private holdings located in the Horse Butte region between Duck Creek and the Madison River, totaling about 1,250 acres. Only the largest, with an area of about 650 acres, has a summer cattle operation with about 215 cow-calf pairs. Including producers to the west and south of Hebgen Lake, there are an estimated 800 cow-calf pairs on private land in the West Yellowstone area that could be directly affected by the most extensive of the SMAs (alternative 2).

Altogether, publicly and privately grazed cattle to the north and west of Yellowstone that could be directly affected are estimated to total about 2,019 cow-calf pairs. They comprise less than 4% of the cattle population of Gallatin and Park Counties.

The impacts of brucellosis on livestock operations involve not only the area adjacent to Yellowstone National Park, but also producers throughout Montana. The threat of disease transmission and the economic effects of disease-exposed bison entering the state have potential impacts that could indirectly affect all producers in the state.

Under alternative 1, cattle producers near Yellowstone National Park currently take precautions against the threat of brucellosis by vaccinating all female calves. In addition, herds from Idaho that graze in the West Yellowstone area are tested both when entering and leaving Montana. The cost of vaccinating and testing is relatively minor, estimated at about 2% of average yearly cow-calf production costs in the western United States. Producers' perceptions of the potentially negative consequences of grazing near Yellowstone National Park underlie recent decisions by two purebred stock owners to no longer graze their cattle in the area.

Alternative 2, characterized by minimal bison management, would involve modification of grazing allotments on the national forest, acquisition or easement of private lands, and conversion of cow-calf operations to steer or spayed heifer production. In the short term, until these changes are accomplished, the interim plan would continue. Public funds would be required for compensating producers who agreed to convert their operations and for acquiring the title or use of the private properties. These transactions would be voluntary with fair remuneration. Nevertheless, they would represent major impacts for the producers involved. Modification of public grazing allotments could affect as many as 926 cow-calf pairs. Incidents of damage by bison would be similar to occurrences under alternative 1 until susceptible cattle were removed from the areas designated as SMAs. Afterward, incidents would be fewer, since the only cattle would be those on converted holdings. Producers near SMA

boundaries would likely continue to vaccinate female calves.

Under alternative 3, testing and vaccinating would continue as under the interim plan (alternative 1) in the short term. In the long term, modifications in grazing allotments on the national forest as described under alternative 2 would reduce the need for vaccinating and testing, but within less extensive SMAs. Producers near SMA boundaries would likely continue to vaccinate female calves. Whereas about 2,019 cow-calf pairs are found within the areas designated to be SMAs under alternative 2, the smaller areas of alternative 3 contain about 895 cow-calf pairs. Moderate to major impacts in the long term for these herds would result from possible conversion to steer or spayed heifer enterprises, closure or modification of grazing allotments, and private land acquisitions. Hunting could provide a minor source of income for remaining converted holdings.

Alternative 4 differs from alternative 1 in that bison hunting would be allowed. Hunting in the West Yellowstone area could provide a minor source of income for some private holdings.

Under alternative 5, livestock operators in the vicinity of Yellowstone National Park would likely perceive a reduced disease threat because no bison would be allowed outside the park. Restriction of bison to the park would lessen concerns over brucellosis transmission, although vaccination of cattle could continue, especially in the short term. Relaxation of testing practices in the West Yellowstone area would depend on changes in Idaho's agreement with Montana. Private grazing resources might increase in value due to reduced risks of disease spread and damage by bison. Thus, the overall impact on affected livestock producers could be moderately beneficial.

Consequences of alternative 6 with respect to testing and vaccinating would be the same as in alternative 1 during the first years of vaccination of Yellowstone bison. Once capture, test, and slaughter of bison were undertaken, consequences for livestock producers would be like those of alternative 5, although seronegative bison would be allowed on public land in the West Yellowstone SMA. Cattle vaccination would probably continue, depending on producers' risk perceptions. Continued testing of herds in the West Yellowstone area would depend on Idaho's agreement with Montana. In the long term, moderate benefits overall would be realized under this alternative, as under alternative 5.

SMAs under phase 1 of the preferred alternative (alternative 7) would be the same as they are now under the interim plan (alternative 1). Testing and vaccinating would continue, as would possible incidents of damage by bison within the boundaries of the SMAs. No modifications of livestock operations would occur under phase 1. In phase 2 (following acquisition of winter range north of the Reese Creek boundary), impacts could affect at least one private holding and could modify three public grazing allotments along the western side of the Yellowstone River in the Gardiner Valley.

In addition to direct impacts on local producers outlined above, ranchers throughout the state could suffer from increased testing or vaccinating requirements or interstate sanctions should brucellosis be transmitted to Montana cattle. The possibility of such transmission and associated indirect impacts would be considered remote in all alternatives, although it would be slightly less in alternative 5, slightly greater in alternative 2, and roughly equal in the remaining alternatives.

Impacts on Socioeconomics

Regional Economy. The affected area primarily encompasses two Montana counties, Park and Gallatin, and portions of Yellowstone National Park.

Throughout the Greater Yellowstone Area, public lands provide the basis for much of the economic activity in the region (recreation, mining, forestry, and agriculture). The area's overall economy has been changing for more

than 20 years. The economy has shifted from commodity-extraction dependence to a more diversified economy based on recreation, tourism, and service industries. For example, between 1969 and 1989, more than 96% of all new jobs in the Greater Yellowstone Area came from sectors other than timber, mining, and agriculture (Rasker, Tirrell, and Kloepfer 1992).

Approximately 10% of Park County employment and 5% of Gallatin County employment is in the agriculture, forestry, and mining sectors. In addition, some component of employment in manufacturing, wholesale and retail trade, and services is derivative of activity in these resource-based sectors. Most jobs pertaining to the recreation and tourism industry are found in the retail trade and service sectors of a county's economy.

Recreation and tourism are significant to the economic viability of the area. Retail trade and services accounted for approximately 40%–45% of each county's earnings. These sectors, along with the government sector, have a strong tie to the region's resources and would likely continue to be important in sustaining segments of the economy of the Greater Yellowstone Area.

The alternatives described in this environmental impact statement would have the potential to affect jobs and income primarily through changes in visitation levels to Yellowstone National Park. Visitation levels could be affected by changes in winter road grooming, changes in wildlife viewing as a result of lowered population levels of bison, or in response to tourism boycotts. Visitors to Yellowstone National Park from outside Montana, Wyoming, and Idaho spent an average of $840 during their trips (Duffield 1992).

Expenditures related to recreation — A 1994 report on snowmobiling in Montana found nonresidents spend approximately $40 million annually in the state, and three-fourths of those nonresidents spent time in or near West Yellowstone (Sylvester and Nesary 1994). If alternative 2, which would include closing roads now groomed for snowmobile use from West Yellowstone into the park was implemented, the annual loss in winter tourism expenditures in the town of West Yellowstone could be between $656,000 and $2 million. Under alternative 5 these regional annual losses could be $1.8 million to $3.2 million during the three to four years of road plowing (to pavement, and therefore unavailable for snowmobile use) for the capture and slaughter operations. Alternative 6 could lead to expenditure losses similar to those under alternative 2 for the first 10–12 years, and similar to those under alternative 5 for the next two to three years. The loss under all these alternatives would be substantially higher if not for considerable snowmobiling opportunities on the nearby national forest. Losses of winter recreation expenditures under alternatives 1, 3, 4, and 7 would probably be negligible. The adverse impacts on winter recreation expenditures under alternative 2 could be more than offset by positive impacts on visitation related to wildlife viewing (see below). The adverse impacts on winter recreation expenditures under alternatives 5 and 6 would be in addition to adverse impacts on visitation related to wildlife viewing.

Resident elk hunters spent $54 per day while resident deer hunters spent $41 per day. Nonresident hunters expenditures associated with elk and deer hunting are $252 and $115 per day, respectively (Duffield 1988). Expenditures related to bison hunting in alternatives 3, 4, and 7 would add to this base, by as much as $440 per day. Since a maximum of 85 hunting permits for any alternative would be expected, expenditures related to it would be only a negligible benefit to the regional economy.

Expenditures related to wildlife viewing — Alternatives 2 and 3 would increase bison viewing opportunities, and alternatives 5, 6, and 7 would reduce them. The beneficial impact on the regional economy from alternatives 2 and 3 from increased visitor expenditures could be $20 million in annual park area visitor spending. Conversely, the adverse impact from alternatives 5, 6, or 7 could be $20 million in lost revenues from tourism.

The management of bison would involve killing through agency shooting, transport of seropositive animals to slaughter, hunting, and other actions that some would find objectionable. People who do take offense might object for any number of reasons: e.g., the killing of any animals is inappropriate, human management of wildlife is not needed, or bison do not need to be controlled to prevent brucellosis transmission from bison to cattle. All alternatives would involve bison management, and thus each would have some potential for adverse public reaction that might result in the call for a tourism boycott, although the potential would likely vary among alternatives. The potential for such a call and the effectiveness of such a boycott would be difficult to judge.

Minority and Low-Income Populations. As of the 1990 U.S. census, Park County had a per capita income of $11,378, approximately equal to that of the state of Montana. Gallatin County had a substantially higher income level of $17,032 per person. The percentage of the population in poverty across the two counties and the state was relatively consistent in 1990 at between 15.2% and 17.1%. Unemployment in the two counties in 1994 was below the state average of 5.1% (Park County, 4%; Gallatin County, 2.3%).

Montana's Native American population had a much lower per capita income ($5,422) than either the two counties or the state, a much higher percentage of population living in poverty (46.1%) than the counties or the state, and an unemployment rate (26.2%) much higher than the counties or the state.

Several area tribes have expressed interest in receiving bison carcasses, or, more importantly, live bison as seed stock from the Yellowstone herd to begin their own bison operations. Bison meat sells for nearly twice the cost of beef because it is considered a health food by some consumers.

Under the interim management plan, a total of 1,084 bison were killed outside the park in Montana in 1996–97. Of this total, 590 bison were shot on the spot and donated to charities or released to Native Americans in exchange for the labor of gutting, cleaning, and transporting carcasses. Charities received 77 bison, and Indian tribes, tribal members, and affiliated organizations received 513 bison (State of Montana, C. Siroky, pers. comm. 1997).

Alternatives 1, 3, 4, 5, 6, and 7 all would include slaughter and the distribution of carcasses, and all alternatives would include provisions for shooting bison if they crossed boundary lines (and the subsequent gutting, cleaning, and distribution of carcasses, hides, and heads). The estimates for numbers of bison to be sold or donated for consumption would range from an incidental number per year in alternative 3 to 720 over four years under alternative 5. These numbers would represent a very minor portion of the total U.S. annual market for bison meat. The impact of charitable donations or release of carcasses to tribes would generally be negligible.

The release of live bison would require quarantining captured seronegative bison for the completion of a lengthy quarantine protocol. Quarantine facilities would be proposed for alternatives 3, 4, and 7, and live bison completing the procedure would be available to tribes and other requesting organizations. Live animals received after quarantine would have substantially more value to tribes than would carcasses.

Social Values. Bison are symbolically an icon for the independent, wild, and free American way of life, and are considered by some people to be "a unique symbol of the strength and determination of the people of North America" (National Bison Association 1997a).

Bison embody the culture of many native Plains peoples. They are a link to the spiritual world, spiritual power concentrated in physical form, the "great provider," and ultimately a symbol of power and strength. Bison skulls are used as altars, bone is used on traditional dress, and they are at the heart of the continuing sun dance.

Bison are important to other groups as well. To hunters, they are a trophy animal; to cattle ranchers, bison have historically represented competition with livestock for limited forage; and to many animal rights activists, they are an aesthetic and historic resource.

Written comments collected from the *Interim Bison Management Plan/Environmental Assessment* in 1995 indicated the public was strongly against the slaughter of bison. Ranchers also indicated strong feelings on the need to protect cattle from brucellosis. These are moralistic-humanistic and utilitarian values, respectively (see the "Socioeconomics" chapter, "Social Values" section of this document for definitions). No systematic surveys have been conducted, but it appears that alternatives relying on slaughter (1, 4, 5, 6, and 7) would have a minor to major adverse impact on those having strong moralistic-humanistic values toward animals.

Attitudes in the Yellowstone region would be more balanced between utilitarian and other attitudes than in the nation as a whole (based on wolf recovery information). Native American values may be more complex, as many of the management actions are viewed as disrespectful or wasteful of bison.

Nonmarket Values. People place value on knowing a species is maintained in a viable state or has been augmented in some way. In a study involving elk winter range north of Yellowstone National Park, those surveyed found the benefit of a land purchase to benefit elk far outweighed actual land acquisition costs. This "nonmarket" or "existence" value applies to bison as well, and although no studies specific to bison were conducted, alternatives 2, 3, and 7 could potentially have large nonmarket value benefits associated with expansion of bison winter range, on the order of $1.6 to $22.9 million annually. Additional nonmarket values attributable to the opportunities to view natural wildlife populations, or for recreational opportunities, could also be in the millions of dollars.

Social Cost-Benefit. From a social cost-benefit perspective, alternatives 2, 3, and 7 would have the potential to range from a moderate negative to a major positive impact, while alternative 4 would likely have a minor adverse to negligible impact compared to alternative 1. Alternative 5 would likely have a major adverse impact, and the impact on alternative 6 could range from minor to moderate adverse.

From a regional economic perspective, alternatives 2, 3, and 4 would likely have a negligible to minor positive impact, while alternatives 5 and 6 would have a minor to moderate adverse impact. Regional economic impacts under alternative 7 would be expected to range from a moderately adverse effect to a minor positive impact.

Impacts on Threatened, Endangered, and Sensitive Species

Peregrine falcons, bald eagles, grizzly bears, and gray wolves are the only known species to occur within the affected area that are protected by the Endangered Species Act. Wolverine, lynx, and trumpeter swan, USFS sensitive species, could also occur in the affected area. These species could be directly affected by bison management actions, such as shooting, hazing, or habitat loss or modification. Because bison are an important food source, predatory species could also be indirectly affected by reduced foraging opportunities caused by changes in bison numbers, distribution, and seasonal migration patterns.

Peregrine Falcons. The alternatives would have no effect on peregrines because bison management activities would not occur near active aerie or foraging areas, and because they do not feed on bison carrion.

Bald Eagles. Alternatives 5 and 6 would negatively affect bald eagles that winter and nest near Seven-Mile Bridge because of the location of a capture facility in this area. Other bald eagles in the analysis area would be protected by avoiding their nesting and wintering areas. Change in bison carrion availability would have a negligible effect because it is only a small part of the bald eagle diet.

Grizzly Bears. All alternatives could potentially disturb or displace grizzly bears from areas near bison management activities. The alternatives would affect only a small part of the Greater Yellowstone Grizzly Bear Recovery Zone, an area where seasonal or year-long grizzly activity is common and contains habitats important to the recovery of grizzly bears. Denning bears would not be affected during the winter when most activities would occur. Under alternatives 3, 4, and 7, increased human activity could increase the probability for human/bear conflicts and bear mortality. This probability would be reduced to negligible by educating hunters, removing gut piles, and implementing other mitigating measures.

The degree to which an alternative modifies bison population numbers could likewise affect grizzly bears. Bison, along with other ungulates, rank as one of the highest sources of net digestible energy for grizzly bears in the Yellowstone ecosystem. Data indicate that 32% of all meat in the diet is carrion, and most of that is from adult bison. Bison are particularly important to bears because they provide a high quality food source during early spring before most vegetal foods are available to bears. Grizzly bears that den in the Pelican and Hayden Valleys in the park depend on bison carrion and are most likely to be affected by changes in bison populations.

Under alternative 1, bison numbers would not be maintained within a specific range, and low population levels could result during some periods. Consequently, foraging opportunities could be reduced during some years and negatively impact grizzly bears, particularly during the spring. This impact would likely be negligible unless bison disappeared from Pelican or Hayden Valleys in the park. Alternative 2 would allow the bison population to reach a long-term maximum of 3,500 bison quickly, and would leave park roads ungroomed, which would likely increase winter bison mortalities and carrion in the park. This would increase the availability of bison as a food source and moderately benefit grizzly bears. Alternative 3 would have minor benefits. Alternatives 4, 6, and 7 would maintain the bison populations within a specific range and cause only minor changes in the population. Thus, the impacts on grizzly bear foraging opportunities would be negligible. Alternative 5 would cause a major decrease in the first few years in the bison population and reduce the carrion supply available to grizzly bears.

Gray Wolves. The Rocky Mountain gray wolf was reintroduced in Yellowstone National Park in March 1995 and is part of a "nonessential experimental population." This means that the species is listed and protected under the Endangered Species Act, but agencies have additional flexibility in their management. To date nine packs are in the Greater Yellowstone Area, mostly in the park. Some individuals and packs have made exploratory movements outside the park, but none is resident outside the park.

All alternatives could disturb or displace wolves from areas near bison management activities. However, any impact on the small wolf population would likely be negligible.

Wolves prey primarily on elk, moose, and deer. These species are abundant in the analysis area, and usually account for more than 90% of the biomass consumed. Smaller mammals may be an important alternative food during the snow-free months. Wolves rarely prey on live bison, but do eat bison carrion if it is available. Although

wolves could eventually increase their take of bison as prey as the wolf population increased, impacts from changes in the bison population during the 15 years this plan was in effect would be negligible in alternatives 1, 3, 4, 6, and 7. Alternative 2 would have a moderate beneficial impact and alternative 5 a moderate to major adverse impact to wolves through larger-scale changes in bison population numbers.

On December 12, 1997, the United States District Court for the District of Wyoming ruled that the gray wolf reintroduction program in Yellowstone National Park and northern Idaho violated one provision of the Endangered Species Act. The court ordered the federal government to remove the reintroduced wolves and their offspring. The court stayed the effect of the order pending appeals. Because the decision is on appeal, this document considers the gray wolf as a permanent component of the study area. Should the decision be upheld on appeal and the wolves were removed, impacts on the gray wolf would not be an issue associated with bison management under the alternatives analyzed.

Wolverine and Lynx. Both wolverine and lynx are very susceptible to human activities, and wolverines readily abandon den sites when disturbed. All the alternatives could displace or disturb wolverine and lynx from areas near bison management activities. Under alternatives 2, 5, and 6, snowmobile use now on the groomed trails inside the park would be displaced to trails and off-trail areas in the neighboring Gallatin National Forest where wolverine and lynx occur. Lynx are specialized predators that may face competition from generalist predators given access to their habitat by following packed-snow routes such as those resulting from snowmobile use. Winter recreation activities would be monitored on the national forest and, if necessary, mitigating measures implemented to protect the wolverine and lynx. Changes in bison numbers would have a negligible impact because wolverine and lynx seldom feed on bison carrion.

Trumpeter Swans. Trumpeter swans could be affected by the location and operation of bison management facilities. The swan occupies meadows and open fields, plus lakes, ponds, or slow-moving water inside the park on the Madison River. In particular, a breeding pair at Seven-Mile Bridge where a capture facility is proposed in alternative 6, would experience major adverse impacts from construction and operation.

Impacts on Other Wildlife Species

Ungulates. The Stephens Creek capture facility occupies 13 acres of critical pronghorn winter range, and has had adverse impacts on the antelope population through displacement, disturbance, and blocked movements. Observations from capture operations during winter 1996–97 showed pronghorn avoided using habitat in the capture facility area, and some pronghorn may have been confused by the wing fences when fleeing from predators. The capture facility at Stephens Creek would continue to exist in all alternatives except alternative 2 (in the short term only in alternatives 3 and 7), and would have a moderate to major adverse impact on the pronghorn population. Other capture facilities, such as those in West Yellowstone and planned for different locations within the park in alternatives 5 and 6, could have minor adverse impacts on wildlife through displacement and disturbance.

Potential acquisition of additional wildlife winter range in the Gardiner Valley, a part of alternatives 2, 3, and 7, would make more winter habitat available to elk, mule deer, bighorn sheep, and particularly pronghorn. This would be a minor benefit to most ungulates and a moderate to major beneficial impact on pronghorn.

Occasional hazing operations associated with all alternatives would be expected to have minor impacts on elk, mule deer, bighorn sheep, and other ungulates through disturbance and temporary displacement.

In alternatives where snowmobile use would be displaced outside the park (alternatives 2, 5, and 6), impacts on ungulates outside the park could be more intense than they are now. This is because snowmobiles would be restricted to trails inside the park, but allowed to travel off trails in many areas of adjacent public lands.

Elk, pronghorn, deer, bighorn sheep, and moose would not likely be affected through competition for forage or space with bison, as each has an ecological niche that differs from bison through food choices, occupied habitat, or tolerance of snow depth. Therefore, increases or decreases in the bison population size would not be expected to affect any other large ungulates.

Predators and Scavengers. Hazing activities directed at moving bison into capture facilities or inside the SMA boundary could disturb and displace predator and scavenger species, including black bear, mountain lion, coyote, fox, wolverine, bobcat, lynx, and a variety of smaller mammalian and avian carnivores and scavengers using those areas. Hazing should be infrequent, however, and displacement and stress would be local and temporary and would have only minor effects on those populations. Changes in the bison population size and resulting availability of carrion would not affect predators and scavengers except during the parkwide capture and slaughter phases of alternatives 5 and 6, when reductions would be severe enough to cause a moderate impact. Displaced snowmobile use associated with alternatives 2, 5, and 6 might affect some of these species more severely than at present, as this activity is restricted to trails inside the park and might not be if it was displaced outside the park. Impacts on some species could be moderate.

Impacts on Human Health

Brucellosis is a zoonotic disease that can infect people, causing undulant fever. Symptoms include intermittent fever, chills, night sweats, body and joint pain, poor appetite, and weakness. The general public would be at no risk of contracting the disease from bison. However, people responsible for carrying out proposed bison management actions such as capturing, vaccinating, gutting, loading for slaughter, and laboratory analysis, could be at moderate risk. Hunters could also be at some risk. Recipients of auctioned or donated meat could be at minor risk of exposure through the handling of potentially contaminated meat and the consumption of improperly prepared meat. Proper handling and cooking completely kills the bacteria.

Mitigating and preventive measures, such as proper equipment, ventilation, and information, would prevent impacts from being more than negligible to minor in all alternatives except during the parkwide capture and slaughter phases of alternatives 5 and 6, when the risk would be minor to moderate.

Impacts on Cultural Resources

The Great Plains and the northern Rocky Mountains of western Montana and Wyoming served as feeding grounds for bison. This region is also the homeland of various native peoples who hunted these herds.

Bison were critical to the indigenous cultures of North America and were an important part of the landscape covering over half the continent. They once ranged from the Appalachian Mountains to the "deserts" of the Great Basin south into Mexico and as far north as the Yukon territory in Canada. English settlers arriving in what is now Georgia wrote of the "innumerable" bison they encountered. The numbers were so great that early Euro-American explorers could only describe them as "numberless," and wrote that the plains were "black and appeared to be moving" with the herds of bison. The most commonly used estimates of their numbers were between 30 and 65 million.

Illustration entitled "By the Millions" by Martin S. Garretson, 1913. (NPS photo)

Bison provided not only food, clothing, fuel, tools, and shelter, but also were central to Plains tribal spiritual culture, viewed as an earthly link to the spiritual world. For many tribes, bison represent power and strength. For example, the Shoshone believe that spiritual power is concentrated in the physical form of the bison. Many contemporary tribes maintain a spiritual connection with bison. Today, the InterTribal Bison Cooperative describes itself as "tribes proudly serving the buffalo nation," indicating respect and a sense of equality and direct spiritual connection.

Traditional use of bison by humans centers on hunting and is evidenced in the archeological record. The remains of game drives, including both the fences and bison jump sites, as well as chipping stations, wickiups, and weapons, are all associated with the importance of hunting bison for tribal economy and culture.

Most archeological sites in the Yellowstone area have not been evaluated according to the National Register of Historic Places criteria, although Obsidian Cliff, an area particularly rich in cultural remains, has been nominated as a national historic landmark. Several others, including the Yellowstone road system, one archeological site in the Stephens Creek area, and one archeological site in the Eagle Creek area, are considered to be eligible for inclusion in the national register.

In all alternatives, bison would be killed while occupying their historic range. Reductions in the population size compared to the no-action alternative (alternative 1) would occur on a short-term basis in alternatives 5 and 6, might occur on a short- term basis in alternative 4, and would occur on a long-term basis in alternative 7.

In all alternatives except alternative 2, the process of monitoring and vaccinating bison would change their appearance. Bison would be marked with visible metal ear tags, paper back tags, and paint/peroxide stripes to indicate to managers and others that they have tested negative for the *Brucella* organism. These actions alter the historic image of the bison and would have a temporary, moderate impact on the historic landscapes.

The construction of new capture or quarantine facilities would have the potential to affect archeological resources. In all alternatives proposing construction of bison management

facilities (all except alternative 2), site-specific surveys would be conducted prior to ground-disturbing activities, and every effort would be made to avoid known archeological resources. Should avoidance prove impossible, the National Park Service, U.S. Forest Service, and state agencies would develop mitigating measures in consultation with the state historic preservation officer and the advisory council. Therefore, the impact would likely be minor.

Removal of the capture facility at Stephens Creek, as proposed in alternative 2, would have a beneficial impact on the historic landscape. The construction of several new capture facilities in alternatives 5 and 6 would have a temporary but significant adverse impact on the historic landscape of Yellowstone National Park.

Impacts on Visual Resources

Visual resources consist of landform (topography and hydrology) and land cover (vegetation, buildings, roads, etc.). Visual resources are centered on significant features and intrinsic features. Also included is visibility of the undertaking, such as exposure and location.

The Greater Yellowstone Area is world renown for its scenery, wildlife, wilderness, rivers, fishing, hunting, outdoor recreation opportunities, and geologic and thermal features. The natural landscape is rugged and formidable due to the rapid gains in elevation, and most of the area remains in a wilderness state. Bison and other wildlife are frequently observed meandering through the landscape.

Visual resources within Yellowstone National Park fall into two general zones — the natural zone and the park development zone. Bison are observed within both, although they are most frequently observed within the natural zone.

Vehicle pullouts in the park are designed for visitors to stop and experience the visual resources, and are placed in areas where bison are most frequently found — e.g., valley low-lands off the main loop roads. Some locations include the open areas within Hayden Valley, Old Faithful/Firehole area, the Madison River (past Seven-Mile Bridge), Indian Creek in the Mammoth area, the Norris Campground, Gibbon Meadows, Elk Park, and others. The view from these pullouts includes an unobstructed natural setting containing habitat desirable to bison as well as other wildlife species.

The process of capturing and/or vaccinating bison would temporarily change their natural appearance. Bison would be visibly marked with tags and peroxide stripes due to vaccination and testing procedures. These processing marks would detract from the natural appearance of the animal. This would be a short-term, moderately adverse impact on the viewer, photographer, and anyone interested in seeing bison. Capture would be a part of all alternatives except phase 2 of alternative 2.

Agency shooting of bison and some hazing operations would be visible if bison ventured beyond delineated management areas. Hunting of bison outside the park in designated SMAs is also part of alternatives 3, 4, and 7. These bison management actions would have a minor to major short-term (winter only) visual impact on the landscape, or on some viewers, who might be opposed to shooting, hunting, or hazing bison, or might be sensitive to these activities.

The existing capture and test facility would continue to intrude on the viewshed at Stephens Creek in all alternatives except alternatives 2, 3, and 7. Because this facility is of a compatible design with the nearby Yellowstone National Park wrangling facilities, the impact on visual resources would be minimal. Also, this facility would not be readily visible to the majority of visitors to the park and surrounding areas.

Capture and test facilities within the viewshed on the western boundary of Yellowstone National Park would continue to adversely impact visual resources in alternatives 1, 4, 6, and 7. The visual impact of capture facilities at West Yellowstone would be minor to moderate. These facilities would not be visible in major

viewsheds, but some park visitors, national forest users, and local residents would see them. Bison management actions, such as hazing, shooting, and gutting, could be a major adverse visual impact on some of these viewers. Construction of capture and testing facilities in the Seven-Mile Bridge viewshed near the western boundary of the park in alternative 6 would be a major impact on visual resources.

The proposed construction of capture and test facilities within Yellowstone National Park at the Lamar Valley/Crystal Bench, Blacktail Plateau, Madison River, West Yellowstone boundary area, Old Faithful/Firehole River, and Hayden/Pelican Valleys, which is part of alternatives 5 and 6, would have a major impact on visual resources. These areas are highly sensitive to visual intrusions, and while measures would be taken to minimize impacts, the presence of these facilities would be highly noticeable.

A quarantine facility is part of alternatives 3, 4, and 7. Although the location or design of a quarantine facility for bison has not been determined, the facility would probably appear as large-scaled corrals and pens within which bison would be visible. Siting of a relocated capture facility and a new quarantine facility would be sensitive to views and features of the viewshed; therefore, impacts are expected to be minor.

In alternatives 2, 3, or 7, grazing allotments might be modified and could cause negligible to minor changes in the rural landscape near park boundaries. In the long term, cattle grazing would be modified in some allotments on lands adjacent to Yellowstone National Park, and the scenery would change to views of bison and wildlife habitat.

Changes in the size of the bison population would affect viewers. Some would find increased opportunities to view bison a benefit; others opposed to wildlife management policies would be adversely affected.

Alternatives 2, 5, and 6 include provisions for closing roads to snowmobile traffic. This would help restore the winter visual scene inside the park to a more natural one, but would adversely affect visual resources on adjacent Gallatin National Forest where much of the snowmobile traffic would be displaced.

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PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

The "Purpose of and Need for Action" part of the draft environmental impact statement (EIS) explains why the document is being developed. It describes the EIS planning process, details the need for action, provides background on why action is required, and identifies the specific purpose, objectives, and constraints in taking action. It also outlines the public input received to date on the bison management plan, including additional objectives, alternatives, or environmental issues the public has asked that this environmental impact statement analyze. A summary of all environmental issues analyzed, including those from the public, and an explanation of why some have been dropped from further analysis, concludes this part of the document.

PROPOSED ACTION

The National Park Service (NPS), the U.S. Forest Service (USFS), the Animal and Plant Health Inspection Service (APHIS), and the state of Montana have proposed several options for the interagency, long-term management of Yellowstone area bison to ensure domestic cattle in portions of Montana adjacent to Yellowstone National Park are protected from brucellosis, a disease that some of these bison carry, and to ensure the viability of the bison herd. Each option requires the cooperation of all agencies as all have jurisdiction over a portion of the management effort, either directly or indirectly. Members of these agencies working on this environmental impact statement are referred to as the "interagency EIS team," "interagency team" or simply "agencies" throughout the document.

The management actions proposed for evaluation in this environmental impact statement were developed with consideration for the current authorities of these cooperating agencies and information relevant to the management of the bison herd that periodically migrates across their jurisdictional boundaries.

Management decisions that are made pursuant to this environmental impact statement would remain in effect until the purpose of the plan has been achieved (see "Purpose of Action"); agency authorities change; or, new information, gained through implementation of those decisions, suggests a need for change. Future decisions to revise bison management procedures will be supported with additional NEPA analysis if necessary. For purposes of analysis, this environmental impact statement assumes that the selected alternative will remain in effect for 15 years.

PROJECT LOCATION

This project involves the northern Rocky Mountains of the United States, specifically Yellowstone National Park and an area of private, state, and federal lands in Montana to the north and west of the park boundary (see Region map). The study area is within what is known as the Greater Yellowstone Area or GYA (see the Greater Yellowstone Area and Study Area maps).

THE ENVIRONMENTAL IMPACT STATEMENT / PLANNING PROCESS

The first step in any planning process is to completely define the problem. In this case, the involved agencies must agree on why action is required. Members of the interagency EIS team are specialists in different fields relevant to the management of bison, cattle, and/or brucellosis, and have composed the need for action statement below as a brief synopsis of the problem they are attempting to solve by proposing action. A more in-depth discussion of the need for action is presented later in the "Background" chapter.

The interagency team also identified the general and specific purposes or goals it felt the action must accomplish to be successful. The general

goal is stated in the purpose section below, and the specifics are presented in the "Objectives and Constraints" chapter under "Objectives in Taking Action." The interagency team agreed these objectives would apply to all alternatives, as well as to the selection of a preferred alternative. Any alternative unable to meet one or more of the nine objectives to some degree would be eliminated as unreasonable.

The same was true for any alternative that did not comply with the legal or regulatory mandates of each agency. These mandates are identified in the "Constraints in Taking Action" section.

Public input on additional objectives, as well as on environmental issues and alternatives, was gathered in scoping and document review sessions described in the "Scoping Process and Public Participation" chapter. A more detailed description of public participation is in part 5 of the document, "Consultation and Coordination."

The interagency team then used objectives, constraints, and input from the public to devise a set of alternatives it felt covered the full spectrum of viable options. All were legally implementable and met objectives to some degree. None was considered to have such severe environmental, technical, or economic impacts or constraints as to be considered infeasible. All were distinct enough from each other to be separate alternatives. A description of each of the seven alternatives, as well as summary comparisons of the features and impacts of each, is found in part 2 of the document, "The Alternatives."

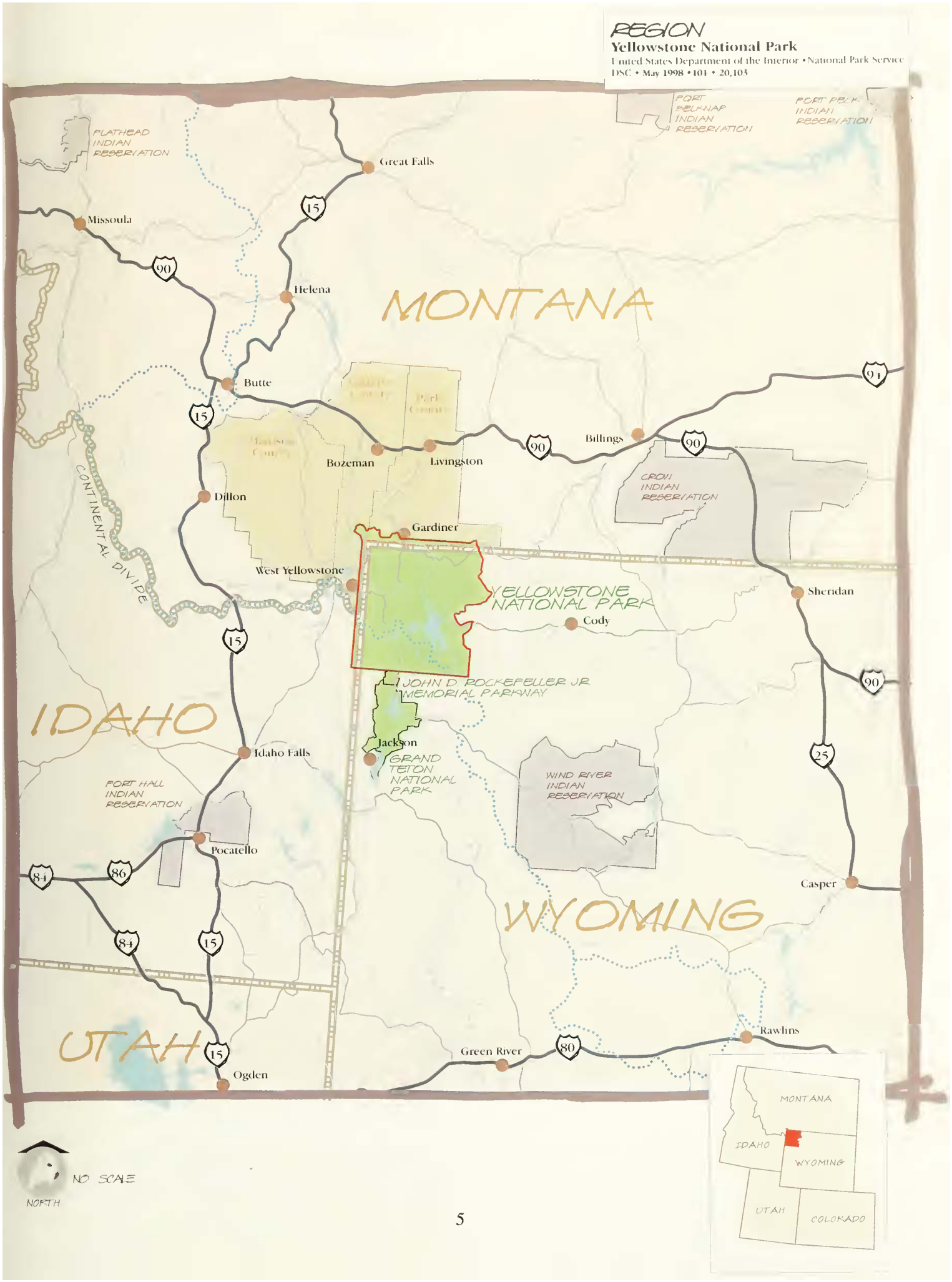
The environmental impacts of each alternative were analyzed and compared to existing conditions. A summary of this information is presented in part 3, "Affected Environment," and part 4, "Environmental Consequences."

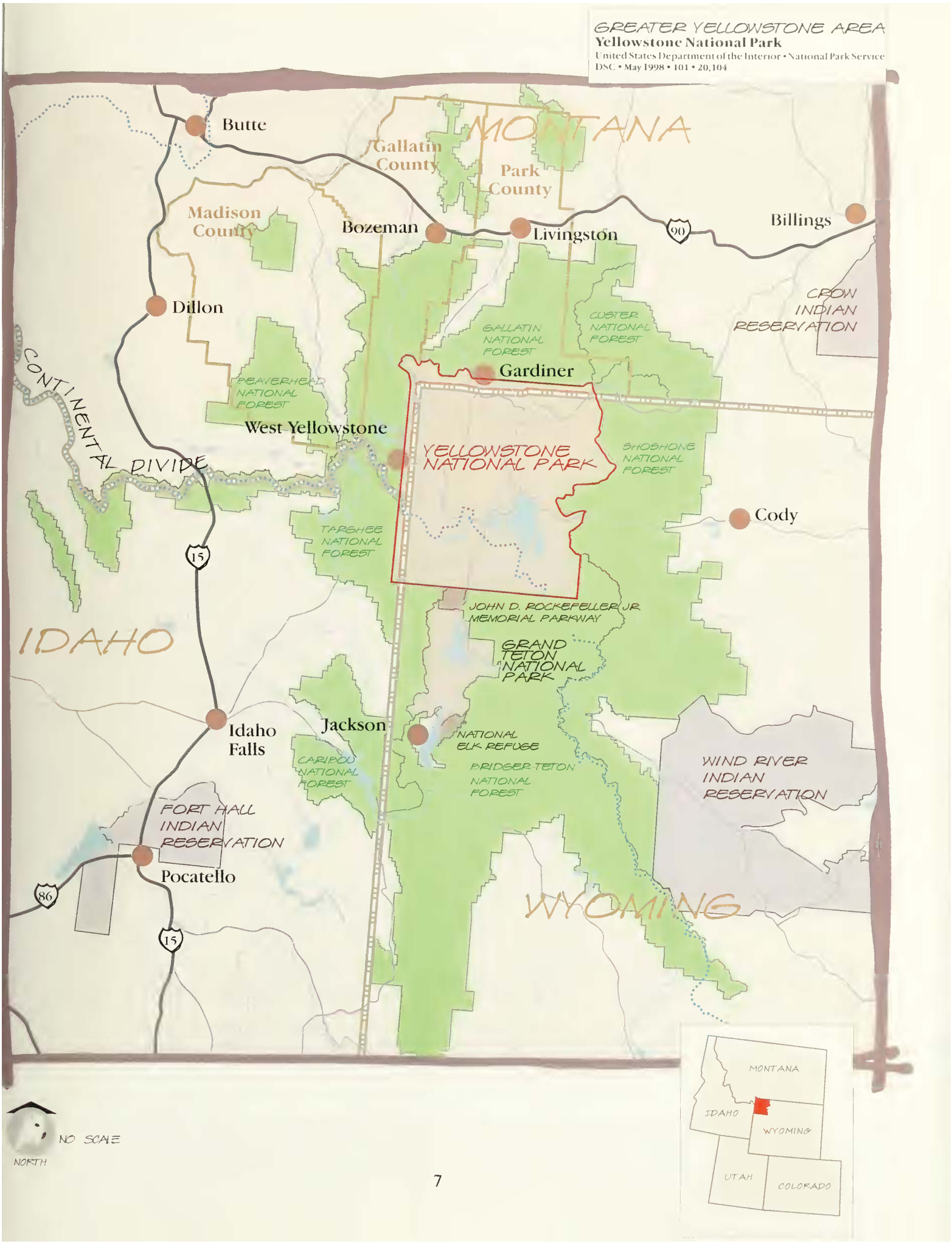
This environmental impact statement has both policy, or programmatic elements, as well as site-specific elements. Bison range over most of the 2.2-million-acre park, as well as into areas outside the park. Management actions may affect distribution of bison within this area, or may cause regional changes in one or more of the resources analyzed. These are discussed primarily qualitatively, and since they occur over such a large scale, impact analysis is less precise. Conversely, impacts of specific management actions at a capture facility, or the impacts of locating a new capture facility (such as at Seven-Mile Bridge) are discussed in more site-specific detail. Because some choices are by design policy or program ones, additional site-specific environmental impact analysis may be required to implement them at some future date. For instance, the construction and operation of a quarantine facility on federal land or built with federal money, should quarantine be a selected management strategy, would be analyzed in a subsequent document. That document would be prepared, as is this one, to comply with NEPA requirements, and would be tiered to this environmental impact statement. This means the policy guidance derived from this environmental impact statement would apply to the subsequent analysis, and agencies would not evaluate nonquarantine options. Rather, they would focus on sites, designs, operation choices, etc., for the facility.

Information in this environmental impact statement was used by decision makers from the interagency team to help in selecting a preferred alternative from the alternatives analyzed. When the time period for public review has ended, the interagency team will revise the environmental impact statement to respond to comments and update and refine the document. The final environmental impact statement, together with public input, advice from staff, and economic, technical, and other information, will form an information base to be used by decision makers in selecting an alternative for implementation. This choice will be reflected in the final environmental impact statement and formalized in both federal and state records of decision.

OTHER ONGOING PLANNING EFFORTS

Bison management is only one of many management issues in Yellowstone National Park. Ongoing planning on these issues may


REGION
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,103
FLATHEAD INDIAN RESERVATION
FORT BELKNAP INDIAN RESERVATION
FORT PECK INDIAN RESERVATION
Great Falls
Missoula
Helena
MONTANA
Butte
Billings
Bozeman
Livingston
CROW INDIAN RESERVATION
CONTINENTAL DIVIDE
Dillon
Gardiner
West Yellowstone
YELLOWSTONE NATIONAL PARK
Sheridan
Cody
JOHN D. ROCKEFELLER JR. MEMORIAL PARKWAY
IDAHO
Idaho Falls
Jackson
GRAND TETON NATIONAL PARK
WIND RIVER INDIAN RESERVATION
FORT HALL INDIAN RESERVATION
Pocatello
Casper
WYOMING
Rawlins
Green River
UTAH
Ogden
NO SCALE
NORTH
MONTANA
IDAHO
WYOMING
UTAH
COLORADO


GREATER YELLOWSTONE AREA
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,104
MONTANA
Butte
Gallatin County
Park County
Madison County
Bozeman
Livingston
Billings
90
Dillon
CROW INDIAN RESERVATION
GALLATIN NATIONAL FOREST
CUSTER NATIONAL FOREST
Gardiner
CONTINENTAL DIVIDE
BEAVERHEAD NATIONAL FOREST
West Yellowstone
YELLOWSTONE NATIONAL PARK
SHOSHONE NATIONAL FOREST
Cody
TARGHEE NATIONAL FOREST
15
JOHN D. ROCKEFELLER JR. MEMORIAL PARKWAY
IDAHO
GRAND TETON NATIONAL PARK
Idaho Falls
Jackson
NATIONAL ELK REFUGE
CARIBOU NATIONAL FOREST
BRIDGER TETON NATIONAL FOREST
WIND RIVER INDIAN RESERVATION
FORT HALL INDIAN RESERVATION
Pocatello
86
WYOMING
15
NO SCALE
NORTH
MONTANA
IDAHO
WYOMING
UTAH
COLORADO

STUDY AREA
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,105

GALLATIN NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
BUFFALO HORN CREEK
to Livingston
Yankee Jim Canyon
Corwin Springs Bridge
Maiden Basin
LITTLE TRAIL CK.
EAGLE CK.
BEAR CK.
GALLATIN NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
Eagle Creek/ Bear Creek Area
CUSTER NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
REESE CREEK
Stephens Creek Area
Gardiner
YELLOWSTONE RIVER
HELLROARING CK.
MONTANA
WYOMING
Cooke City
Silver Gate
SHOSHONE NATIONAL FOREST
to Red Lodge
LEE METCALF WILDERNESS
LEE METCALF WILDERNESS
Cabin Creek Recreation & Wildlife Mgmt. Area
Hebgen Dam
to Butte, Sheridan, and Dillon
Mammoth Hot Springs
SLOUGH CREEK
GALLATIN RIVER
Tower-Roosevelt
LAMAR RIVER
YELLOWSTONE NATIONAL PARK
MADISON RIVER
HEBGEN LAKE
DUCK CREEK
COUGAR CREEK
Horse Butte Peninsula
Canyon Village
Norris
BEAVERHEAD NATIONAL FOREST
West Yellowstone
Madison Junction
MADISON RIVER
GIBBON RIVER
FIREHOLE RIVER
Hayden Valley
IDAHO
MONTANA
MONTANA
WYOMING
TARGHEE NATIONAL FOREST
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE

Affected area shown at left

NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY
HYDROGRAPHY
MILES
0 5 10
NORTH

ultimately affect or guide the decision made on bison management. Therefore, the decision on bison management will need to be coordinated with other ongoing planning efforts. In addition, pursuant to the settlement of litigation, Yellowstone National Park and Grand Teton National Park anticipate commencing a plan and environmental impact statement for winter visitor use management. The parks should commence scoping on that plan in spring 1998. Yellowstone National Park is also preparing a commercial services plan that should be completed in 1999. As the agencies make decisions on these various processes, they will need to consider existing decisions and, perhaps, revise those decisions.

The U.S. Forest Service's *Gallatin National Forest Plan* (1987) would also be considered in ongoing planning efforts.

NEED FOR ACTION

Bison are an essential component of Yellowstone National Park and the Gallatin National Forest because they contribute to the biological, ecological, cultural, and aesthetic purposes of the park. However, Yellowstone National Park is not a self-contained ecosystem for bison, and periodic migrations into Montana are natural events. Some bison have brucellosis and may transmit it to cattle outside the park boundaries in Montana (see "Background"). As bison migrate out of the park and into Montana, they move from one jurisdiction with management objectives to another jurisdiction with different management objectives.

Therefore, the cooperation of several agencies is required to fully manage the herd and the risk of transmission of brucellosis from bison to Montana domestic cattle.

PURPOSE OF ACTION

The purpose of the action (that is, the bison management plan) is to maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana.

Bison migrating outside Yellowstone National Park.

THE YELLOWSTONE AREA BISON HERD

Bison are native to the Greater Yellowstone Area, and were observed there by early travelers before and after the creation of Yellowstone National Park in 1872 (see the Historic Bison Range map). In the 1870s and 1880s, the North American bison was driven nearly extinct by market hunting. In 1880, after a decade of intensive market hunting (for elk, bison, and other large mammals) in the park, the superintendent reported three herds totaling about 600 animals (Schullery and Whittlesey 1992). Over the next 15 years, this number was substantially reduced by poaching, but improved policing of the park by the U.S. Army (after 1886), combined with strengthened legal protection (after 1894), prevented complete elimination of park bison (NPS, Meagher 1973).

In 1902, 23 bison were counted in the native Yellowstone herd (see also "History of Bison in Yellowstone National Park" section in the "Affected Environment, Bison Population" chapter). Fearful the small wild herd might vanish, park managers imported 21 bison from captive herds in Montana and Texas into the park. These bison were raised using livestock techniques on the "Buffalo Ranch" in Lamar Valley. They were fenced, fed, vaccinated, and separated for shipment to slaughter. Between 1915 and 1920, intermingling of this captive herd and the remaining wild herd began, and by 1930, bison wintering in the Lamar area numbered more than 1,000 (Keiter and Forelicher 1993).

In the 1930s, the National Park Service gradually began efforts to restore the bison to a more natural distribution (NPS, Meagher 1973). However, herd reductions to achieve range management goals and other manipulation of the population continued from the 1920s until the late 1960s, and were often quite intensive. The highest reported bison count during this period was 1,477 in 1954.

In 1967, when bison population controls ceased, 397 bison were counted in the park. At that time, as part of a larger redirection of park policies, ungulate herd reductions ceased. Bison, elk, and other animals were allowed to reach population levels primarily affected by environmental conditions. As the population has grown since the late 1960s, more bison have attempted to move to ranges outside the park, particularly in harsh winters. However, past data demonstrate that the number of bison moving beyond Yellowstone boundaries is highly variable from year to year, and show no strong or discernible correlation with population size. This means bison may not move outside the park even at high population numbers. Conversely, large numbers of bison may leave when population numbers are low if winter conditions prevent access to forage. During a given stochastic or periodic event such as a severe winter, it is likely that more bison would leave the park if population sizes are larger.

In 1968, in response to livestock industry concerns over the disease brucellosis, the National Park Service proposed a program to control bison at the boundary of the park. The program relied on shooting bison that approached or passed beyond park boundaries and could not be deterred from leaving the park.

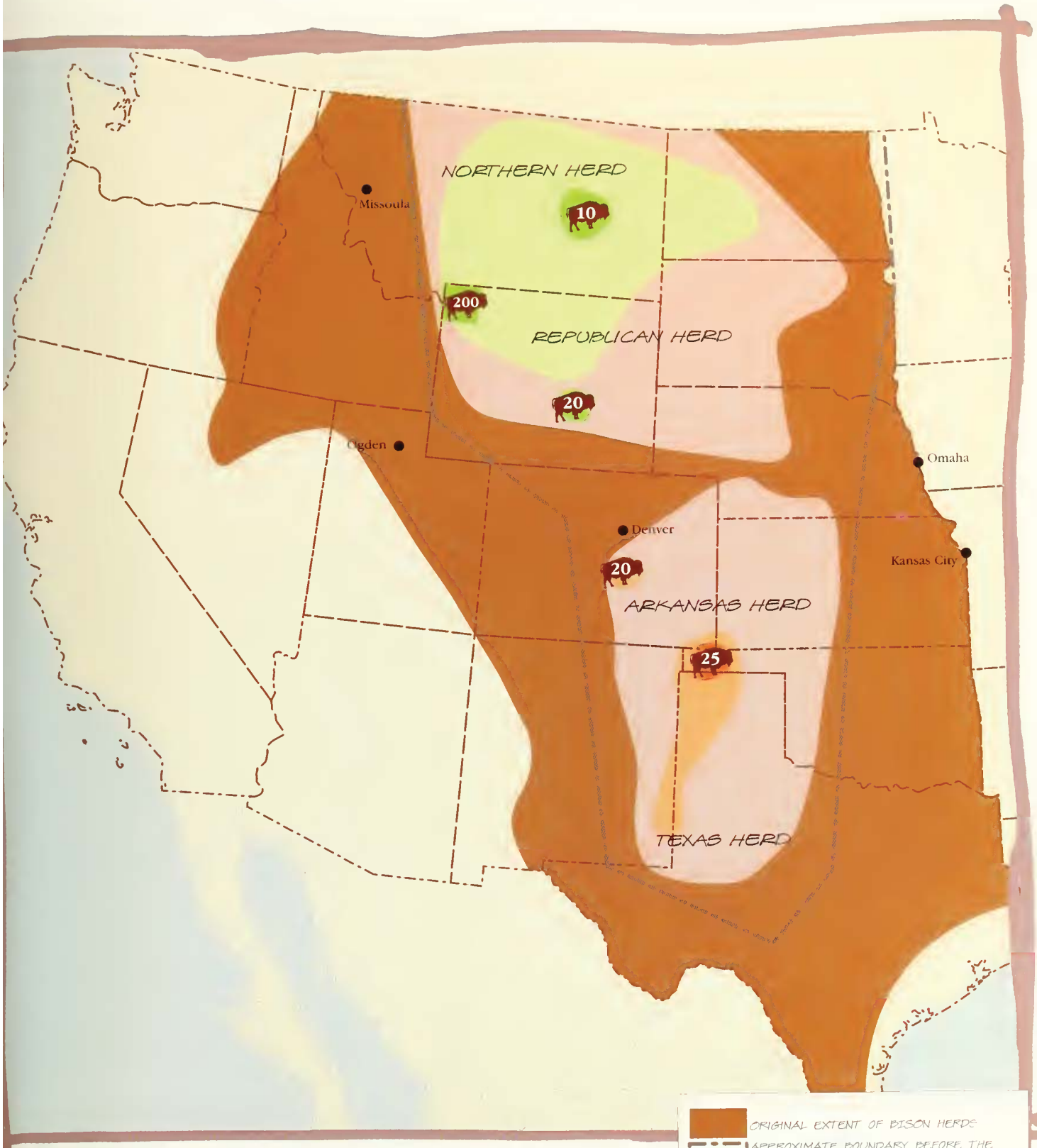
As early as the winter of 1975–76, National Park Service and Montana Department of Fish, Wildlife and Parks personnel experimented with hazing, herding, baiting, physical barriers, and scare devices in order to discourage bison from leaving the park. Barriers and harassment were found ineffective in preventing bison movement (Meagher 1989a).

Shooting bison had been regarded as a last resort in management but became more necessary as time passed. Three bulls were shot in 1974, and one was shot in 1978. In 1978 approval for park personnel to shoot bison inside park boundaries was rescinded, unless human safety was

HISTORIC BISON RANGE

Yellowstone National Park

United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,106



HISTORICAL ATLAS OF THE AMERICAN WEST
BY BECK AND HAASE
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threatened (Meagher 1989b). This authority was later returned in the 1995 *Interim Bison Management Plan*.

In 1984, Montana wardens killed 88 bison outside the park. In 1985 the Montana Legislature authorized public hunting to remove bison that migrated from Yellowstone National Park into Montana. In the next three winters, 99 bison were killed after leaving the park, mostly by hunters. In the winter of 1988–89 following a summer drought and areawide fires, a much larger migration out of the park on the north side resulted in the removal of 569 bison. Most of these were killed by hunters, and the rest were taken by wardens or park rangers. In 1991, due to public controversy over the large number of bison killed during the 1988–89 season, the Montana Legislature removed the authorization to hunt bison in Montana.

The number of bison grew to a peak population of more than 4,200 animals as of July 1994, and declined to a high count of 3,436 in September 1996. In 1996–97, a particularly harsh winter with deep snow and ice sent hundreds of bison toward park boundaries, seeking exposed forage at lower elevations. With capture, slaughter, and other agency-maintained boundary control measures in place, the migration meant the slaughter or shooting of 1,084 bison in the five months between November 14, 1996, and April 15, 1997. This, added to losses from natural causes like extreme weather, winter kill, and starvation, brought the total population down to an estimated 2,000 animals.

BRUCELLOSIS IN THE YELLOWSTONE BISON HERD

The first known positive serologic test for brucellosis in the bison herd was reported in 1917. *Brucella abortus* was introduced to North America with imported cattle. *Brucella* organisms isolated from bison are identical to those that cause brucellosis in cattle (see "Brucellosis in Cattle and Bison"). While it is unknown exactly how and where the original transmission to bison occurred, it is presumed that bison acquired the disease directly or indirectly from domestic livestock.

Cattle were grazed inside Yellowstone National Park from 1886 to 1917, and included beef and dairy herds run by concessioners in support of restaurants and hotels or tent operations (Whittlesey 1994; Meagher and Meyer 1994). Permits were granted to pasture cattle at seven different locations around the park, many in the same location as bison, particularly those on the Buffalo Ranch. In addition, bison calves from the wild population were captured and fed cows' milk around the turn of the century. Some of the bison that were imported to the park in 1902 originated from a brucellosis-affected bison herd (Don Ferlicka, pers. comm.), and the Texas herd had been closely associated with cattle. Bison from the Texas herd were exported to the Moiese Bison Range, Elk Island, and Yellowstone National Park. Subsequently, brucellosis was discovered in each of these herds.

It does not appear that brucellosis is a threat to the long-term survival of park bison. Although brucellosis-related abortions are known to occur, studies have demonstrated that the park bison population has been generally increasing, in spite of the disease and intermittent control actions outside the park, for the last 30 years.

In 1997, the secretary of the interior commissioned the National Academy of Sciences (NAS) to complete a report on brucellosis in the Greater Yellowstone Area. In December 1997, the National Research Council of the National Academy of Sciences issued a prepublication draft, "Brucellosis in the Greater Yellowstone Area."

The agencies have not referenced or cited the NAS report because it is in preliminary form. The NAS report will provide further information on topics addressed by this draft environmental impact statement. When the NAS report has been finalized, the agencies fully anticipate reviewing and utilizing it where appropriate in writing the final environmental impact statement. The NAS report will be widely

distributed to the public, placed in libraries, and put on the Internet (http://www.nas.edu/).

BRUCELLOSIS IN CATTLE AND BISON

One of the most difficult aspects of developing a management plan for the wild, free-ranging bison that migrate from Yellowstone National Park is that some animals in this herd are infected with *Brucella abortus*. This organism causes the disease brucellosis, which can occur in humans, domestic livestock, bison, elk, and other mammals. Within the scientific community and among the people who are interested in bison management, there are differing opinions about the appropriateness or necessity of a management emphasis on the control or elimination of *B. abortus*, the environmental consequences of actions necessary to control or eradicate the disease, and the consequences of not controlling or eradicating brucellosis from this bison herd.

Given the controversy about brucellosis in wildlife, the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) developed and approved at its April 1997 meeting a paper entitled "Brucellosis in the Greater Yellowstone Area," which summarizes some of the information about brucellosis as it might relate to management of bison and elk. This paper represents the factual information for which there is general agreement among the technical experts employed by the responsible state and federal agencies that are members of the GYIBC. The following summary of brucellosis, as it relates specifically to the management of bison that migrate from Yellowstone National Park into Montana, is based on that paper.

What is Brucellosis?

Brucellosis is a contagious bacterial disease caused by various species of the genus *Brucella* that infect domestic animals, wildlife, and humans worldwide. In North America, the primary livestock hosts of *Brucella* spp. are cattle (*B. abortus*), goats (*B. melitensis,* Mexico only), swine (*B. suis*), and sheep (*B. ovis*). The principal North American wildlife hosts for *Brucella* spp. are bison and elk (*B. abortus*), caribou and reindeer (*B. suis*), and feral and wild swine (*B. suis*). Brucellosis also may occur in carnivores, including dogs, and it is usually caused by *B. canis*. Wild canids also may develop antibodies to *B. abortus* without developing clinical infections or shedding the organism.

In cattle and possibly wild ungulates, transmission of *B. abortus* typically occurs through ingestion of the bacteria in birth materials shed from infected animals. The incubation period (the time between exposure and onset of infection) varies widely depending on exposure dose, previous vaccination, species, age, sex, stage of gestation, and susceptibility. Following a brief systemic (bodywide) infection, the organism typically localizes in the udder and/or lymphatic system and, depending on the stage of gestation, in reproductive tissues. Abortion is the characteristic sign of acute brucellosis. Other signs include retained placenta, infertility, reduced milk production, lameness, swollen joints, and swollen testicles. Microscopic lesions may also occur in lymph nodes. Following pregnancy, the *Brucella* organism may become dormant, persisting only within cells of the lymphatic system. Following a dormant period, acute infection may recur during subsequent pregnancy.

The organism is shed in aborted tissues, reproductive tissues, and discharges, especially just prior to, during, or soon after abortion or live birth. The organism also may be shed in milk for variable lengths of time. Some infected cattle, bison, and elk intermittently shed the organism. The quantity of *Brucella* organisms shed at any particular time is variable and the number of organisms that comprise an infectious dose also is variable.

There is no feasible treatment or cure for animals infected with *Brucella*. Some animals may develop immunity and never have the disease. Animals that overcome the clinical signs of brucellosis may develop recurrent infections

and thus may be a source of exposure and possible infection for other animals. Some animals may completely clear the bacterium. Some individual cattle are reported to have a natural resistance to brucellosis, and this trait may be inherited. Natural resistance may also occur in other species including bison.

Brucellosis Transmission

The primary mechanism for transmission of *B. abortus* in cattle is well understood. Typically, transmission occurs when susceptible animals come into direct contact with contaminated aborted fetuses, birth membranes, uterine fluids, or vaginal discharges from infectious animals. Ingestion of contaminated material is the primary route of infection. A female calf born to an infected dam (female parent) can also become infected in utero, but may not manifest the disease until it has matured and either aborted or calved. Infected females typically abort their first pregnancy following infection. Abortion usually occurs during the third trimester. Thereafter, the bacteria usually localizes in lymph nodes surrounding reproductive organs and the udder.

Transmission of *B. abortus* is less understood in wild ungulates. It is far less documented in elk than cattle, but it is believed to be similar to that described above. There is disagreement over the primary means of brucellosis transmission among bison. Research projects now underway are designed to provide more and better scientific information.

Brucellosis Diagnosis

Standard serologic tests for the presence of *Brucella* antibodies in milk and blood are used to identify potentially affected cattle herds. An affected herd is one in which one or more animals have been determined to be infected. The presence of antibodies is used as an indication of infection, particularly on a herd basis. Diagnosis is based on the results of serologic tests combined with other information, including individual animal and/or herd history, clinical signs, epidemiology, and bacteriology. The bacteriological procedures used to identify *Brucella* infection include culturing the bacteria from tissues, milk, udder secretions, aborted fetuses, and uterine discharges.

Some animals may lack antibodies but still may be infected, especially those incubating the bacteria. In contrast, antibodies may be present in an animal from which the bacteria have not been cultured. An animal with natural resistance to the *Brucella* organism that has been challenged with *B. abortus* will generally experience a short-lived antibody response. Tissues collected from these animals will be culture negative, supporting their resistance to infection. A herd is classified as an affected herd after *B. abortus* has been isolated from at least one animal in a suspect and/or reactor herd, or epidemiological data support that conclusion.

Killing suspect animals generally is necessary to obtain adequate samples for bacteriologic culture. Biopsy of tissues from live animals may also be performed. Biopsy is not currently a routine diagnostic technique, but is being evaluated as a research tool for studies of wild bison. Interpretation of culture results is difficult because the ability to isolate the bacteria varies with the location and abundance of *B. abortus* in the animal. The culture of *Brucella* organisms from tissue or blood is a definitive indication of infection; however, the organism may not always be recovered even though it is present. Failure to culture the bacteria may be due to inappropriate techniques, improper storage of specimens, or failure to use sufficient amounts of tissue.

It is not possible to determine or quantify the risk of bacterial transmission based on the results of these standard serologic and culture tests. Within a herd, the number of animals capable of transmitting the bacteria generally is less than the number of animals with positive blood tests. The number of infected animals generally is greater than the number of animals with positive culture tests. There is no test to specifically identify all infectious animals, i.e., those animals currently capable of transmitting brucellosis. It is assumed that if antibodies are present, the

animals must have had a large enough quantity of bacteria in their systems to trigger an immune response. Management actions in this environmental impact statement are based on the assumptions that (1) the antigen, i.e., *B. abortus*, must be present in the herd because the antibodies to *B. abortus* are present in this herd; (2) *B. abortus* is being transmitted from bison to bison because antibodies to *B. abortus* persist in this herd; and (3) therefore, there is a potential for brucellosis transmission from bison to cattle. In particular, it is assumed that each female bison testing positive for the presence of antibodies will shed the organism at some time in her life.

Brucellosis in Other Wild Ungulates

About 1.5% of the elk in the Montana portion of the GYA herd has consistently tested positive for *Brucella* antibodies. These include the Madison, Gallatin, Gravelly-Snowcrest, Absaroka, and Northern Yellowstone herds. These elk herds are free-ranging and do not use artificial feedgrounds. The seroprevalence of brucellosis in the southern elk herds, i.e , those associated with the National Elk Refuge and the feedgrounds managed by the state of Wyoming, is considerably higher (ranging from 3% to 65% seropositive) and probably maintained at high levels through increased exposure while on the feedgrounds. The source of brucellosis in GYA elk has not been identified. Six of the 104 elk (5.8%) harvested during the 1997 late hunt near Gardiner tested positive for brucellosis. At this time it is too early to determine what this rate of seropositivity in this one sample means. Were the agencies successful in eliminating brucellosis from the bison herd, elk could be a potential source for reinfection.

Bovine brucellosis only rarely occurs in deer, pronghorn, and mountain sheep, and any infection in these species is inconsequential to the management of brucellosis-affected bison and elk populations. Brucellosis has not been documented in any of these species within the Greater Yellowstone Area. One study suggested that when brucellosis occurs in moose, the disease appears to be systemic and typically causes death (Forbes et al. 1996). Whether moose are exposed is unknown.

Process for Bison Quarantine

A quarantine protocol has recently been developed for bison from Yellowstone and Grand Teton National Parks. According to the protocol, a bison quarantine facility can be used to test bison from either national park to qualify the animals as brucellosis-free. The facility must be approved by state and federal animal health officials. The complete protocol is included as appendix B.

Prior to entering the facility, bison must test negative on official brucellosis serological tests that are conducted at the National Veterinary Services Laboratories or at an approved cooperative state-federal brucellosis laboratory. Those bison found to be reactors (seropositive) must go either to slaughter or to an approved research facility. Bison not properly separated by fencing are considered one test group and will go through the quarantine testing protocol together. If any in the group are found to be reactors at any time, the rest of the group must start the testing protocol over. Thus, it would be advantageous to have a number of small test groups of bison rather than one or a few large test groups because fewer bison would have to start the testing protocol over if a reactor were found.

As a minimum, all bison must have three consecutive negative serological tests with at least 12 months between the first and last tests. In addition, specific age/sex groups have additional requirements. For example, all female bison not born in the facility must be bred and calve in the facility, and all bison in a test group having such female bison must be tested 30–90 days after calving and again six months after calving. Calves born in the facility may be released at six months of age provided certain conditions specified in the protocol are met.

Those bison that qualify as brucellosis-free could be moved intrastate or interstate provided the state animal health authorities in the receiving state authorize movement into their state. The new owners must agree to have the bison tested approximately six months and one year after release from the quarantine and must keep the bison separate from all other animals until the six-month test has been completed.

Risk of Transmission

There is considerable disagreement regarding the risk of *B. abortus* transmission from bison and elk to domestic livestock, the applicability of information derived from studies of the disease in domestic bison and cattle, and appropriate methods for the conduct of additional research to determine the risk of transmission. Prior to 1995 there had been no controlled field studies, specific to bison in Yellowstone National Park, to determine either the mechanism of *B. abortus* transmission from bison to livestock or the frequency of brucellosis-induced abortions. In 1995 a multiyear research project was initiated to study brucellosis transmission and the natural course of the disease in Yellowstone bison.

Most of the knowledge regarding brucellosis has been developed from studying the disease in cattle and captive bison, although a limited amount of published information has been developed from controlled and field studies of brucellosis in bison. Brucellosis may behave differently in cattle than in bison (see "Alternative Interpretation of Risk" below). It is also known that the infection behaves differently in chronically infected herds as compared to cattle or captive bison herds that experience a new outbreak of the disease. For instance, chronically infected bison and cattle have a lower frequency of brucellosis-induced abortions because they have a higher acquired immunity in response to frequent exposure to noninfectious doses. Chronically infected bison herds also have lower calving rates than uninfected herds.

It is not possible to quantify the risk of *B. abortus* transmission from bison and elk in the Greater Yellowstone Area to domestic livestock because most of the variables that define risk are unknown. However, it is possible to identify the various factors that affect risk and to qualitatively evaluate how alternative management approaches affect those factors. Important factors include the following:

1. Risk of transmission is affected by the degree of association between potentially infectious and susceptible animals. To become infected, a susceptible animal must come in contact with an infectious animal or discharges that contain a sufficient dose of viable *Brucella* organisms. Separation in space and time reduces the potential for transmission. In addition to separation that occurs as a result of management actions, separation may occur as a result of differences in behavior, habitat selection, geographic features, and distribution in response to weather.

2. The risk of *B. abortus* transmission increases as the number and density of infectious animals in the host population increases. Conversely, the risk is reduced when the number of infectious animals is lowered through reduction in animal crowding, reduction in population size, and vaccination.

3. The risk of transmission increases as the number of susceptible animals that may associate with infectious animals increases, and decreases as the number of animals that may be associated with infectious animals decreases.

4. The risk of transmission is affected by environmental factors. Outside its host, *Brucella* organisms have limited viability. Discharges remain infectious for longer periods during cold weather. Direct sunlight quickly kills the organism. Scavenging by wildlife reduces the occurrence of infectious tissues, but scavengers may also physically transport infectious tissues.

5. The risk of transmission is affected by the class of the infectious animals. The available evidence indicates that the primary risk of *B.*

abortus transmission from bison to cattle is contamination resulting from abortions and birthing events by infected adult female bison. However, limited available data documents the presence of *B. abortus* organisms in bison semen. Therefore, the risk of transmission from bull bison, although logically small, cannot be entirely eliminated based on existing information. Neutered animals are unlikely to transmit the disease.

6. The risk of transmission may be reduced by vaccination, neutering, and herd management (such as separation of animals in time and space).

7. Some animals are naturally resistant to infection.

Alternative Interpretation of Risk

As noted above, there is considerable disagreement about the significance of brucellosis in bison, especially the degree to which bison pose a risk of brucellosis transmission to livestock. There is no definitive information with which to resolve this disagreement. The following information summarizes ideas discussed during development but not included in the paper on "Brucellosis in the Greater Yellowstone Area" (GYIBC 1997).

The bulk of brucellosis research and disease management has focused on domestic livestock, yet limited published information suggests the disease may be transmitted differently and have different clinical, pathological, and population effects in bison (Williams, Cain, and Davis 1994; Meyer and Meagher 1995a).

Those who suggest that the risk is negligible point out that there have been no documented cases of brucellosis transmission from wild, free-ranging bison to cattle. No documented cases exist of wild, free-ranging male bison transmitting brucellosis to domestic cattle (bison and cattle may interbreed in captivity). Epidemiological studies, however, have indicated wildlife (probably elk) to cattle transmission of brucellosis on six Wyoming premises since the 1960s. In cattle, semen from an infected bull did transmit the disease when used in artificial insemination, but has rarely been observed as a result of natural breeding (Nicoletti and Gilsdorf 1994).

It is possible that, although brucellosis may be endemic in this bison herd, few of the animals are capable of transmitting the disease. This suggestion is supported by noting the discrepancy between the frequency of seropositive animals in samples collected at various times since 1917 and the frequency of culture positive animals in samples of tissues collected during 1991–92 to determine the presence of *B. abortus*.

Because of the technical difficulties in the isolation of *B. abortus* from bison tissues, the recovery rate is typically lower than the seroprevalence would suggest. Thus, as a negative culture does not provide conclusive evidence that the animals' tissues are free of bacteria, all seropositive animals are currently considered to be potentially infected. Studies are in progress to more specifically define the relationship between a seropositive animal and the isolation of bacteria from its tissues.

It has been theorized that the primary route of transmission among cattle (abortions and birthing events) may be different from that among bison. This suggestion is based on the infrequency of observed abortions in the Yellowstone area (usually required for transmission of the disease between cattle) and the discrepancy between the frequency of seropositive and culture positive animals. In bison, the disease may transmit through milk from cow to calf, which develops antibody response from repeated exposure (Meyer and Meagher 1995b).

BISON DISTRIBUTION

The Yellowstone bison population uses three different wintering areas in the park: Pelican Valley (the smallest), Mary Mountain (the largest, in the Hayden Valley-Firehole River

area), and the Lamar Valley or northern range (see Bison Winter Movements map). Individuals or small groups of bison (usually bulls) move to other areas of the park, or occasionally leave the park to the east, south, or southwest, but most movement from the park has been into Montana, along the Madison River to the west and the Yellowstone River to the north. Although at one time these groups were semidistinct subpopulations and continue to winter in these areas, the subpopulations are no longer distinct (Meagher et al. 1994).

Bison migrate from Yellowstone National Park during the winter into Montana in five general areas (also see Bison Winter Movements map). During some years, substantial numbers of bison move north across the Reese Creek boundary of Yellowstone National Park and onto adjacent private land along the Yellowstone River valley near Gardiner (the Gardiner Valley). These lands are leased to cattle operators who graze livestock year-round. Bison have historically used the Gardiner Valley, and would likely migrate much farther north without agency or other controls.

Bison drive - Upper Nez Perce Creek, 1966.

Large numbers of bison also move from Yellowstone National Park onto Gallatin National Forest in the Eagle Creek/Bear Creek area, northeast of Gardiner. Land use in this area emphasizes wildlife and precludes domestic livestock. Although most bison remain in this area all winter, some may move north and west beyond the Little Trail Creek/Maiden Basin hydrographic divide and onto private land in the Gardiner Valley.

Limited numbers of bison also migrate into the Hellroaring and Slough Creek drainages in the Absaroka-Beartooth Wilderness, a congressionally designated wilderness area to the east of the Eagle Creek/Bear Creek area. These drainages are geographically isolated from areas with permitted cattle. An occasional bison moves even farther east and leaves the park boundary by way of Cooke City or Silver Gate.

A few individual bison and small groups use public lands contiguous with the northwestern boundary of Yellowstone National Park in the area that is generally north of Grayling Creek/Fir Ridge and referred to as the Lee Metcalf Wilderness and Cabin Creek Recreation and Wildlife Management Area. Land use in this area emphasizes wildlife and precludes domestic livestock. Bison that use this area are unlikely to migrate farther but could associate with domestic livestock if they do.

During some winters, substantial numbers of bison move west along the Madison River, Duck Creek, and Cougar Creek and leave Yellowstone National Park in the vicinity of West Yellowstone, although they typically return to the park after snowmelt, normally around May 1. The numbers and timing are highly variable from year to year. After leaving the park, these bison either occupy public lands in the Gallatin National Forest that are allocated to multiple-use management or move onto adjacent private lands, some of which may be occupied by livestock during summer.

The number of bison migrating out of the park in any given year is impossible to predict. The policy of Yellowstone National Park has been to manage park resources with minimal human manipulation and to allow ecological processes, to the extent possible, to determine wildlife population levels. After termination of bison and elk reduction programs in the park in 1968, these wildlife populations have increased. As a result, some experts believe range resource conditions in the northern range of the park do not produce adequate forage for winter habitat resulting in increased bison migration. However, there is scientific evidence that shows that grassland

productivity is high, species diversity is stable, and the standing crop is not correlated with wildlife populations (Reardon 1996; Singer 1996; Wallace 1991, 1996; Frank-McNaughton 1996).

It has been further speculated that bison migration out of the park is facilitated by winter road grooming for oversnow machine use, or plowing for wheeled use during the winter (the highway from Mammoth to Cooke City is plowed for wheeled vehicle use during winter). Some bison use the roads for energy-efficient travel, particularly during winter. One line of argument is that energy-efficient travel provided by the roads allows bison to access habitats that would otherwise be too energy costly to use. This allows higher survival and facilitates movements to new areas. The memory of these access routes is retained and used in subsequent years.

The groomed road system in winter allows long distance movement over short periods of time that would otherwise not be possible, particularly in the park interior, where snow depths are typically much greater. On the northern range, where snow depths are significantly lower, it is not likely that bison use of groomed roads in this area provides them any meaningful energy savings.

The precise relationship between road grooming and bison movements is not well defined. Research to better understand these relationships has been initiated. As a result of the settlement agreement in "Fund for Animals v. Babbitt (D., D.C., Civ. No. 97-1126), Yellowstone National Park has recently (January 1998) decided to formally monitor wildlife movements and wildlife use of two segments of groomed roads (in Hayden Valley and along the Gibbon River) inside the park.

Stochastic events such as winter severity, snow depth, and access to forage and other periodic events are known to be important influences on bison migration. For instance, large migrations occurred in the severe winters of 1988–89 after large-scale fires burned much of the Greater Yellowstone Area and summer drought reduced forage for bison (and other wildlife), and in 1996–97 due to deep snow and ice.

Despite increases in migration during these events, the opportunities for transmission of brucellosis from bison to cattle have been negligible because bison management programs have not permitted bison to freely associate with domestic livestock during high risk periods (see "Administrative History of Bison Management" for more information on management actions).

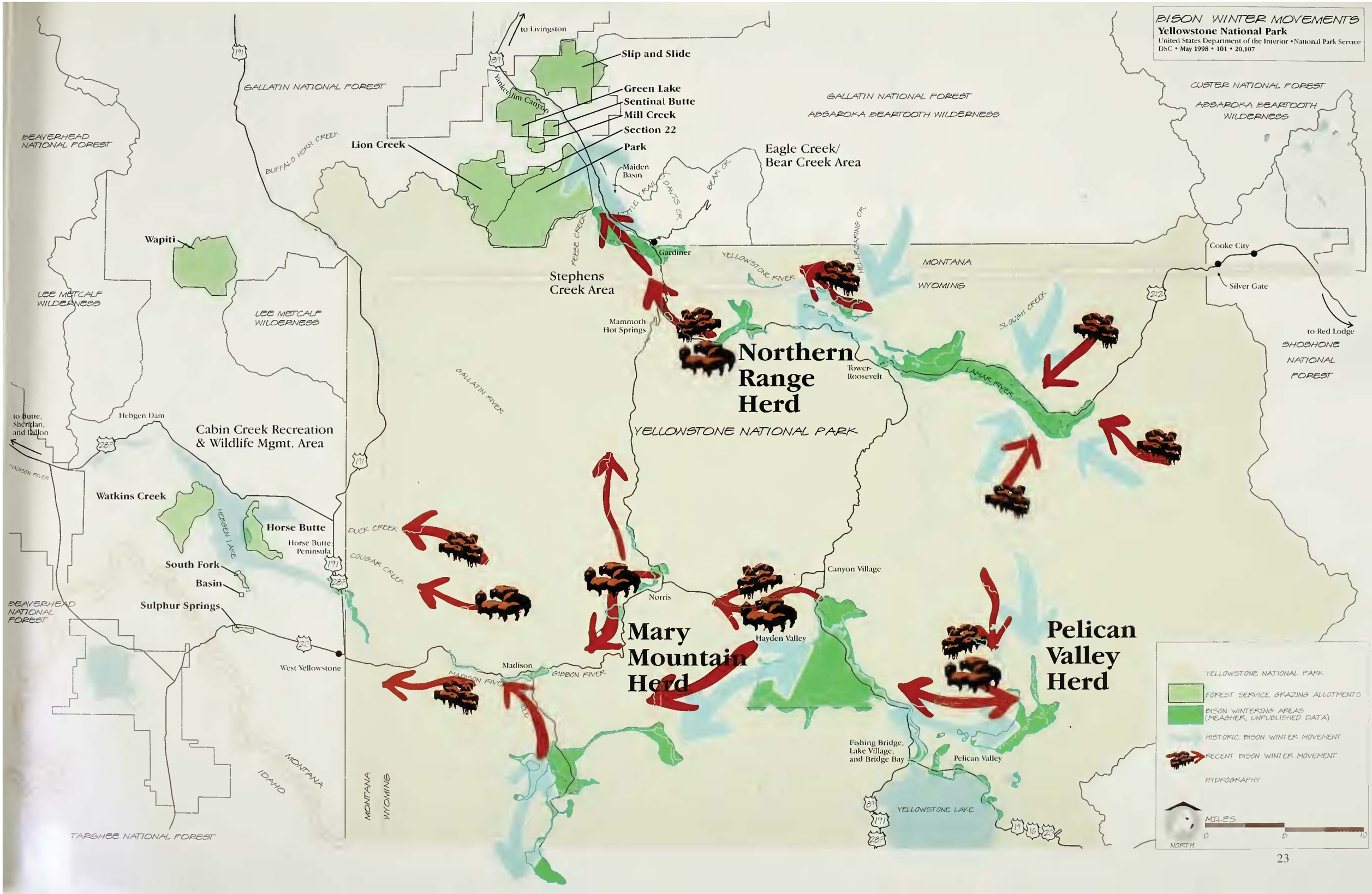
ECONOMIC IMPACTS OF BRUCELLOSIS IN CATTLE

Agriculture has been and continues to be Montana's basic industry. It accounts for over 30% of the state's industrial sector employment, labor income, and gross sales. Approximately 64% of the state's 93 million acres is used for farming and ranching. In 1995, Montana agriculture generated $2 billion in cash receipts, of which cattle calves and dairy accounted for 40% of total cash receipts.

Left unchecked, the migration of brucellosis-infected bison from Yellowstone National Park into Montana could have not only direct effects on local livestock operators, but also on the cattle industry statewide. Production in infected herds could decline due to a number of consequences of the disease, including the following:

- *Abortions.* Abortion losses constitute the largest single cost of brucellosis in beef cattle. A cow that aborts or has a calf that does not survive because of the debilitating effects of brucellosis has, in effect, been maintained for a year without financial return.

- *Decreased weight gain by calves.* Calves from infected cows may have less than normal weight gains, since milk production from infected cows may be inadequate. Affected calves at the time of sale may weigh 100 pounds less than calves from healthy cows.


BISON WINTER MOVEMENTS
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,107
to Livingston
Slip and Slide
Green Lake
Sentinal Butte
Mill Creek
Section 22
Park
Lion Creek
Maiden Basin
Yankee Jim Canyon
GALLATIN NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
BUFFALO HORN CREEK
GALLATIN NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
Eagle Creek/
Bear Creek Area
BEAR CR.
DAVIS CR.
LITTLE TRAIL CR.
FEESE CREEK
Gardiner
YELLOWSTONE RIVER
HELLROARING CR.
MONTANA
WYOMING
Cooke City
Silver Gate
to Red Lodge
SHOSHONE NATIONAL FOREST
Wapiti
LEE METCALF WILDERNESS
LEE METCALF WILDERNESS
Stephens Creek Area
Mammoth Hot Springs
Northern Range Herd
Tower-Roosevelt
SLOUGH CREEK
LAMAR RIVER
GALLATIN RIVER
YELLOWSTONE NATIONAL PARK
to Butte, Sheridan, and Dillon
Hebgen Dam
Cabin Creek Recreation & Wildlife Mgmt. Area
MADISON RIVER
Watkins Creek
HEBGEN LAKE
Horse Butte
Horse Butte Peninsula
DUCK CREEK
COUGAR CREEK
South Fork
Basin
Sulphur Springs
BEAVERHEAD NATIONAL FOREST
West Yellowstone
Norris
Canyon Village
Hayden Valley
Mary Mountain Herd
Madison
MADISON RIVER
GIBBON RIVER
Pelican Valley Herd
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE
MONTANA
IDAHO
MONTANA
WYOMING
TARGHEE NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
FOREST SERVICE GRAZING ALLOTMENTS
BISON WINTERING AREAS (MEAGHER, UNPUBLISHED DATA)
HISTORIC BISON WINTER MOVEMENT
RECENT BISON WINTER MOVEMENT
HYDROGRAPHY
MILES
0
5
10
NORTH

- *Delays in calf production.* Brucellosis would result in some infected cows being difficult to breed, resulting in fewer market cattle each year.

- *Increased rates of culling and replacement.* Brucellosis-affected cows are usually culled at a faster than normal rate because of reproductive deficiencies. Another cost for affected herds would be the expenses related to additional testing and vaccinating. Testing for brucellosis is done every 30 days, as long as reactors are found. The herd is then retested after 90 days, and again after another 90 days (three negative tests in 180 days). After the quarantine is lifted, the herd is tested again after six months.

Current incomes from affected herds would be disrupted because of quarantines, and future incomes would be lost due to depopulations. Depopulation costs would be somewhat mitigated by the sale of affected cattle and indemnity payments, but in most instances indemnification would provide only partial compensation.

Producers statewide could suffer the marketing consequences of the disease. Sales at all levels — intrastate, interstate, and international — would be affected. There would be the direct impacts on sales of herd depopulations and quarantines, but far more detrimental to the state's livestock industry would be the requirement of a negative brucellosis test within 30 days before interstate movement. Of greatest consequence would be diminished interstate and international demand for test-eligible stock because of the presence of brucellosis.

Increased production and marketing costs and a contraction in demand would mean fewer breeding cattle sold out-of-state, and widespread losses for Montana's cattle producers. Nationally, stockgrowers and livestock disease management agencies have spent $3.5 billion to eradicate the disease from cattle (Frye and Hillman 1994). Any new outbreak would be a setback to this program.

Federal animal-disease regulations declare that the presence and spreading of brucellosis among cattle herds would place Montana's "brucellosis class-free status" in jeopardy. State animal health authorities may levy additional restrictions beyond those imposed by the Animal and Plant Health Inspection Service, which have the same impact as downgrading if they believe a threat exists from importing Montana cattle. In Montana increased testing could add $6 million per year statewide should an outbreak occur (State of Montana, L. Petersen, pers. comm. June 1997).

If brucellosis is diagnosed in a livestock herd, the affected herd is immediately quarantined. A thorough epidemiological investigation, including brucellosis testing, is immediately conducted to determine the origin and potential spread of the infection. An action plan is developed for potential source and destination herds. This action plan would likely include herd tests and may necessitate quarantine of additional herds.

If the affected herd is in a brucellosis class-free state such as Montana and is imported into the state, the herd must be either depopulated or returned to the state of origin to maintain class-free status. If the infection is found not to have been imported or has spread to other herds, class-free status is automatically suspended and the herd is kept under quarantine until it is brucellosis free or sent to slaughter. As a minimum, suspension of class-free status requires brucellosis testing of certain age/sex cattle prior to interstate shipment unless the cattle are going to slaughter or to a quarantine feedlot.

Since Montana producers export a majority of their commodity to other states and to international markets, the perception of diseased animals could impede producers from around Montana from marketing livestock. For instance, during the 1996–97 winter the state of Oregon imposed restrictions on the movement of untested livestock from Montana into Oregon. In 1994, APHIS informed the Montana State veterinarian that states surrounding Yellowstone

National Park would be downgraded from class-free status if the states failed to take action against bison within the state's borders when bison leave the park (letter to Dr. Clarence Siroky from APHIS dated December 9, 1994). Also in 1994 and 1995 the states of Idaho, Nebraska, North Dakota, Oregon, South Dakota, and Washington informed the Montana State veterinarian that testing requirements would be imposed on Montana cattle due to the emigration of bison into Montana from Yellowstone National Park. In 1994, 1995, and 1996 the Montana State veterinarian also received inquiries from other states regarding the presence of disease-exposed bison emigrating into Montana and whether testing requirements should be imposed.

The economic consequences of these actions would be felt by other segments of Montana's economy in communities throughout the state. While no specific information is available on the amount of livestock exported out of Montana, it is important to note every dollar of meat animal (beef cattle, sheep, hogs, and poultry) product sold to entities outside Montana results in approximately $1.25 of additional sales by Montana economic sectors tied to the meat sector (Bureau of Economic Analysis, U.S. Department of Commerce). Cash receipts from sales of cattle and calves in 1996 for Montana were $655,770,000 (Montana Agricultural Statistics Service, U.S. Department of Agriculture), and the average for the last five years is $730 million. Also, for every additional job in the meat animal sector, approximately 1.3 jobs are generated in the Montana economy.

The potential for such widespread economic consequences is a primary motivating factor in taking action to ensure brucellosis is not transmitted from Yellowstone bison to Montana cattle, and/or that federal downgrading or state sanctions do not occur. In this regard, all alternatives in this environmental impact statement include measures to "address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana" (see "Purpose of Action").

The agencies have taken action for several years to meet this goal, and are currently operating under an interim bison management plan (see following section on "Administrative History of Bison Management"). Compliance with the plan has had economic impacts on each of the agencies; these costs are reported in the description of alternative 1 (continuation of the strategies in the interim plan) in this environmental impact statement, as are estimated costs to implement alternatives 2 through 7.

Cattle drive, by Donnie Sexton. (NPS photo)

ADMINISTRATIVE HISTORY OF BISON MANAGEMENT

The need to cooperatively prepare a long-range bison management plan was formally recognized in July 1990, when the National Park Service, Montana Department of Fish, Wildlife and Parks, and U.S. Forest Service filed a "Notice of Intent" in the *Federal Register* to prepare an environmental impact statement examining options for such a plan.

The list of participating agencies was expanded to include the Montana Department of Livestock and U.S. Department of Agriculture, Animal and Plant Health Inspection Service. Both state agencies — Montana Department of Fish, Wildlife and Parks and Montana Department of Livestock — are represented as the state of Montana. All parties signed a May 1992 "Memorandum of Understanding" (see appendix C) to work together in developing a cohesive plan to meet their varying objectives.

During the development of the long-range plan and environmental impact statement, a series of four interim bison management plans and environmental assessments were prepared by the National Park Service (1990, 1992), state of Montana (1995), and National Park Service and state of Montana (1996). In general, these interim plans provided for agency personnel from Montana and the National Park Service to cooperatively shoot bison moving from Yellowstone National Park into Montana in order to achieve the objectives of protecting private property, providing for human safety, and maintaining Montana's brucellosis class-free status.

A finding of no significant impact and decision notice signed in August 1996 approved for implementation of the latest *Interim Bison Management Plan* (see alternative 1 in "The Alternatives" part of this environmental impact statement). Adjustments to the *Interim Bison Management Plan* were made by both state and federal agencies in 1997 (see appendix A). This bison management plan provided for capture of bison in Yellowstone National Park near the north boundary in the Stephens Creek area and shipment of bison to slaughter. Bison were allowed to enter the Eagle Creek/Bear Creek area northeast of Gardiner, Montana, as these public lands are wildlife winter range and no domestic cattle are present at any time. Capture of bison also took place outside Yellowstone in the West Yellowstone area, and seropositive bison and seronegative-pregnant females were shipped to slaughter. Seronegative-nonpregnant bison were released on public lands in the Horse Butte area.

After completion of the interim plan, work resumed on the long-term management plan and environmental impact statement. As part of a court-approved settlement agreement to a lawsuit Montana brought against the National Park Service and the Animal and Plant Health Inspection Service in 1995, the National Park Service, U.S. Forest Service, Animal and Plant Health and Inspection Service, and state of Montana agreed to complete the long-term bison management plan and environmental impact statement (this document) for public review according to a specific schedule.

OBJECTIVES IN TAKING ACTION

This section elaborates on the general and specific statements of purpose (objectives). The purpose statement agreed upon by the interagency team is as follows:

> To maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana.

The interagency team has defined a "wild, free-ranging population" of bison as one that is not routinely handled by humans and can move without restrictions within specific geographic areas. The operation of a capture facility would not affect the wild, free-ranging character of the herd. However, assigning bison to a quarantine facility would affect individual bison. These animals would be unlikely to return to Yellowstone National Park, but would be available to requesting organizations to establish or augment populations elsewhere.

The "economic interest and viability of the livestock industry in the state of Montana" is tied directly to the maintenance of a class-free designation by the Animal and Plant Health Inspection Service (see the above section on "Economic Impacts of Brucellosis in Cattle" and the "Socioeconomics" chapters in the "Affected Environment" and "Environmental Consequences"). The secretary of agriculture is authorized to make such regulations and take such measures as are deemed necessary to prevent the introduction or dissemination of any contagious, infectious, or communicable disease of livestock or poultry from a foreign country into the United States or interstate. The department has the authority to cooperate with states and political subdivisions in the control and eradication of diseases of livestock and poultry. The Cooperative State-Federal Brucellosis Eradication Program was implemented in partnership with the states to use the combined authorities to control and eradicate brucellosis. Under the program, individual states progress through various classifications by reducing the prevalence of brucellosis until brucellosis class-free status is attained.

To obtain class-free status under the requirements in Title 9, *Code of Federal Regulations*, Part 78 (9 CFR 78), a state must, among other things, conduct brucellosis ring tests on all dairy herds at least twice a year, test at least 95% of cows and bulls slaughtered annually, and successfully trace 90% of reactors back to the herds from which they originated. If field strain *Brucella* is found, an epidemiological investigation is conducted to identify possible sources of brucellosis. Appropriate action must be taken based on the results of this epidemiological investigation to eliminate the potential spread of brucellosis.

The Animal and Plant Health Inspection Service (APHIS) has agreed not to initiate a downgrade of Montana's brucellosis class-free status if Montana has complied with its responsibilities under the selected bison management plan. APHIS anticipates that any of the bison management plans (alternatives) outlined in this document would be sufficient to prevent the actual outbreak of disease in domestic livestock and the subsequent spread of brucellosis. Therefore, APHIS would not downgrade the brucellosis status of Montana based on the mere presence of bison migrating out of Yellowstone National Park into special management areas, or SMAs (management areas along the park boundary), in accordance with the selected bison plan (see "Actions Common to All Alternatives" in "The Alternatives" part of the document for the definition of an SMA).

The "risk of brucellosis transmission" to cattle and ranched bison is addressed through specific objectives, particularly numbers 5 and 6, identified below:

The nine objectives that the interagency team agreed would be used to help determine reasonableness of each alternative, and that would be applied to the selection of a preferred alternative are as follows:

1. *Address bison population size and distribution; have specific commitments relating to size of bison herd* – The policies of the National Park Service direct that native populations of wildlife be managed by natural processes in a relatively undisturbed setting to the maximum extent possible. Therefore, inside the park, bison population sizes would be determined by weather, winter snow depth, competition for forage, predation, and other environmental conditions. However, since uncontrolled movements of bison outside the park would be inconsistent with the purpose of the plan, each alternative also includes measures to control bison distribution. Each alternative also includes measures to prevent the population from dropping below low numbers as a result of increased kills by agencies controlling bison entries into the state. The agencies used mathematical models published in scientific literature to estimate the number of bison, based on plant forage production and winter severity, the park could support (Boyce and Gaillard 1992); see "Impacts on Bison Population" chapter of the "Environmental Consequences."

2. *Clearly define a boundary line beyond which bison will not be tolerated* – Each alternative defines a boundary on both the west and north where management actions take place. In some cases, the boundary is maintained through hazing or shooting; in others, capture facilities are also used.

3. *Address the risk to public safety and private property damage by bison* – The risk to public safety and private property damage by bison outside Yellowstone National Park is addressed as an environmental issue in the "Affected Environment" (part 3) and "Environmental Consequences" (part 4) of this document. With permission from the Department of Livestock, current state law allows private landowners to shoot bison occurring on private land and causing damage or considered a threat to safety.

4. *Commit to the eventual elimination of brucellosis in bison and other wildlife* – The interagency team concluded that the elimination of brucellosis, even in bison, is not within the scope of this management plan. This is because elk in the Greater Yellowstone Area also carry the disease, and it is potentially mutually transmissible between the two species. However, all agencies are committed to the eventual eradication of brucellosis from the Greater Yellowstone Area. This management plan is one of several steps in that process. The eventual elimination of brucellosis from the Greater Yellowstone Area is the task of a larger-scope plan, currently under discussion by the GYIBC. The interagency EIS team agreed actions in the bison management plan must not detract from this objective, and must demonstrate progress toward it.

5. *Protect livestock from the risk of brucellosis* – All alternatives include specific measures aimed at meeting this objective.

6. *Protect the state of Montana from risk of reduction in its brucellosis status* – The interagency team agreed this objective was referring to the federal status conferred by the Animal and Plant Health Inspection Service. Montana is currently identified as class-free. Producers are able to ship their cattle interstate to national and international markets with minimal program restrictions. Any change in this status could mean significant economic impacts for the livestock industry in Montana.

7. *At a minimum, maintain a viable population of wild bison in Yellowstone National Park, as defined in biological, genetic, and ecological terms* – Currently available information indicates that the bison population should be maintained above 580

animals in order to preserve minimum genetic integrity. This number in no way represents a management objective or goal for the herd, but is the lowest level to which the herd would be allowed to fall. Agencies would undertake actions beforehand to ensure that this number is not reached. This number is based on research from a private bison herd that determined the population size and structure needed to ensure random intermixing of breeding animals and avoid significant inbreeding (Knowles, unpub. data). The number may be adjusted as ongoing research provides new information.

8. *Be based on factual information, with the recognition that the scientific database is changing* – Professionals in the fields of wildlife science, livestock disease, wildlife disease, livestock management, and wildlife management do not agree on the central issues relating to brucellosis in Yellowstone bison. The disagreements include (1) the degree of risk of transmission from the bison to livestock, (2) the level of prevalence of brucellosis in the bison, (3) the safety and effectiveness of existing brucellosis vaccines, and (4) which management actions to take with regard to the disease in the bison. The agencies have agreed to support research to help resolve these issues and will update the bison management plan as new information becomes available. A list of research topics approved by the Greater Yellowstone Interagency Brucellosis Committee is found in appendix D.

9. *Recognize the need for coordination in the management of natural and cultural resource values that are the responsibility of the signatory agencies* – The agencies have interpreted this objective as a requirement for the cooperative compliance with statutes designed to protect cultural and natural resources that may be affected by bison management actions proposed in the plan. Impacts are most likely to come from actions called for in various alternatives, effects on bison populations, and effects from actions proposed such as construction and operation of capture or quarantine facilities or acquisition of additional range. Future site-specific NEPA analysis (including public review) may be required.

In addition to the objectives, the agencies have also recognized, as noted in the "Need for Action" section, that Yellowstone National Park is not a self-contained ecosystem for bison. Lower elevation range could provide areas for bison to winter adjacent to the park as well as additional management options. Three of the alternatives (2, 3, and 7) analyzed in this environmental impact statement include provisions for such possible acquisitions. Although the agencies agree any acquisition of grazing rights, easements, or property from willing sellers could be by a public entity, Yellowstone National Park has no plans for expansion of the park boundary.

CONSTRAINTS IN TAKING ACTION

Each agency involved in producing this environmental impact statement has well-established mandates. If these mandates conflict, the number of options for management may be affected. Discussions among team members have resulted in some alternatives being dropped from the analysis because they conflicted with agency mandates. None of the alternatives retained for analysis was outside the agencies' legal constraints.

Agency Responsibilities

The National Park Service manages bison inside park boundaries. Outside the park, in Montana, wildlife-management and wildlife-damage cases are supervised by the Montana Department of Fish, Wildlife and Parks. This authority extends onto Gallatin National Forest in the state of Montana. The U.S. Forest Service has the authority to manage wildlife habitat on the national forest, but the management of the wildlife itself is largely the responsibility of the Montana Department of Fish, Wildlife and Parks.

Because of the presence of brucellosis in Yellowstone bison and the risk of its transmission to domestic cattle, the Montana Department of Livestock and the Animal and Plant Health Inspection Service have a role in bison management. The Animal Health Division of the Montana Department of Livestock adopts rules, policies, and orders fostering the prevention, control, and extirpation of animal diseases.

Legal and Policy Mandates

A brief summary of the respective legal and policy backgrounds of each of these federal and state agencies is provided below (also see appendix E for legal and policy guidance). Each agency must satisfy its particular mandates and operate within its legislative and regulatory constraints. The alternatives analyzed in this environmental impact statement are considered implementable by each of the agencies involved, i.e., they meet these criteria.

The National Environmental Policy Act of 1969 requires consideration of the environmental effects of proposed federal actions. NEPA procedures ensure that environmental information is available to public officials and members of the public before decisions are made and actions are taken. This act has equal effect on all federal agencies involved in the management of Yellowstone bison. A similar state act, the Montana Environmental Policy Act (MEPA), applies to Montana state agency actions.

Yellowstone National Park, National Park Service, U.S. Department of the Interior. An act of Congress on March 1, 1872, established Yellowstone National Park as "a public park or pleasuring ground for the benefit and enjoyment of the people." The act required the secretary of the interior to "make and publish such rules and regulations" that will "provide for the preservation, from injury or spoilation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition." It also required the secretary of the interior to "provide against the wanton destruction of the fish and game found within said Park, and against their capture or destruction for the purposes of merchandise or profit." Fishing and hunting, for sport or personal subsistence, were informally considered appropriate uses of the park at that time.

On January 15, 1883, the secretary of the interior amended park regulations to "prohibit absolutely" public hunting of wildlife species, including bison, in the park, and to restrict fishing to sporting means. The precedent of allowing sportfishing and prohibiting sport hunting was applied in most subsequently created national parks.

The act of May 7, 1894, known informally as the first "Lacey Act," prohibited the "killing, wounding, or capturing at any time of any bird or wild animal, except dangerous animals, when it is necessary to prevent them from destroying human life or inflicting an injury . . . within the limits of said park." This law, which was enacted in response to a bison poaching incident, provided park managers with improved power to punish offenders.

On August 16, 1916, Congress created the National Park Service, whose mission is "to conserve the scenery and the natural and historic objects and the wildlife in parks and to provide for the enjoyment of the same in such manner, and by such means as will leave them unimpaired for the enjoyment of future generations."

The act of January 24, 1923, recognized the authority of the secretary of the interior to "sell or otherwise dispose of the surplus buffalo of the Yellowstone National Park herd."

Several recent planning and policy documents, including the *Yellowstone National Park Master Plan* (NPS 1974), the *Yellowstone National Park Statement for Management* (NPS 1991), and the *National Park Service Management Policies* (NPS 1988), require the protection of ecological processes and native species in a relatively undisturbed setting, and require that park planning be accomplished in a regional

context. This latter concern is summarized in the *Management Policies* as follows: "Recognizing that parks are integral parts of larger regional environments, the National Park Service will work cooperatively with others to anticipate, avoid, and resolve potential conflicts, to protect park resources, and to address mutual interests in the quality of life for community residents, considering economic development as well as resource and environmental protection."

Gallatin National Forest, U.S. Forest Service, Department of Agriculture. The national forests of the United States derive management authority and direction from a variety of laws. Principal among these are the following:

The Creative Act of 1891, which authorized the president to set aside public lands as forest reserves.

The Organic Administration Act of 1897, which specifies the purposes for which forest reserves might be established and provided for their protection and management.

The Multiple Use-Sustained Yield Act of 1960, which established the multiple-use and sustained yield policies for management of the national forests.

The 1974 Forest and Rangeland Renewable Resources Planning Act and the 1976 National Forest Management Act, which direct preparation of strategic plans for all Forest Service activities, including a comprehensive plan for each national forest.

Through these statutes the Gallatin National Forest maintains viable populations of existing native and desired nonnative vertebrate species, and maintains diversity of plant and animal communities to meet overall multiple-use objectives. These broad objectives are further clarified in the 1987 *Gallatin National Forest Land and Resource Management Plan*, which portrays a program of uses for these 1.8 million acres that best meets the demands of a diversified public. In addition to the general laws guiding Forest Service activities, an Act of May 26, 1926 (16 USC 37) is significant to management of the upper Yellowstone River corridor as it gives specific recognition and authority for federal acquisition and management of the northern winter range for migratory animals. This early recognition of need for extensive winter range, especially mentioning elk but not exclusive to them, continues to be expressed in land acquisition efforts by the Gallatin National Forest. In the last decade alone, some 12,000 acres of winter range has been added to the forest to complement acquisitions by the state of Montana, through partnerships with private organizations. Expressed in the preferred alternative (alternative 7) in this environmental impact statement is a tentative acquisition of some 8,000 acres of lands that may be acquired in title and another 2,000 acres of lands on which easements may be acquired for the benefit of wintering wildlife. For the portion of these lands that may become the Gallatin National Forest, priority for uses will be for big game winter range, as directed by the 1987 forest plan. The further utility of these lands for either concentrated uses or site-specific facilities will be determined through appropriate public involvement and NEPA decision-making processes.

State of Montana, Department of Fish, Wildlife and Parks. Montana statutes authorize the Fish, Wildlife and Parks Commission to set the policies for the protection, preservation, and propagation of the wildlife, fish, game, furbearers, waterfowl, nongame species, and endangered species of the state. Within the policies established by the commission, the Montana Department of Fish, Wildlife and Parks is responsible for supervising the management and public use of all the wildlife, fish, game, furbearing animals, and game and nongame birds of the state.

The 1985 Montana Legislature authorized a hunting season for bison. This legislation was repealed during the 1991 legislative session, making bison a game animal that cannot be legally hunted. This 1991 legislation and a House Joint Resolution adopted during the 1989

session are consistent expressions of Montana's concern for (1) the possible transmission of brucellosis from Yellowstone bison to domestic livestock, (2) the possibility of damage to private property when bison leave Yellowstone National Park, and (3) the implementation of a long-term, flexible management program in cooperation with Yellowstone National Park, Gallatin National Forest, the Montana Department of Livestock, and the Animal and Plant Health Inspection Service.

State of Montana, Department of Livestock. The Animal Health Division of the Montana Department of Livestock has statutory authority to protect and promote the Montana livestock industries through the adoption of rules, policies, and orders fostering the prevention, control, and extirpation of animal disease. The Department of Livestock has the power to quarantine, inspect, test, and slaughter animals in the interest of its mandated mission. The department may cooperate with the U.S. Department of Agriculture and other federal agencies to remove infection and suppress disease. The department may, in fact, adopt applicable portions of federal policies and rules to attain its goals. Some state statutes define specific prohibitions of certain actions that are counterproductive to sound disease suppression. These center primarily on requirements for entry of animals into Montana and for animals in known diseased herds or premises.

Between 1952 and 1985, eradication of brucellosis in cattle from Montana was a major control endeavor. Upon completion of the goal of eradication from cattle in 1985, the efforts against brucellosis have concentrated on preventing its reintroduction.

The Department of Livestock has specific statutes and rules pertaining to bison. The department has the authority to regulate estrayed or improperly disposed of animals that fit within Montana's legal definitions; this includes bison. Most legislative or regulatory authorities applied to diseased bison have evolved from experiences with privately owned bison classified as livestock. The Department of Livestock, however, makes no legal or medical distinction in addressing the disease risks presented by publicly owned bison versus privately owned bison. The department believes that this is appropriate when conflict areas lie within the jurisdictional boundaries of the state of Montana. Specific statutes (81-2-120 MCA) address the removal from the state of publicly owned bison originating from a herd infected with a dangerous disease when the disease may spread to persons or livestock or jeopardize the state's compliance with other state-administered or federally administered livestock disease control programs. In essence, wild bison may be summarily removed from within the state's boundaries by the safest and most expeditious means if they originate from a diseased herd. In Montana, Yellowstone National Park bison fit within these specific statutory obligations.

The Montana Department of Livestock, Animal Health Division, is funded by "State Special Revenue (per capita tax) sec. 15-24-901 through 931 (MCA), Article 12, sec. 1 sub (2) Montana Constitution." This tax is paid by all Montana livestock producers and no general fund monies are expended by the department.

Animal and Plant Health Inspection Service, U.S. Department of Agriculture (cooperating agency). The mission of this agency is to lead the national effort to protect, sustain, and improve the health, quality, and productivity of United States' agricultural resources. The Act of May 29, 1884, established the Bureau of Animal Industry and authorized the commissioner of agriculture to cooperate with states to prevent the spread of livestock diseases. The act also prohibited the transportation of diseased livestock from one state or territory to another.

Subsequent acts authorized the secretary of agriculture to establish regulations to prevent the introduction or spread of animal disease from a foreign country or from one state or territory into another, and to quarantine any state or portion of a state and prohibit transportation of animals to and from quarantine, and in other ways defined in detail the scope and effect of APHIS authority. Extensive authority was granted for cooperation with other agencies (state and

federal), not only in eradication and control of diseases, but also in research on those activities.

The act of July 2, 1962, prohibited the interstate movement of animals reacting to the tests for brucellosis, and subsequent regulations provided a system for classifying states or portions of states (areas), herds, and individual animals with respect to brucellosis status. States or portions of states are classified according to their rate of *Brucella* infection present in cattle and the general effectiveness of their brucellosis control and eradication program. The classifications are class free, class A, class B, and class C. States or areas that do not meet the minimum standards for class C are required to be placed under federal quarantine. Restrictions on the interstate movement of cattle and bison are generally more stringent for movements from class A states or areas than from class-free states or areas, and are more stringent for movements from class B states or areas than from class A states or areas, and so on. The most stringent restrictions are for movements from quarantined states or areas.

SCOPING PROCESS AND PUBLIC PARTICIPATION

The National Park Service, U.S. Forest Service, and Montana Department of Fish, Wildlife and Parks initiated the process of preparing an environmental impact statement for an interagency bison management plan by publishing a "Notice of Intent" in the *Federal Register* in July 1990 (the Montana Department of Livestock and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service joined the planning process shortly thereafter). In order to identify issues and alternatives to be considered, a public participation and interagency coordination program was developed. This effort, called "scoping," included the review of all relevant previous planning and management documents, as well as scientific and popular literature related to the issues involved.

In November 1989, prior to the publication of the notice of intent, a brochure entitled *The Yellowstone Bison: Managing a National Heritage* was published and distributed to provide an interested public with current information on the bison management issue. As a way of more completely informing the public on the issue's background, and of initiating public involvement, a booklet entitled *Yellowstone Bison: Background and Issues* was then published in May 1990. This booklet, distributed to the interested public, was accompanied by a scoping letter that suggested a range of alternatives for bison management.

Written and verbal public comments identifying issues and concerns about these suggested alternatives were sought from August 11 through October 31, 1990. Public scoping meetings were held in Gardiner, West Yellowstone, and Bozeman, Montana, on October 9, 10, and 11, 1990, respectively. Public responses to the scoping document were summarized and the comment summary was distributed to those interested in December 1990. A second public input session in spring 1991 focused on the review of a short list of alternatives.

During development of the long-range plan and environmental impact statement, a series of four interim bison management plans and environmental assessments have been prepared (NPS 1990, 1992; State of Montana 1995; NPS and State of Montana 1995). All have been publicly available or included public comment periods. The most recent of these was released to the public on December 20, 1995 (NPS and State of Montana 1995). This environmental assessment was on public review through February 2, 1996. The agencies received 260 comments from state and federal agencies, Native American tribes, organizations, and individuals. The agencies prepared a summary of public comments and issues, responses to issues, and corrections to the environmental assessment. A finding of no significant impact (FONSI) was signed on August 5, 1996, and made available to the public.

OBJECTIVES, ALTERNATIVES, AND ISSUES FROM PUBLIC COMMENTS

The scoping and public review processes described above provided the agencies with public input on objectives, alternatives, and environmental issues. Many of these suggestions became part of the analysis for this environmental impact statement and are enumerated below.

Objectives

The following objectives gathered through public commentary were incorporated by the interagency team in creating its list, discussed above (see "Objectives in Taking Action" section):

- Minimize impacts on bison population dynamics and behavior. (Objective #1, general purpose statement)

- Develop an ecosystem based, bison disease management plan. (Objective #1, general purpose statement)
- Control bison distribution (movements) and numbers. (Objectives #1 and #2)
- Protect human health and safety. (Objective #3)
- Maintain Montana's brucellosis-free status. (Objective # 6)
- Maintain a self-sustaining, genetically diverse bison population (a minimum viable population). (Objective #7)
- Determine impacts and cooperatively manage impacts on threatened and endangered species, wetlands, and historic and cultural resources. (Objective #9)

Alternatives Included in this Environmental Impact Statement

The following options suggested by the public were included in the range of alternatives analyzed in this environmental impact statement. Some were slightly modified, but are considered similar enough to the original suggestion to be included in this section.

Manage bison without lethal controls. Although alternatives minimize the use of lethal controls in some cases (alternative 2), none completely eliminates the option of shooting bison. This is because agencies could not meet the objective to "clearly define a boundary line beyond which the bison will not be tolerated" without the ability to use lethal means to control bison.

Provide opportunities for Native American tribes, other organizations, and the general public to obtain live bison. Concerns were expressed that live bison be made available to Native Americans, other organizations, or the general public as an alternative to the killing of bison by government agents or hunters. Many of these concerned citizens thought that Native Americans and other people would have the opportunity to benefit culturally, spiritually, and economically by receiving Yellowstone bison. Bison can be shipped live only after meeting the release requirements of an approved quarantine protocol. Alternatives 3, 4, and 7 include quarantine.

Some of these Native American groups have contacted various agencies expressing an interest in the participation of a quarantine facility program. One group, the InterTribal Bison Cooperative, consisting of 42 tribes in 17 states, has developed a proposal for a program for a quarantine facility. Another such group, One People, One Nation, is a nonprofit organization dedicated to returning the buffalo to native lands and is actively raising funds to assist the state of Montana in the cost of building and maintaining a quarantine facility. If the selected alternative includes quarantine, the location, funding, and design of the quarantine facility would be analyzed in a future NEPA process. The two proposals specifically mentioned, and others the agencies receive, will be among those considered and analyzed.

Provide opportunities for Native American Tribes, other organizations, and the general public to obtain bison carcasses. All alternatives include provisions to provide carcasses to social service organizations, tribes, or the general public or other organizations through auction.

Acquire additional lands for bison. Recent initiatives and public-private partnerships in acquiring elk winter range north and west of Yellowstone National Park were cited as effective ways to improve wildlife habitat availability north of the park. Alternatives 2, 3, and 7 in this environmental impact statement allow for acquiring additional winter range from willing sellers, or for altering cattle operations on those lands to remove susceptible cattle, or both.

Establish bison management areas outside Yellowstone National Park. A central question for the public and for land managers is which lands bison would be allowed to occupy. The alternatives provide a variety of answers to this question, including restricting bison distribution to Yellowstone National Park (alternative 5); allowing bison unrestricted access to most public lands they may seek to occupy (alternative 2); and allowing bison restricted access to designated public lands in and immediately adjacent to Yellowstone National Park (alternatives 1, 3, 4, 6, and 7).

Many concerns center, favorably or unfavorably, on the establishment of special management zones on public lands along the park boundary. The creation of special bison management areas (SMAs) adjacent to Yellowstone National Park is a part of all alternatives except alternative 5.

Restrict winter recreational use in Yellowstone National Park. Increasing winter recreational use of Yellowstone National Park, with concurrent winter grooming of roads for use by oversnow travel, is seen by some members of the public as contributing to increased bison population size and movement. Concern over these departures from traditional use patterns has resulted in an interest in reducing winter use in the park, presumably to restore more natural limitations on bison. Some changes in winter use activities are a part of alternative 2 and would also be a consequence of alternatives 5 and 6.

In a settlement agreement executed on September 23, 1997, in "The Fund for Animals v. Babbitt" (D. D.C., Civ. No. 97-1126), the National Park Service agreed to prepare a new winter use plan and environmental impact statement to evaluate a full range of alternatives on all aspects of winter use activities in Yellowstone National Park, Grand Teton National Park, and John D. Rockefeller, Jr., Memorial Parkway.

Modify cattle grazing allotments on the national forest to reduce conflict between bison and cattle. Concerns were expressed over existing grazing allotments, and if Gallatin National Forest should manage the allotments to emphasize use by livestock, wildlife, or a combination of both. All alternatives except alternative 5 allow for minor alterations in these allotments, including timing of use to accommodate both cattle and bison. Alternatives 2, 3, and 7 envision more changes to the allotments, including modifying operations to remove susceptible cattle or moving cattle operations.

Make Yellowstone National Park responsible for bison disease management. The bison that have occupied Yellowstone National Park continually since prehistoric times are the remnants of once larger herds that occupied much of the west. These bison have long been almost solely the management responsibility of the National Park Service, and some members of the public expressed a feeling that "this is the park's problem, so the park should solve it." Alternatives 5 and 6 address bison management primarily as a park operation with management operations almost entirely within the park boundary. However, in each of the alternatives analyzed in this environmental impact statement, Yellowstone National Park plans to be an active participant.

Conduct additional research and public education. The agencies agree that continued research and education into many aspects of bison and their management as well as brucellosis in bison and elk is needed. Efforts to collect and analyze research data and improve public education is an ongoing effort by all the agencies, and will in fact continue whether an interagency bison management plan is approved or not approved. The relevant research and its status are listed in appendix D. The agencies have developed this environmental impact statement based on the best currently available knowledge, and have included alternative interpretations when there is disagreement among the scientific community.

Alternatives Suggested but Not Analyzed

Members of the public also suggested a number of alternatives that were considered by the agencies, but precluded from further analysis. A brief discussion of each of these alternatives follows.

Fence the perimeter of Yellowstone National Park to physically prevent bison from migrating beyond the park boundary. Migrating bison are not easily deterred by normal fences. While substantial or electrified fences could limit bison migrations, they would have major impacts on the movements of other wildlife species, such as pronghorn, bighorn sheep, elk, moose, deer, and bear. Restricting these species has serious ecological and social consequences, including prevention of normal migrations of game species onto public lands (some of which are designated for winter use of animals moving from Yellowstone National Park) and concentration of animals in a confined area with resultant damaging effects on local vegetation. These consequences are inconsistent with both state and federal wildlife management policies. Fences also tend to create a zoo-like atmosphere that is contrary to the wildlife management policies of several agencies.

Adequate fences would also be expensive to purchase, install, and maintain, and their installation could cause major site impacts. Estimates for purchase and construction of "bison-proof" fences are $30,000 to $50,000 per mile depending on access and terrain. Yellowstone National Park has a perimeter of about 250 miles, and bison migrations from the park have at times occurred at a number of widely scattered points. Constant monitoring would be required to ensure that fences were not breached by animal damage, falling trees, or other events. Fences would be less effective, or perhaps even useless, during winter months, when snowdrifts could bury them and the bison could leave through the public access points of the park. For the above reasons, fencing the park is not being evaluated further, although limited, site-specific fencing will be retained as a management option.

Provide supplemental forage for bison to prevent them from migrating beyond the park boundary. As an expedient or temporary measure, the distribution of high-quality hay and commercially prepared rations at strategic locations near the park boundary could conceivably have the desired effect of encouraging bison to migrate no farther. However, hay baiting was largely unsuccessful even though it was used extensively in the 1970s to influence bison migrations. If done consistently, providing supplemental forage would do nothing to relieve the pressures of bison migrations. Over time, with such additional food sources, bison numbers might increase to unnaturally high numbers. Undesirable changes in behavior and social organization, and increased incidence of brucellosis infection and other diseases in bison would probably result from such long-term concentrations on artificial feeding sites. These outcomes are contrary to the intended purposes of a bison management plan and NPS policy.

Among professional managers and ecologists, supplemental feeding of wild herbivores is widely recognized as a poor range and wildlife management practice. Animals become increasingly dependent on the feedgrounds while they continue to forage heavily on vegetation in the vicinity, resulting in serious damage to native range.

Artificial feedsites are recognized as reservoirs of disease. Bison concentrated at such a feed site would be increasingly exposed to risk of infection by brucellosis, other diseases, and parasites. Other ungulates, especially elk, would be attracted to the feedgrounds, increasing their exposure to disease as well. The potential for subsequent transmission of brucellosis from these elk to domestic livestock also could increase.

For these reasons, supplemental feeding of bison to stop their migrations will not be evaluated further in this environmental impact statement.

Relocate bison to other public ranges or private lands. The option of relocating bison has been addressed in several of the alternatives

but with specific restrictions. The Animal and Plant Health Inspection Service's *Uniform Methods and Rules for Brucellosis Eradication* and relevant regulations control the relocation of brucellosis-exposed livestock. Once captive, these methods and rules would apply to bison. The unrestricted relocation of the captive bison would not be allowed and is therefore not analyzed further in the environmental impact statement. The relocation of bison successfully completing quarantine procedures is a part of alternatives 3, 4, and 7.

Stop oversnow vehicle (snowmobiles and other tracked vehicles) travel on all roads in Yellowstone National Park. A *Winter Use Plan for Yellowstone and Grand Teton National Parks and John D. Rockefeller Jr., Memorial Parkway* (approved in 1990) identified that use of snowmobiles and snowcoaches along road corridors, and maintenance of the road corridors (through grooming) for this use, were appropriate activities that would not result in significant impacts. Winter use of Yellowstone National Park is growing rapidly, and winter activities are undergoing monitoring and research. Yellowstone National Park, Grand Teton National Park, and the six surrounding national forests recently issued a joint assessment of winter use on federal lands within the greater Yellowstone ecosystem. Operationally, some oversnow travel is required for park maintenance and protection purposes during the winter months. Discontinuing maintenance (winter grooming) of some segments on some key roads within the park to reduce the number of bison migrating toward Montana boundaries is part of alternative 2. In resolving litigation challenging the winter use program in Yellowstone National Park, Grand Teton National Park, and John D. Rockefeller, Jr., Memorial Parkway, the National Park Service agreed to prepare a new winter use plan and environmental impact statement. The National Park Service agreed to consider a full range of alternatives for all winter use activities, and is scheduled to commence scoping on that document in 1998.

Control bison population numbers using current wildlife birth control methods. The purpose of actions proposed in this environmental impact statement is to maintain a wild, free-ranging bison population and maintain the brucellosis class-free status of Montana by ensuring a low potential risk of brucellosis transmission between bison and cattle. However, unlike this specific goal, contraception is broad-based and a nonspecific population control method.

Currently, the bison population numbers 2,156 animals (actual fall 1997 count). However, as population sizes increase to a point where numbers management is important, the ability to effectively use contraception falls. Research has been done on using contraception as a technique to limit the growth of certain nonnative wildlife populations elsewhere in North America. A six-year study of wild horses at Assateague Island National Seashore in Maryland showed promising results. However, researchers at Assateague indicated that a major factor in the success of that program was that they were dealing with a small population of animals (165 horses) confined to a relatively small island habitat (8,500 acres).

Bison population control using contraceptives would be a highly technical program, requiring professional personnel and specialized supplies and equipment. Some contraceptive agents must be delivered by hand, requiring handling of the animals. Others could be delivered remotely (by hypodermic darting, for example), up to a distance of 50 yards. In both cases, bison could develop conditioned avoidance, making it increasingly difficult to administer the agent.

Long-term effects of having a large number of nonreproducing animals in a herd are unknown. Hormonal contraception of females would suppress ovarian function, prevent estrous cycles, and reduce male attraction to females (McCullough et al. 1993). Immunocontraception does not prevent ovarian cycling, and males could be repeatedly attracted to females. The breeding season likely would be extended because of the polyestrous (multiple ovulation)

nature of nonpregnant animals and could have physiological effects on males and females. It is also unknown if immunocontraception would affect the immune system of bison and potentially make them more susceptible to disease.

For these reasons, contraception will not be considered as a population control strategy for bison in this environmental impact statement.

Using sterilization (neutering) as a means of controlling brucellosis in bison in Yellowstone National Park. The Animal and Plant Health Inspection Service's *Uniform Methods and Rules for Brucellosis Eradication* and relevant regulations offer sterilization as an option to livestock producers with brucellosis-exposed cattle. It has been suggested as a means of controlling the spread of brucellosis in bison as well.

Brucellosis is a disease usually affecting the reproductive tract of animals, causing abortions. It is transmitted primarily when noninfected animals come into physical contact with aborted materials or birthing products that harbor the *Brucella* organism. Sterilized female bison would be rendered harmless for any potential transmission of brucellosis given the biological circumstances for such transmission. The *Uniform Methods and Rules for Brucellosis Eradication* and relevant regulations require that bull bison also be sterilized, even though the risk of bulls transmitting the disease sexually is uncertain but unlikely.

Neutering, by whatever means and for whatever purpose, may alter the social interactions and behavior of bison, such as family bonds or the dominance of bulls during the rut. Sterilization, if done on a large scale, might have genetic influences on the population by eliminating pre-selected animals from the gene pool. And, neutering would not contribute to controlling migrations.

For these reasons, neutering bison and returning them to Yellowstone National Park will not be considered further in the environmental impact statement, although changing cattle operations to run steers or spayed heifers is a part of alternatives 2 and 3.

Depopulate the entire Yellowstone bison herd and replace it with brucellosis-free bison. The *Uniform Methods and Rules for Brucellosis Eradication* and relevant regulations provide owners of brucellosis-affected herds with the option of depopulation and herd replacement. Depopulation of the Yellowstone National Park bison herd is rejected for the following reasons:

1. While all Yellowstone bison have been exposed to brucellosis, not all are infected. Uninfected bison are no risk to cattle.

2. The removal of thousands of bison that have merely been exposed to brucellosis is unacceptable to most people who have submitted comments thus far.

3. Depopulation operations, by whatever method, would have negative impacts on other wildlife and park resources, including threatened and endangered species.

4. A portion of Yellowstone bison may have desirable genetic materials, such as a demonstrated immunity to brucellosis, to contribute to future genetics research and development, as well as to the biodiversity of the species and the planet. They are also descendants of the only continually wild bison herd in the United States.

5. Brucellosis is also found in elk in the Greater Yellowstone Area, so the risk of elk infecting a replacement bison herd renders depopulation meaningless.

For the reasons listed above, depopulation of the Yellowstone National Park bison herd will not be considered further in this environmental impact statement.

Allow native predatory animals to control the bison population. Yellowstone has an abundance of predators, including grizzly and black bears, mountain lions, coyotes, and

wolves, but to date these animals have had limited influence on the bison population. Coyotes, bears, wolves, and mountain lions may take an occasional bison calf, but there are other prey species, such as elk and deer, that are more numerous and more susceptible to predation than a healthy adult bison.

Wolves, which have been recently reintroduced on an experimental basis in Yellowstone National Park, may eventually reduce the bison population by some measurable amount. However, data from Wood Buffalo National Park in Canada indicates that wolf predation on bison is a major factor only in combination with major habitat changes or the lack of alternate prey (Carbyn, Oosenbrug, and Anions 1993). Because there are no indications that changes in the availability of alternate prey species or in major habitat are likely to take place in Yellowstone in the foreseeable future, wolves cannot be expected to have a major impact on bison populations.

While predatory animals will continue to play an important role in the natural systems of Yellowstone, they are not expected to significantly impact bison populations and will not be further evaluated in the environmental impact statement.

Control or eradication of brucellosis in elk. It does not appear possible to eradicate brucellosis from bison without also eradicating it from elk and is therefore not part of this bison management plan. However, eradication in both species will be addressed by the GYIBC in a future planning process.

Require livestock owners to stop raising cattle, to raise bison instead of cattle, or to graze only steers. Although incentives to eliminate susceptible cattle are parts of some of the alternatives analyzed, requiring livestock owners to modify their operations is not a legal option.

Require cattle to be vaccinated for brucellosis. The cooperating agencies have no authority to require vaccination of animals that remain on their owner's premises. Cattle producers are encouraged to voluntarily vaccinate cattle in high-risk areas. At this time, all Montana female calves near Yellowstone National Park are voluntarily vaccinated against brucellosis by owners (State of Montana, former state veterinarian, C. Siroky, pers. comm., May 21, 1997). State animal health authorities may also require vaccination of female calves grazed on public lands within a bison contact area (e.g., within the SMA).

Vaccination may adversely affect marketing of animals in some international markets, as several foreign countries perceive vaccination as a possible disease risk and know older vaccines can cause positive responses on diagnostic tests for brucellosis (see "Livestock Health and Operations" section).

Allow bison to exist without human influence. Allowing bison to exist without human influence would lead to their migration out of the park and eventually onto their historic range. This violates the interagency agreed upon purpose to "address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana," as well as objective #2 (clearly define a boundary line beyond which bison will not be tolerated), objective #4 (commit to the eventual elimination of brucellosis in bison and other wildlife), objective #5 (protect livestock from the risk of brucellosis), and objective #6 (protect the state of Montana from risk of reduction in its brucellosis status). For these reasons, the alternative to "do nothing" is considered unreasonable (see "Alternatives Considered but Rejected" section).

Restore bison to the Great Plains. Interest was expressed in allowing bison to recolonize large areas of the plains beyond the Greater Yellowstone Area, even "as far as St. Louis." For reasons stated above, this alternative is considered unreasonable and will be not analyzed further. However, all alternatives except alternative 5 do allow very limited numbers of bison to recolonize some public

lands beyond the boundary of Yellowstone National Park.

Environmental Issues

The public also asked that certain environmental issues be analyzed. Issues are environmental problems that might occur should action be taken as proposed. They are analyzed in this document in part 4, "Environmental Consequences." The National Environmental Policy Act requires that only important issues, e.g., those with the potential for significant or severe impacts, be discussed in an environmental impact statement, and that the discussion of unimportant issues be minimized or eliminated. Table 1 includes a summary of issues considered by technical experts on the interagency team to be important. Following the table is a brief discussion of issues considered, but eliminated as less important. The list of issues was created by both the public and agency specialists.

TABLE 1: ENVIRONMENTAL ISSUES AND CORRESPONDING IMPACT TOPICS

Description of Environmental or Other Issue	Corresponding Topics in Part 4, "Environmental Consequences," Where Impact is Discussed
Lethal means of control would reduce bison population numbers, but not below an established minimum (580 bison) required to maintain genetic viability.	Impacts on bison population chapter, methodologies for analyzing impacts section
Slaughter and shooting, used by agencies to maintain separation of cattle and bison and reduce the risk of transmission of brucellosis, would slow natural growth rates of the Yellowstone bison population.	Impacts on bison population chapter, effects on the bison population section
Parkwide slaughter of seropositive bison (in alternative 5) would temporarily drop population numbers below the lower end of the range of bison for which agencies would manage.	Impacts on bison population chapter, effects on the bison population section
Vaccinating calves (alternatives 1 through 7) would result in lower seroprevalence rates in the bison population.	Impacts on bison population chapter, seroprevalence in the bison population section (alternatives 1 through 7)
Parkwide vaccination of calves and adults would, in combination with capture and slaughter, reduce seroprevalence rates to near zero.	Impacts on bison population chapter, seroprevalence in the bison population section (alternatives 5 and 6)
Hunting would reduce population numbers in special management areas outside the park in alternatives 3, 4, and 7.	Impacts on bison population chapter, effects on free-ranging status and distribution of bison section (alternatives 3, 4, and 7)
Winters with varying severity or other periodic events would result in varying migrations of bison outside the park.	Impacts on bison population chapter, stochastic influence on bison population section
Increases in bison population numbers, which would occur in alternatives 1 through 4 if winters are normal, would increase viewing opportunities for Yellowstone area visitors.	Impacts on recreation chapter, bison viewing section (alternatives 1 through 4)
Decreases in bison population numbers, which would occur for up to 15 years in alternatives 5 through 7, would decrease viewing opportunities for Yellowstone area visitors.	Impacts on recreation chapter, bison viewing section (alternatives 5 through 7)

Description of Environmental or Other Issue	Corresponding Topics in Part 4, "Environmental Consequences," Where Impact is Discussed
Changes in winter road grooming, road plowing, or road closures on some roads inside Yellowstone National Park to keep bison from migrating outside the park boundaries would mean snowmobile and snowcoach traffic on these roads would be displaced.	Impacts on recreation chapter, winter recreation section (alternatives 2, 5, and 6)
Bison hunting, if approved by the Montana Legislature, would supply additional recreational opportunities in the Yellowstone area.	Impacts on recreation chapter, hunting section (alternatives 3, 4, and 7)
Perceived risks of brucellosis transmission to cattle in the Yellowstone area may cause producers to leave the area.	Impacts on livestock operations chapter, cumulative impacts common to all alternatives section
Yearly testing of herds in the parts of Montana adjacent to Yellowstone where bison may range in some alternatives would add to the cost of livestock operations.	Impacts on livestock operations chapter, brucellosis testing and vaccinating section
Changing operations to remove susceptible cattle may be difficult for livestock operators, as changes in equipment, structures, and personnel would be required.	Impacts on livestock operations chapter, conversion from cow-calf to steer or spayed heifer enterprise section (alternatives 2 and 3)
Modifications in public grazing allotments may displace cattle herds to other locations and increase demand for grazing resources.	Impacts on livestock operations chapter, Gallatin National Forest grazing allotments section (alternatives 2 and 3), and impacts on socioeconomics chapter, summary of benefits and costs section
Acquisition of easements or purchase of property from willing sellers as winter range for bison would cost taxpayers money.	Impacts on livestock operations chapter, private land acquisitions and easements section (alternatives 2, 3, and 7)
Bison may damage fences, livestock, and other private property if they leave the park.	Impacts on livestock operations chapter, property damage by bison section
Upon completion of the quarantine procedure, live bison may be used to seed herds on Native American reservations and improve income for tribes (alternatives 3, 4, and 7).	Impacts on socioeconomics chapter, minority and low-income populations section
Increases in tourism and individual entrepreneurs are offsetting the decline in resource extraction industries in the Yellowstone area to maintain a prosperous economy in Gallatin and Park Counties.	Impacts on socioeconomics chapter, cumulative impacts common to all alternatives section
Changes in winter road grooming, road plowing, or road closures on some roads would reduce winter tourism-related income in West Yellowstone and the Greater Yellowstone Area.	Impacts on socioeconomics chapter, regional economy section (alternatives 2, 5, and 6)
Bison hunters would benefit the economy of the Greater Yellowstone Area through dollars spent while in the area.	Impacts on socioeconomics chapter, regional economy section (alternatives 3, 4, and 7)
Reducing bison numbers through lethal means may trigger a boycott with economic consequences.	Impacts on socioeconomics chapter
Changes in cattle operations or acquisition of easements or property from willing sellers may change the contribution of livestock-related dollars to the regional or state economy.	Impacts on socioeconomics chapter, regional economy section

Description of Environmental or Other Issue	Corresponding Topics in Part 4, "Environmental Consequences," Where Impact is Discussed
Bison that are shot or slaughtered may be released to Native American tribes, and to charitable organizations.	Impacts on socioeconomics chapter, minority and low-income populations section
Bison are perceived many different ways, and their slaughter and shooting offends some.	Impacts on socioeconomics chapter, social values section
If bison are perceived as disease-carrying animals, ranchers outside the park boundaries may be worried their lifestyle will be threatened.	Impacts on socioeconomics chapter, social values section (alternatives 2, 3, and 7)
People are willing to pay additional taxes to secure land for bison if it would reduce or eliminate slaughter and return more natural conditions.	Impacts on socioeconomics chapter, nonmarket values section
Increases in the bison population would mean increases in tourism; decreases would mean decreases in tourism.	Impacts on socioeconomics chapter, nonmarket values section
Food sources for grizzly bear, including whitebark pine nuts and cutthroat trout, are decreasing in the Greater Yellowstone Area due to blister rust and the accidental introduction of lake trout to Yellowstone Lake, respectively. This, in combination with increased private development, increased recreation, and timber harvest has influenced the amount and quality of grizzly bear habitat.	Impacts on threatened, endangered, and sensitive species chapter, cumulative impacts common to all alternatives section
Grizzly bears and gray wolves may lose habitat from the construction of capture or quarantine facilities.	Impacts on threatened, endangered, and sensitive species chapter, impacts common to all alternatives section
Shooting, hazing and other human activities may displace or disturb grizzly bears and gray wolves in the short term.	Impacts on threatened, endangered, and sensitive species chapter
Bison serve as live prey and carrion for grizzly bears and gray wolves. If more bison are present, these predators may fare better; if bison numbers are decreased, some grizzly bears, wolves, and other species may suffer.	Impacts on threatened, endangered, and sensitive species chapter
Grizzly bears feed primarily on bison and elk carrion when they emerge from their dens in the spring in the park interior. However, increased bison populations provide more carrion and more bears enter the summer in good condition.	Impacts on threatened, endangered, and sensitive species chapter (alternative 2)
Grizzly bears feed primarily on bison and elk carrion when they emerge from their dens in the spring in the park interior. If bison are slaughtered in large numbers, bears may be adversely affected.	Impacts on threatened, endangered, and sensitive species chapter (alternative 5)
A decrease in snowmobile use in the park, with a result in increased use on the adjacent national forests, may shift the location of effects on various sensitive wildlife species, including the wolverine and lynx.	Impacts on threatened, endangered, and sensitive species chapter (alternatives 2, 5, and 6)
A capture facility at Seven-Mile Bridge may disrupt nesting trumpeter swans as well as displace wintering swans.	Impacts on other wildlife species chapter (alternative 6)
Large numbers of bison may displace ungulates like elk, deer and bighorn sheep where they overlap.	Impacts on other wildlife species chapter, impacts common to all alternatives section
If bison populations increase, predators and scavengers will benefit. If they decrease, predators and scavengers may suffer.	Impacts on other wildlife species chapter, impacts common to all alternatives section

Description of Environmental or Other Issue	Corresponding Topics in Part 4, "Environmental Consequences," Where Impact is Discussed
Capture operations, hazing, and shooting may affect wildlife through displacement and disturbance.	Impacts on other wildlife species chapter
The Stephens Creek facility is located on pronghorn winter range. It removes habitat and displaces animals from the area.	Impacts on other wildlife species chapter.
Wing fences and corrals in capture facilities may inadvertently capture other ungulates.	Impacts on other wildlife species chapter.
Acquisition of additional wildlife winter range in the Yellowstone River valley near Gardiner would provide additional habitat for elk, mule deer, bighorn sheep and pronghorn.	Impacts on other wildlife species chapter
People who work in slaughterhouse, hunters, and veterinarians or laboratory personnel working with infected carcasses or tissues are at risk of exposure from brucellosis if proper procedures are not followed.	Impacts on human health chapter
Shooting, blood, and viscera associated with killing bison is not visually appealing.	Impacts on visual resources chapter

ISSUES CONSIDERED BUT NOT EVALUATED FURTHER IN THE ENVIRONMENTAL IMPACT STATEMENT

If an issue was considered to either be outside the scope of the environmental impact statement, or the best available scientific evidence indicated it would experience only negligible impacts, it was eliminated from further analysis, as per NEPA requirements. The issues considered but not evaluated further in this document are as follows.

State vs. federal authority to manage bison. To some, the bison management issue is perceived as a local situation not requiring the involvement of "outsiders." In this view, which often translates into a state versus federal authority issue, local regulatory and management agencies should take care of their own decisions. This position is not considered further because, as outlined above under "Legal and Policy Mandates," state and federal laws dictate management authorities for each of the cooperating agencies. None of the cooperating agencies has the option to ignore its responsibilities or abrogate its authority to another agency for wildlife or disease management. Furthermore, the agencies have made a conscious effort and signed a "Memorandum of Understanding" (see appendix C) to work together to develop this bison management plan.

Agencies are being influenced by the livestock lobby and protecting the livestock industry. Concern has been expressed that the livestock industry has a disproportionate influence over the planning process. It is probably the belief of those on any side of an issue that those on the opposite side have more power and influence. This issue is beyond the scope of the environmental impact statement, and not relevant as the agencies have made every effort to address all concerns without giving any one individual or group opinion any more weight than any others. This issue will not be further evaluated in the environmental impact statement.

Livestock grazing impacts on public lands. A variety of livestock-related concerns involved the impacts of livestock on public lands administered by the U.S. Forest Service. Concerns expressed included the beliefs that the livestock industry had excessive political power, that livestock should not be grazed on public lands but wildlife should, that livestock are damaging public land ranges, and that bison should be

given preference over livestock on grazing lands adjacent to Yellowstone National Park. Livestock grazing is a legally authorized activity on many public lands, and these issues are beyond the scope of this environmental impact statement, although modifications in public allotments on the Gallatin National Forest are part of alternatives 2 and 3.

Bison should be listed as a threatened or endangered species. The agencies do not believe that bison as a species meet the criteria for listing under the Endangered Species Act.

Vegetation and vegetative communities. The bison diet consists of sedges and grasses, and these plant communities may experience small changes if population numbers in any one area were to increase or decrease dramatically for a long period of time, e.g., if bison density were to change.

Bison would also exert a more intense impact on vegetation in capture facilities and quarantine areas through trampling. Building facilities and associated structures would also result in the removal of some vegetation as land is cleared for construction. Surveys would be conducted before these facilities are built to ensure no threatened, endangered, or sensitive plant species are present. Otherwise, impacts on vegetative communities to build capture and quarantine facilities proposed in the alternatives are negligible compared to total similar vegetation in the study area.

On the Gallatin National Forest, standards for range condition will be met in accordance with the *Gallatin National Forest Plan* (p. G-14). This issue will not be evaluated further.

Overpopulation of humans. Concern exists that wildlife and wildland are primarily threatened by "encroaching civilization" and increasingly intensive use of landscapes by humans. This issue is beyond the scope of the environmental impact statement and will not be analyzed further.

Impacts on bison genetics. Based on data available at present, a minimum of 580 or more bison (Knowles, unpub. data) is required to maintain genetic viability and diversity in the population. None of the alternatives is expected to reduce the bison population to 580 animals. In fact, in the long term all alternatives would maintain populations at or above 1,700.

Brucellosis in elk and other wildlife species. One concern involving brucellosis is that it is also present in the Greater Yellowstone Area elk, which raises questions of the value of attempting to eradicate brucellosis from bison when elk will still carry it and may transmit it back to bison. This issue involves, to one extent or another, most or all of the elk herds in the GYA, and involves lands in Montana, Wyoming, and Idaho. This issue is beyond the scope of this environmental impact statement, but will be addressed by the GYIBC in a future planning process.

Bison and elk at Old Faithful, by D. L. Cole, 1962. (NPS photo)

Brucellosis survival value in ungulates. Concern exists that brucellosis may have evolutionary survival value in wild animals that have it and seem to have built up a resistance to it; apparently the implication is that loss of the disease in a given ungulate population could lead to that population's increased vulnerability in the future. Brucellosis was not identified in Yellowstone bison until the 20th century, meaning that the bison presumably survived a variety of environmental conditions for several thousand years without such resistance, just as they survived the disease when it was trans-

mitted to them, probably from domestic livestock. This issue is beyond the scope of the environmental impact statement and will not be analyzed further.

Impact of capture facilities on special natural or cultural resources. Capture facilities would be located using specific criteria outlined in part 2, "The Alternatives." These criteria include minimizing impacts on wetlands, threatened and endangered animals and plants, and important historic or other cultural resources. The exact location of capture facilities is unknown in alternatives 5 and 6. If agency decision makers choose either of these alternatives, the facilities would be located within the general areas described in "The Alternatives" using the above criteria. Additional site-specific compliance, including impact analysis, may be necessary to construct and operate additional capture facilities.

Impact of quarantine facility on special natural or cultural resources. If a quarantine facility is located on public land, or built using federal or state money, it would be located using at least the same specific criteria as outlined for capture facilities. These criteria include minimizing impact on wetlands, threatened or endangered animals and plants, and important historic or other cultural resources. Additional impact analysis and site-specific compliance with environmental laws would be required to build such a facility on public land. Therefore, although these resources and impacts on them are discussed generally in this environmental impact statement, the specifics are not known and cannot be evaluated in detail.

Impacts on air quality. Air emissions from trucks transporting bison to slaughter would occur if alternatives 1, 3, 4, 5, 6, or 7 were selected. In addition, particulates and other pollutants from diesel generators required at any of the capture facilities in alternatives 5 and 6 would have a temporary adverse impact on air quality. Because impacts are expected to be negligible, they will not be analyzed further in this environmental impact statement but would be analyzed in any siting evaluation.

Impacts from noise. Generators, snowmobiles, and management activities may result in temporary, minor disturbances to workers or wildlife. The impact of these disturbances to wildlife is addressed in the "Environmental Consequences" part of this document. The impact to humans is negligible and is not analyzed further in this environmental impact statement.

THE ALTERNATIVES

INTRODUCTION

As indicated in "Purpose of and Need for Action," the agencies developed a statement of need, a statement of purpose, and nine specific objectives they believed each alternative had to meet to a large degree before it could be considered reasonable. If the alternative met these objectives, fulfilled the purpose of taking action, complied with legal or regulatory mandates of each agency, and was technically and economically feasible, it was included in the range of alternatives analyzed in this environmental impact statement. Notably, agency mandates differ, and this difference is reflected in the divergent nature of the purpose statement and objectives, as well as in the range of alternatives analyzed.

The objectives and alternatives were developed through a six-year ongoing planning effort (see "Administrative History of Bison Management" section of the "Background") that included several opportunities for public input. Alternatives were added in response to this input. Several commenters insisted on management without lethal controls. Although this type of bison management was considered and rejected from further analysis, the agencies developed alternative 2 as the means to minimize lethal controls and accomplish the purpose of and need for this environmental impact statement. Alternative 3 is similar to a proposal, referred to as the "citizens' alternative," that was developed by representatives from a broad range of conservation, hunting, livestock, and tribal interests. Alternatives 5 and 6 are two different approaches to substantially reduce the incidence of brucellosis in the Yellowstone bison herd, a consistent concern of the livestock industry.

Agency decision makers met in March 1997 to review a list of objectives they had developed in 1992 (see "Objectives and Constraints" in the "Purpose of and Need for Action"). Originally, this list would have driven the selection of only the preferred alternative. However, decision makers agreed that all alternatives must meet these objectives, resolve need, and fulfill the purpose of action to some degree to be carried forward for analysis. This approach would provide agencies several practical options, all of which are implementable. The decision makers also agreed that the existing six alternatives (alternatives 1 through 6 in this environmental impact statement) the agencies had developed with help from public input represented the full range of options. Like agency mandates, public opinion on how bison should be managed proved to be diverse.

In June 1997 agency decision makers met to review information from the in-house draft environmental impact statement and select a preferred alternative from among the six alternatives. However, the agencies found that none of the six alternatives adequately met all their respective needs, and a seventh alternative was developed. Alternative 7 has features of other alternatives, but is also distinct.

In response to public input and agency needs, the range of alternatives was created to "capture" the most divergent, yet reasonable, scenarios each agency could legally implement. Where one might emphasize the "wild, free-ranging population of bison" piece of the purpose statement, another might focus on "addressing the risk of brucellosis transmission." Some also emphasized different management techniques, such as hunting, quarantine, or vaccination. Alternatives were also built to illustrate the effect of the presence or absence of a particular technique. For instance, the impact of quarantine is best understood by comparing alternatives 1 and 4, as they are similar except for quarantine. The effect of vaccinating the entire herd for several years is illustrated by comparing alternatives 5 and 6, which are nearly identical except for this feature. The impact of acquiring land to the north of the park is most clearly understood by comparing alternatives 4 and 7. The "theme" of each alternative is described below to show some of these differences.

Alternative 1 is the no-action alternative. As defined by the National Environmental Policy Act, the no-action alternative in this case is a continuation of the 1996 *Interim Bison Management Plan*. The 1996 plan was modified by state and federal agencies to maintain a generally stable bison population during the winter of 1997–98. The no-action alternative does not consider those modifications; however, the modified features of the interim plan are analyzed under other alternatives. For example, all alternatives except alternative 5 provide for the tolerance for bison posing a lower risk of transmission on public lands at lower population numbers; Alternatives 3, 4, and 7 contemplate holding seronegative bison and feeding them at the Reese Creek facility at the lower end of the population range; Alternative 7 also considers the effects of moving the Madison River capture facility to Horse Butte. Appendix A includes state and federal documents on adjustments to the *Interim Bison Management Plan*.

Alternative 2 focuses on changes in cattle operations outside the park and minimal, nonlethal methods of management to ensure separation and minimize the risk of disease transmission between bison and cattle. It assumes acquisition through purchase, easement, or other means of the largest tracts of land from willing sellers on property adjacent to the park for bison winter range. Alternative 5 is at the other end of the spectrum. It assumes bison would not be allowed to leave Yellowstone National Park and maximizes agency management of the herd. The focus of this alternative is the elimination of brucellosis from bison through the capture of all bison in the herd and the slaughter of all seropositives.

The other alternatives are more moderate in the amount of land available to bison and the intensity and use of management techniques than alternatives 2 or 5. Alternative 3 relies on hunting of bison to regulate population numbers and distribution of bison outside the park, and separation in time and space to preclude contact of bison with cattle. Where hunting is infeasible, capture and shipment of seropositive bison to slaughter and seronegative bison to quarantine are used. Alternative 3 includes provisions for acquisition of some winter range to the north of the park's Reese Creek boundary.

Alternative 4 is similar to the *Interim Bison Management Plan*, but it includes quarantine and hunting as additional bison management tools. Although bison leaving the park to the west are allowed to occupy public lands, private land abuts the park to the north. Under the interim plan, all bison leaving the park to the north are shipped to slaughter, regardless of whether they test seropositive or seronegative. A quarantine facility would allow agencies to ship seronegative bison live to complete a protocol, whereupon they would be available to tribal governments or others. A quarantine facility and hunting would also give agencies management tools they do not now have under the interim plan to manage the population size to some degree.

Alternative 6 is a variation of alternative 5, as it, too, focuses on the elimination of brucellosis from the bison herd. However, parkwide capture, test, and slaughter would not begin until a safe and effective vaccine had been applied to the entire herd for a number of years. Bison would be tested, and when seroprevalence had leveled off, capture, and slaughter of remaining seropositives would begin.

Alternative 7, the preferred alternative, departs from all other alternatives in that a range of bison population numbers would be the focus, and specific management scenarios would be put in place as the population approaches either end of that range. As the bison population approaches 2,500, the upper end of the range, the agencies would increasingly use lethal means to enforce separation of cattle and bison and to maintain population limits. At the lower end, 1,700 bison, agencies would cease all but the most necessary lethal means to maintain separation. Beyond this, alternative 7 includes a mix of management techniques similar to alternatives 1, 3, 4, and 6. Capture and slaughter of seropositives is the primary means of managing risk, as it is in alternatives 1, 4, and 5. Low levels of hunting outside the park are also

allowed, as they are in alternatives 3 and 4. Land to the north of the park's Reese Creek boundary may be acquired, as is proposed in alternative 3. Parkwide vaccination with a safe and effective vaccine is a part of all alternatives, including the preferred alternative.

The agencies believe that these seven alternatives represent a full range of options for management techniques and habitat available to bison to ensure separation between cattle and bison, minimize the risk of transmission of brucellosis to Montana cattle, and maintain a wild, free-ranging bison population. All seven alternatives address the stated agency need for taking action and fulfilling the stated purpose of taking action. Although the alternatives may differ in the degree to which they meet one or more of the objectives (see "Objectives and Constraints" section of the "Purpose of and Need for Action"), the agencies have agreed that each alternative meets all nine objectives to a large enough degree to be considered reasonable. All alternatives are analyzed in similar detail in the "Environmental Consequences" part of this environmental impact statement.

Bison at Old Faithful, 1970.

ACTIONS COMMON TO ALL ALTERNATIVES

INTERAGENCY INVOLVEMENT

Cooperation among agencies is essential to maintain a wild, free-ranging bison herd in Yellowstone National Park and to maintain Montana's federal brucellosis class-free status. The bison traditionally spend summers in Yellowstone National Park, which is managed by the National Park Service, and some move in winter outside the park to neighboring USFS and private land. In Montana, wildlife is managed by the state's Department of Fish, Wildlife and Parks, and cattle diseases are managed by the state's Department of Livestock. Both of these agencies are referred to as the state of Montana in this document. The Animal and Plant Health Inspection Service determines whether Montana is class-free, i.e., its cattle can be moved interstate without brucellosis testing. Animal health authorities in each individual state may impose import regulations equal to or more restrictive than APHIS regulations as long as there are no irreconcilable conflicts with APHIS regulations. Within the identified management boundary for each alternative, different agencies would have primary authority for various management activities. However, agencies would share responsibility for bison management actions.

These agencies have agreed through a "Memorandum of Understanding" (see appendix C) to devise a long-range management plan that is mutually acceptable. Each alternative evaluated in the range of alternatives in this environmental impact statement is one that the agencies considered technically and legally implementable. The alternatives also represent the further limits of acceptability on each side of the range. Those alternatives considered infeasible or illegal have been eliminated from analysis.

BISON POPULATION NUMBERS

All alternatives, except alternative 1 (no action), employ population numbers to guide management actions. A "minimum viable bison population" for Yellowstone National Park may not be possible to define. However, information developed from research with private bison herds suggests that about 580 bison and a normal population sex and age structure are required to ensure random intermixing of breeding animals and avoid significant inbreeding (Knowles, unpub. data). All of the alternatives would preserve the genetic and biological integrity of bison in Yellowstone National Park by maintaining the bison herd at population levels considerably greater than 580 bison. None of the alternatives is intended to reduce the herd to that level, and, in all alternatives, lethal control measures would cease well before the herd has been reduced to 580 bison.

Population models suggest that the maximum number of bison that can live year-long in Yellowstone National Park varies between 1,700 and 3,500 bison, depending on forage production and winter severity. All of the alternatives are intended to maintain a viable bison herd in Yellowstone National Park. During periods of natural or management-induced population declines and as bison numbers approach 1,700, the agencies would more aggressively employ nonlethal methods to encourage bison to remain within management boundaries. Lethal controls would be employed only to remove those bison that pose the greatest risk of brucellosis transmission. Bison also might be held for extended periods in capture facilities for subsequent return to the park.

MANAGEMENT AS A WILD, FREE-RANGING POPULATION

The agreed-upon purpose of taking action is to "maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana." Therefore, each alternative sustains a

wild, free-ranging bison population over the long term, although the degree to which each fulfills this goal varies. A wild, free-ranging bison is defined as one that is not routinely handled and that can move without restrictions within specific geographic areas.

None of the alternatives envisions a "no management" strategy, that is, letting bison roam wherever they want with no agency actions to minimize the risk of brucellosis transmission to cattle. Doing so would be inconsistent with the purpose and need for implementing a long-term, cooperative bison management plan (see "Objectives in Taking Action" section of the "Purpose of and Need for Action"). Rather, each alternative features different levels of "hands-on" management actions to reduce sero-prevalence in the bison population. However, as described above, even during the periods of most active management, each alternative ensures that a viable population of bison is allowed to range over large areas of Yellowstone National Park.

In some alternatives, bison are captured and tested for exposure to brucellosis. Extraordinary measures, which would include the over-wintering of captive bison in agency capture facilities to prevent population numbers from dropping below those required by a particular alternative, would entail a temporary loss of the wild, free-ranging status of the captive animals.

BRUCELLOSIS CLASS-FREE STATUS

As previously stated, the purpose of taking action is to maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the state of Montana. Both the risk of transmission and the economic interest and viability of Montana livestock figure heavily into the state's class-free status. Protecting the state of Montana from a reduction of its status (an objective of taking action) requires actions that ensure, among other things, separation of bison and cattle, ensuring that livestock that graze on public and private lands are not exposed to the *Brucella* organism, and implementation of bison management actions that minimize the risk of transmission from a disease perspective. The agencies have made a commitment to the eventual elimination of brucellosis from the Greater Yellowstone Area. This commitment is also a stated objective to which each alternative must be responsive.

Although each alternative meets these objectives, they do so to varying degrees. The distinction among the alternatives lies in the specific actions proposed and the varying methods and adequacy of ensuring these objectives are accomplished (see table 9 in "How Alternatives Meet Stated Objectives").

BISON DISTRIBUTION LIMITS

All alternatives include a management boundary that defines a certain distribution of bison. While the location of the boundary and the blend of management actions differ, in all alternatives, agency actions within the boundary are intended to prevent the movement of bison beyond the boundary. When bison move beyond the designated management boundary, agency personnel may haze bison back into the management area. Hazing may employ a variety of methods including noise, rubber bullets, cracker shells, dogs, and baiting. Hazing may take place on foot, on horseback, in vehicles, or by air. If bison cannot be hazed back into the management area, they may be shot.

Yellowstone National Park extends into the state of Montana along the park's northern and western border. Three specific entries from the park in this area are of concern, and measures to prohibit or restrict bison movement are in place at these entry points in all alternatives (see Bison Winter Movements map). Two entries lie along the northern boundary near the northwestern corner of the park — one a direct approach from the park into the town of Gardiner or across the boundary at Reese Creek onto private land, and the other farther east through the Eagle Creek/Bear Creek drainage. The third entry is

along the west side of the park in the general vicinity of the town of West Yellowstone.

Two additional boundary areas are mentioned in the alternatives. One is the combined Monument Mountain Unit of the Lee Metcalf Wilderness and Cabin Creek Wildlife and Recreation Management Area on the west side of the park and north of West Yellowstone (generally north of Grayling Creek/Fir Ridge). Land use in this area emphasizes wildlife and precludes domestic livestock. The other, which includes Hellroaring Creek and Slough Creek drainages in the Absaroka-Beartooth Wilderness lies along the northern boundary of the park to the east of the Eagle Creek/Bear Creek drainage. Both Hellroaring Creek and Slough Creek drainages are geographically isolated from areas with permitted cattle. In most alternatives, bison are allowed into Lee Metcalf/Cabin Creek and Hellroaring and Slough drainages, although very few are able to traverse the rugged terrain and deep snow in the winter.

BISON CAPTURE

The agencies have included capture facilities to help keep bison from moving across the boundaries in all alternatives except alternative 2. Bison are either herded into the facility with fences and hazing, or they are baited to enter. Captured bison are card tested for exposure to *B. abortus*, and either slaughtered, quarantined, or released depending on serological status, pregnancy status, population numbers, and the alternative. The size of the capture facility would vary with location, but siting criteria always include at a minimum the following:

- Holding pastures, corrals, handling equipment, and wing fences would be temporary structures.

- Capture facilities would use existing roads inside the park and to the extent practicable outside the park.

Brucellosis card test, 1997.

- Adequate water for captured bison, and hay if animals are kept longer than 24 hours, would be available.

- Ground disturbance would be kept to the minimum needed to properly construct the facilities.

- Facilities would be located in areas that do not contain significant wetland and riparian areas, or endangered, threatened, rare, and sensitive plant or animal species.

- If sited on U.S. Forest Service land, the location of the facility would be such that it meets the visual quality objectives of the *Gallatin National Forest Plan*.

- Natural and cultural resource surveys to comply with applicable laws would be completed before the facilities were built. Facilities would be located to avoid known sensitive or important cultural and natural resources.

- Facilities would be constructed and operated in such a manner that capture and handling of bison would be as humane as possible.

HUMANE TREATMENT OF BISON

The agencies are concerned with humanely managing bison (see appendix F for a summary of bison management techniques). Female bison and calves usually travel in groups of 25 to 30.

At the Stephens Creek capture facility, the entire group is directed by wing fences and by NPS personnel moving bison slowly and quietly on foot into a large pasture adjoining the capture facility. A few agency personnel may occupy catwalks overlooking the compound to help in moving groups of bison into corrals or chutes for testing. Battery-operated cattle prods to administer electric shocks are used only sparingly. Captured bison are separated into different sex and age groups, and older bulls are not commingled, if possible, with other bison for safety reasons. A recent evaluation by veterinarians and members of the Humane Society of the United States indicated directing fewer animals into the capture facility at one time may reduce stress and injuries to the bison (letter from Humane Treatment Evaluation Team to Gov. Marc Racicot, Feb. 3, 1997). This same evaluation indicated fewer personnel on the catwalks as bison are being driven toward the facility may be helpful as well.

Bison destined for slaughter would be shipped to one of five slaughterhouses in the state of Montana, all within a 160-mile radius of the Stephens Creek capture facility. The humane treatment team suggested all open grid fences used to direct bison into trucks for shipment be covered so the animals do not catch and rip their horns. The team also advised it would be more humane to shoot bison at the capture facility, rather than transport them live to slaughter. "While gunshots to the brain may be aesthetically unpleasant to some individuals," the report notes, "unconsciousness is instantaneous" if the procedure is performed by skilled personnel.

Agencies provide water at the capture facilities if bison are held less than 24 hours, and both water and food if they are held longer. The humane treatment team found this treatment adequate.

The team concluded that, while some changes could be made in the capture operation, "NPS had made a considerable effort to minimize any fatalities and injuries to the bison."

MONITORING

All alternatives follow the same monitoring schedule as bison move toward and outside the boundaries. As they approach Yellowstone National Park boundaries from inside the park in the winter, bison are monitored once per week. As they get closer to the boundary areas on the north and west, monitoring is increased to daily during winter months (November 1 to April 30). On the north side, the boundary is identified as the Reese Creek area. If bison move beyond this boundary, their movements may be monitored daily. On the west side, bison are monitored once per week when they are traveling along the Madison River inside the park, and daily as they move into the West Yellowstone area. Once outside the park in the western boundary area, they may be monitored as frequently as three times per week. Monitoring activities would include aerial or ground reconnaissance of individual bison or groups of bison. In the Eagle Creek/Bear Creek area, bison are monitored twice per week during the winter. If bison move toward the Little Trail Creek/Maiden Basin hydrographic divide and Gardiner, their movements are monitored daily.

Bison may also be monitored during other times of the year, but little movement outside the park is expected during June 1 to October 1.

SPECIAL MANAGEMENT AREA

All alternatives (except alternative 5) allow some bison outside the park and envision the creation of special management areas. A special management area is an area contiguous to the park where some or all bison may be tolerated for part or all of the year, as specified in the selected alternative, without increasing the risk of brucellosis transmission to domestic livestock. SMAs and the management within them vary within an alternative and between alternatives. Adequate disease control measures taken within these SMAs would protect Montana's brucellosis class-free status. The risk of transmission is managed in various alternatives through spatial separation of bison and cattle,

temporal separation, changes in cattle operations (such as running steers or spayed heifers), disease control in cattle or bison, or a combination of these factors. APHIS has indicated that any of the bison management plans (alternatives) in this environmental impact statement would be sufficient to prevent the actual outbreak of disease in domestic livestock and the subsequent spread of brucellosis. Therefore, it would not initiate a downgrade of Montana's class free status based on the mere presence of Yellowstone bison migrating out of the park into the SMAs in accordance with the selected bison plan (alternative). APHIS has also indicated that no changes in the current requirements for obtaining class-free status (Title 9, *Code of Federal Regulations*, Part 78) would be required for the agencies to establish SMAs.

Pursuant to statutory and regulatory requirements, the establishment, modification, or revision of SMAs requires the approval of the state of Montana as specified by Montana law. These decisions regarding SMA designation, modification, or revision will be based on the best science and information available, including bison management circumstances of the area.

DISTRIBUTION OF CARCASSES

Bison that are captured and test positive for exposure to *B. abortus* are slaughtered (a few may be used for research purposes). Those that cross the designated management boundary or evade capture may be shot. Seropositive bison are not slaughtered at the capture facility, but are trucked to slaughterhouses in the state of Montana within a 160-mile radius of the capture facility.

Under Montana statute (81-2-120, MCA) wild bison "that are certified by the state veterinarian as brucellosis-free may be transferred for full or partial compensation." Accordingly, meat from slaughtered animals is distributed to social service organizations, tribal governments, or is auctioned to help defray state costs of capture and slaughter. In 1997 the state received $185,763 from the sale of bison products, which partially offset its operating costs for bison management activities of $245,703. Heads and hides may be auctioned or released to tribal governments. Some bison that are shot are gutted and dressed by tribal members, who keep meat, heads, and hides. Otherwise, most bison are sent to slaughterhouses. Carcasses may also be left inside park boundaries to serve as a source of food for wildlife in any of the alternatives.

DISTRIBUTION OF LIVE BISON

Live bison are only available for release outside the area if they have successfully completed an APHIS-approved quarantine protocol. Occasional live bison may be used for research purposes.

PRIVATE LAND

Under Montana statute (81-2-120, MCA), the Department of Livestock with assistance from other agencies removes bison known or suspected to be carrying a disease on public land or, with landowner permission, on private property. If private landowners want bison removed from their property, the landowner must contact the Department of Livestock and allow ample time to respond. If the Department of Livestock does not respond to the landowner's request, the landowner may shoot the bison, but must contact the department to report the shooting and must retain the carcass for distribution by the department. Other agencies may assist in the effort at the request and with permission of the Department of Livestock.

VACCINATION

All alternatives include the suggested vaccination of female cattle calves in higher-risk areas, e.g., those adjacent to the park or to the SMAs. Vaccination of cattle against brucellosis remains a common practice in Montana and other areas across the country. However, because vaccination of cattle does not provide 100%

immunity against the disease, vaccination alone will not prevent the transmission of the disease from an infected animal. Within high-risk areas, the Department of Livestock requires surveillance testing of all test-eligible cattle coming into direct contact with bison. Testing requirements for those cattle occupying adjacent areas is conducted at the discretion of the Montana State veterinarian. If a herd is in contact with bison, test-eligible female cattle are tested. State animal health authorities would encourage calfhood (4–12 months old) vaccination with RB51 (the current vaccine for cattle) of all test-eligible cattle on private lands within a 20-mile radius of areas where bison are allowed (SMAs) and encourage vaccination on public lands within the SMA. The Animal and Plant Health Inspection Service would provide the vaccine for all cattle vaccinations required on public land performed within the SMA, although livestock operators would be responsible for costs.

In all alternatives, the agencies are proposing the use of a vaccine for brucellosis in the bison population. In alternatives 1, 2, 3, 4, and 7, vaccination of bison calves or captured adult bison would begin when a safe and effective vaccine is available. In alternatives 5 and 6, whole herd vaccination is planned.

A vaccine known to be safe and effective in bison and safe for nontarget species does not currently exist. The agencies have agreed that a safe vaccine is one that has no long-term pathological effects on the vaccinated bison or its fetus, and no debilitating reaction that would increase mortality in the population. A safe vaccine would also be one in which the bacteria incurs no genetic mutations or reversions, and that causes no pathological effects, death, or disability in nontarget animals exposed to the vaccine or vaccinated bison.

Effectiveness, or efficacy, is the ability to impart protection from abortion and infection when exposed to brucellosis. To date vaccines protect better from abortion than from infection. The decision on when a vaccine is safe and effective "enough" is complex and depends on several factors. The decision to administer a specific vaccine would depend, in part, on the opportunity afforded by the selected management actions for a given location. For instance, bison already in a capture facility and being prepared for testing and marking (as seronegative) may be vaccinated with a safe but relatively less effective vaccine than one slated for remote delivery or through a parkwide roundup and capture program. Research on the vaccine RB51 may show this or a similar strain to be appropriate for the former situation. Also, a vaccine with a relatively high efficacy rate that could be broadcast for oral administration in bait, but which offered a potential hazard to a native nontarget species, might be used if that hazard could be eliminated through timing or method of administration. Therefore, the decision on whether a particular vaccine is safe and/or effective will be made cooperatively and should be based on many factors.

When the National Park Service and the state of Montana agree that a vaccine is safe for bison and nontarget species, and the vaccine is at least somewhat effective in protecting vaccinated bison from infection, the agencies would determine when and where, within the approved management plan, that vaccine might be used. The agencies would review ongoing vaccine research results and assess the consequences of using vaccines as they are developed. If vaccine characteristics require it, the National Park Service and the state of Montana would complete the appropriate environmental review (according to state and federal laws) before administering the vaccine.

RESEARCH EFFORTS

Research is underway now and will continue during implementation of the selected management alternative. Research topics include, but are not limited to, testing and development of a safe and effective vaccine for bison, studies on the epidemiology and pathogenesis of *B. abortus* in bison, bison-specific blood tests for the exposure to *B. abortus* and presence of brucellosis, risk assessment of brucellosis transmission from bison to cattle in a wildland

setting, and the use of groomed roads and trails by bison (see appendix D). Agencies would use the information from these research efforts to review pieces of the plan as appropriate. Whole bison carcasses and/or blood and tissue samples would be collected from bison for the purposes of disease surveillance, and for research to increase understanding of *B. abortus* in bison. Live seronegative bison may be obtained from winter capture operations for approved research.

Tissue samples would be collected from all seronegative-pregnant bison killed during management operations. Sampling protocols would be based on those developed by the GYIBC. The agencies, including APHIS Veterinary Services and the Biological Resources Division of the U.S. Geological

Survey, with assistance from the Montana Departments of Livestock and Fish, Wildlife and Parks and the National Park Service, would provide qualified personnel to conduct necropsies and collect tissues. Test results would be provided to all cooperating agencies.

ALTERNATIVE 1: NO ACTION – CONTINUATION OF THE CURRENT INTERIM BISON MANAGEMENT PLAN

Adopting this alternative would continue current bison management as set forth in the 1996 *Interim Bison Management Plan*. NEPA guiding regulations (40 CFR 1502.14) define the no-action alternative in a plan as "no change from current management direction or level of management intensity," and state that an alternative based on no management at all is often "a useless academic exercise." (Although the 1996 plan was modified by state and federal agencies to maintain a generally stable bison population during the winter of 1997–98, the no-action alternative does not consider those modifications. Instead, the environmental impact statement assumes bison management actions, environmental conditions, and other relevant factors are as they were in spring 1997 when work on this environmental impact statement began. Appendix A includes the evaluation and state and federal decision documents on adjustments to the *Interim Bison Management Plan*.)

The interim plan relies on strict border enforcement to keep bison and cattle separate, and has no provision for quarantining bison. Bison are prevented from crossing the northern park boundary at Reese Creek because the adjacent land is private and occupied by cattle throughout the year. Bison are allowed in the Eagle Creek/Bear Creek area.

In the West Yellowstone area, public lands are adjacent to the park. Cattle are more dispersed than at Reese Creek and are not grazed during the winter months. Up to 200 bison in Eagle Creek/Bear Creek, and 50–100 in the West Yellowstone area have been able to overwinter successfully outside the park without coming in contact with cattle. Bison located outside the park in the west boundary area would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. In addition, a handful of bison (usually single bulls) use the Lee Metcalf/Cabin Creek area on the west, or Hellroaring and Slough drainages to the north and east of Eagle Creek/Bear Creek. Those few bison that move beyond the borders of either of these large tracts of forest land would be hazed or shot.

NORTHERN BOUNDARY

Reese Creek

Private property (the Royal Teton Ranch) abuts the Yellowstone National Park boundary at Reese Creek. Through a lease with property owners, approximately 250 cow-calf pairs graze in the Gardiner Valley during the winter from the Corwin Springs bridge for about 8–9 miles to the north end of the property just south of Yankee Jim Canyon (see Alternative 1 map). A capture facility inside the park at Stephens Creek is within 2 miles of Reese Creek, and operates from November 1 to April 30. Wing fences and agency personnel guide bison toward the facility when they are approaching the park boundary. Bison not captured cross the property where they are hazed back into the park or shot.

The Stephens Creek capture facility (see Alternative 1 map) occupies 13 acres, and includes four pens to separate bison, two holding pastures (one large and one small), and chutes to help direct bison. It is adjacent to a park horse corral, receives water and electricity, and is easily accessible by dirt road. All captured bison are divided into groups for safety reasons, held for a few hours (or occasionally for one to two nights), and shipped to slaughter. A few might be used for research purposes.

Stephens Creek capture facility.

Eagle Creek/Bear Creek

About 23,000 acres of bison winter habitat are located on the Gallatin National Forest in the Eagle Creek/Bear Creek area bordering Yellowstone National Park to the north and east of Gardiner. Bison are able to occupy portions of these lands during the winter (and summer, although most migrate back into the park in May and June). In this alternative, agency personnel would maintain a boundary at the Little Trail Creek/Maiden Basin divide by hazing or shooting bison that crossed it. In average winters, no bison approach this boundary.

WESTERN BOUNDARY

Bison migrate out of Yellowstone National Park along the Madison River corridor, traveling along groomed roads or bison trails inside the park and feeding at riverbanks and pools warmed by thermal features. Most leave by way of Duck and Cougar Creeks to the north of Madison River and travel west to the national forest in the 24,000-acre Horse Butte area. Some of these lands are forested, but the bison prefer open areas where they can find forage under the snow.

The public land outside the park on the west side is intermixed with private holdings, and bison might be shot at any time on private land under the conditions described in the "Actions Common to All Alternatives." No cattle are grazed in this area in the winter, and bison are hazed back into park boundaries in May, well before cattle appear in the summer. Under the provisions of this alternative, bison would be hazed back into the park in the spring 30 to 60 days before cattle occupy land in the area west of the park. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. The scheduled on-date for cattle on Horse Butte is June 15, and for other allotments in the West Yellowstone area is July 15. Cattle can occupy private land at any time; however, they normally are present from about June 1 to November 15.

Two capture facilities smaller than the one at Stephens Creek are also operated by the Department of Livestock from November 1 to April 30 outside the western park boundaries. One is located on private land in the Duck Creek area, about 100 yards from the park boundary. The second is near the Madison River on Gallatin National Forest land. Each facility occupies about 1 acre, and relies primarily on "opportunistic" methods of capturing bison, e.g., baiting with hay. Both facilities have three pens for sorting, as well as a capture pen and hydraulic chutes. Captured bison are blood tested for exposure to *B. abortus*, and all seropositive bison are shipped to slaughter. Seronegative-nonpregnant females and all seronegative males are identified with a metal ear tag and a temporary visual marker, and are shipped to and released on public lands in the West Yellowstone area. Seronegative-pregnant bison are shipped to slaughter. All bison evading capture on public lands are shot. Those evading capture on private lands are shot at the request of or with permission of the landowner. Capture facilities could be relocated to take advantage of changing bison migration routes under this alternative using criteria outlined in the "Actions Common to All Alternatives."

Bison are able to occupy the Cabin Creek Recreation and Wildlife Management Area and Monument Mountain Unit of the Lee Metcalf Wilderness on the west side of Yellowstone National Park without agency management, as

ALTERNATIVE ONE

Yellowstone National Park

United States Department of the Interior ▪National Park Service
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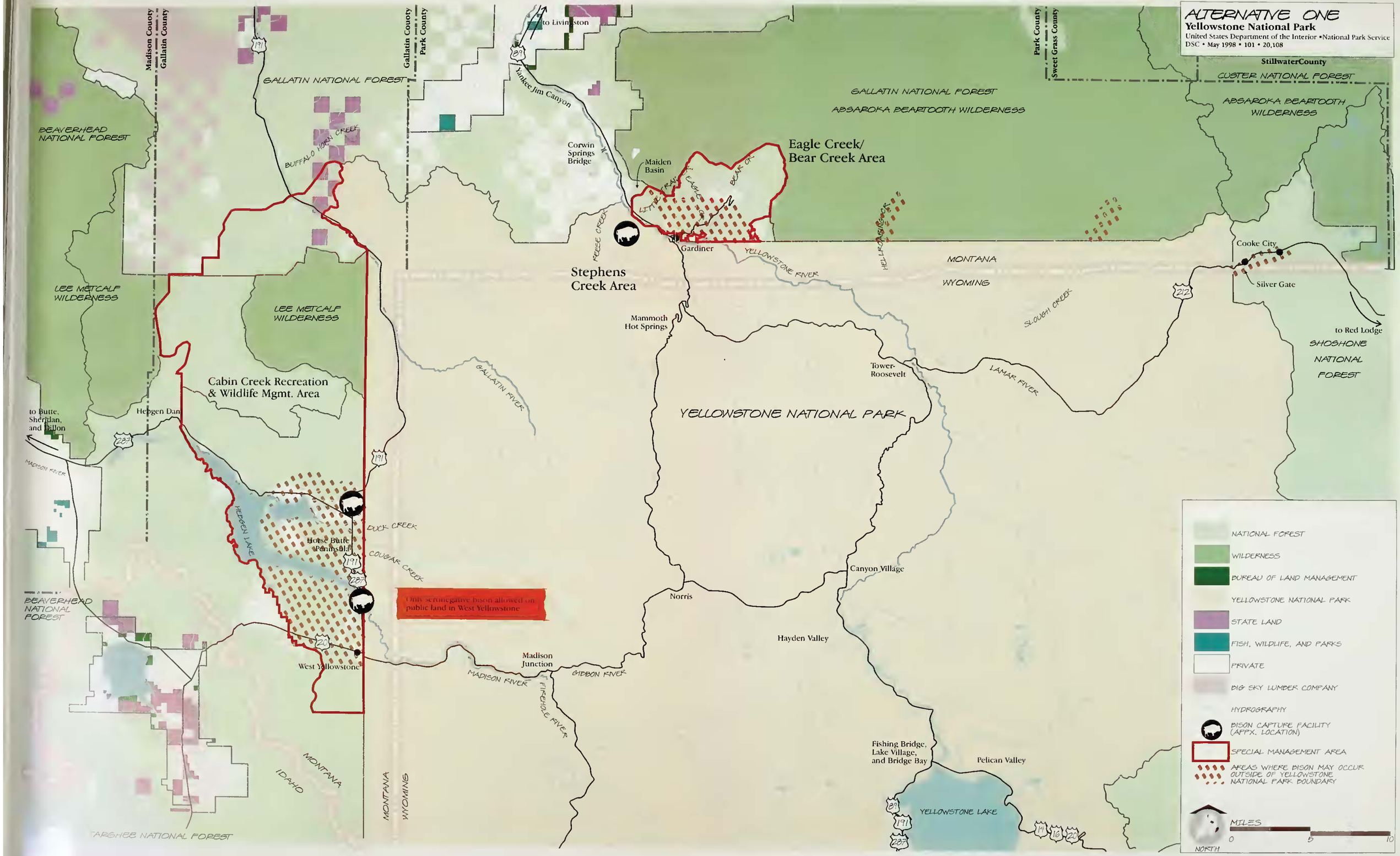

these are public lands without livestock allotments. These large tracts are north of the Horse Butte lands (north of Grayling Creek/Fir Ridge), and topography and snow depth usually limit the number of bison that actually use them. Steep, rugged territory prevents bison from exiting these lands to the west except by way of a narrow corridor around Hebgen Lake Dam. Private lands lie to the south and north. Agencies remove bison by hazing or shooting if they attempt to leave this designated management area by any of these three routes.

SPECIAL MANAGEMENT AREAS

Special management areas have not been officially designated in the operation of the interim plan. However, for the purposes of this environmental impact statement, the lands in the Eagle Creek/Bear Creek area up to the Little Trail Creek/Maiden Basin hydrographic divide, Hellroaring and Slough Creek drainages, the portion of West Yellowstone shown on the Alternative 1 map, and the Lee Metcalf/Cabin Creek area would function as SMAs — i.e., bison could enter them without endangering Montana's federal brucellosis class-free status (see "Special Management Areas" section of "Actions Common to All Alternatives"). For this reason, these areas are referred to as SMAs through the remainder of the description of this alternative.

Bison are and would continue to be allowed in the Eagle Creek/Bear Creek SMA year-round up to the boundary at Little Trail Creek/Maiden Basin hydrographic divide, although all but a few bulls return to higher elevation inside Yellowstone National Park in the spring. They are also allowed year-round access to and from Hellroaring and Slough Creek drainages, and the Cabin Creek/Lee Metcalf area.

Cattle would be grazed on public lands, primarily on the Horse Butte allotment in the West Yellowstone area in the summer months. Grazing on Horse Butte would take place from June 15 to September 15. For all other public allotments in the western SMA, the earliest cattle on-date would be June 15, and the latest cattle off-date would be October 15. Grazing on private lands could begin as early as May 1, but usually begins about June 1. Bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Seronegative-nonpregnant bison are allowed back into the West Yellowstone area following the departure of livestock (November 1).

RISK MANAGEMENT

The primary means to minimize risk of transmission from cattle and bison in this alternative would be the enforcement of controlled entry at the northern borders described above, and temporal separation at the western border on public lands. At Reese Creek, this would include monitoring, hazing, capture and slaughter, and agency shooting. At Eagle Creek/Bear Creek, monitoring, hazing, and agency shooting would be used to prevent entry via Little Trail Creek/Maiden Basin hydrographic divide into the Gardiner area. On the west end, hazing bison back into the park before summer would prevent them from mingling with cattle. Topography, availability of habitat, hazing, and agency shooting would also keep bison from moving beyond SMA boundaries.

In addition to maintaining separation of cattle and bison, other measures would be aimed at reducing the risk of transmission. For example, seronegative-pregnant bison in the western SMA would be slaughtered. This is because bison could test seronegative and be carrying the disease organism. This usually occurs when they have recently become exposed and are in the incubation stage of the disease. In particular, female bison infected *in utero* might show no signs of the disease until the third trimester of their first pregnancy, when hormones trigger the release of the bacteria into the uterus and other reproductive tissues and fluids. Bison fetuses and birth tissues aborted on cattle-use areas in

winter and remaining until spring might pose a risk of transmission to cattle that return to the area in summer.

Cattle operators in the western SMA or adjacent areas on private lands would be strongly encouraged to vaccinate female calves against brucellosis (see the "Vaccination" section of "Actions Common to All Alternatives") with RB51 or other approved vaccine. Cattle herds in these "contact" areas would continue to be surveillance tested, and any herd whose members might have been in contact with bison would be checked for exposure and revaccinated as adults. Livestock owners on private property would continue to be responsible for all costs and materials associated with vaccination.

When a safe and effective vaccine was developed for bison, it would be administered in capture facilities to bison testing negative. It might also be delivered through remote means to bison inside Yellowstone National Park.

POPULATION MANAGEMENT

No actions specifically to control population numbers on either end of the range are built into this alternative. However, it is anticipated that more bison would attempt to migrate outside the park in response to winter severity when numbers were high, and would be captured, slaughtered, or shot. Therefore, this alternative relies on natural forces inside the park and lethal boundary enforcement to keep population numbers from increasing beyond the upper end of the 1,700–3,500 range.

Allowing bison to use the Eagle Creek/Bear Creek area during the winter would sustain between 100 and 200 animals, with good to excellent range condition objectives (*Gallatin National Forest Plan*, p. G-14). The present plan includes a provision that agencies would develop contingencies for ensuring the integrity of the bison herd should numbers drop. However, the interim plan provides no direction for specific contingency measures.

ESTIMATE OF COST

Table 2 indicates the costs that would be incurred by the interagency team for alternative 1.

TABLE 2: ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 1

	National Park Service	U.S. Forest Service	State of Montana	APHIS
Capture facilities[1]	$120,000		$175,000	$50,000
Test/sample				25,000
Operations (hazing, shooting, monitoring, supplies, equipment)	180,000	$15,000	150 ,000 (1996) – 270,000 (1997)	100,000
Vaccination	150,000			8,000
Average income from the sale of meat, hides, and heads			+35,000 to +185,000	
TOTALS	($450,000)	($15,000)	($140,000 – $420,000)	($183,000)

1. One time only (costs for existing facilities at Stephens Creek and western SMA have already been incurred).

ALTERNATIVE 2: MINIMAL MANAGEMENT

The purpose of this alternative is to restore as near-natural conditions as possible for bison, including a small portion of their historic nomadic migration patterns. The area outside Yellowstone National Park over which bison would be able to range (e.g., the special management areas) without agency management is the largest of all alternatives (see Alternative 2 map).

Some features of alternative 2, notably the acquisition, through purchase or easement or changes in cattle operations from willing sellers, of additional winter range for bison, and the vaccination of bison, involve unknowns and/or additional environmental compliance and review. A vaccine the agencies agree is both safe and effective for bison and safe for nontarget species does not currently exist, and the administration of a vaccine requires agreement from the agencies as well as possible environmental compliance, public input, and review. Creation of SMAs to allow bison outside the park would require the approval of the state of Montana as specified by Montana law. This is also true for alternatives 3, 4, 6, and 7.

This alternative focuses on changes in cattle operations for ranchers in the SMAs as the primary means to minimize the risk of disease transmission. This could only take effect if ranchers were willing to sell land or easements, or receive compensation for changes in their existing cattle operations. Determining which lands were appropriate for such changes, which owners were willing to sell, and negotiating compensation would take time.

It is impossible to know for sure whether or which land would be acquired, when a safe and effective vaccine for bison would be available, or whether an SMA would be approved on land outside the park designated as appropriate for winter range. However, for purposes of analysis, this environmental impact statement assumes certain dates when these events would occur. If these dates were not met, the consequences of this alternative might be slightly different than that disclosed in the "Environmental Consequences" part of this document.

This environmental impact statement assumes a safe and effective vaccine for bison would be available and administered parkwide beginning in the year 2000 (or two years from the date the record of decision is signed). It also assumes any state approvals required to create SMAs would be immediately forthcoming.

Because of the complexities inherent in the acquisition of property or easements, or compensation for changes in cattle operations, this environmental impact statement assumes such changes would not be completed until 2003 (or five years from the date the records of decision are signed). For purposes of analysis only, the provisions of the interim plan are assumed to continue until acquisition is completed. This period (when the interim plan is in effect) is referred to as phase 1 of this alternative.

Despite these assumptions for analysis purposes, it is likely that, should some lands be acquired, bison would be allowed on them while others were the subject of continuing negotiations. This would be true of other factors as well. For instance, a safe and effective vaccine would be applied when it was available and compliance was completed, regardless of whether this was earlier or later than the year 2000.

When appropriate acquisition was completed or cattle operation changes were made (referred to as phase 2 of this alternative), lethal control would only be used where human health was in immediate danger, on private property at the request of the landowner, or outside the SMA border. Bison would not be captured or slaughtered by agencies, and all existing capture facilities would be dismantled. A key tool available to help control bison distribution and population size during phase 2 would be the

closure of groomed roads the animals now use to traverse and exit the park.

In addition to leaving road segments ungroomed, the agencies would be able to haze bison in some cases, and would maintain boundary lines through hazing and shooting in phases 1 and 2.

NORTHERN BOUNDARY

Reese Creek

While the interim plan is in effect, bison attempting to leave the park via the Reese Creek boundary would be captured and shipped to slaughter or shot on private land as they are now.

When appropriate acquisitions to the north of the park's Reese Creek boundary were completed, the National Park Service would dismantle its capture facility at Stephens Creek and would not maintain any boundary control at the northern border of Yellowstone National Park.

Bison movement would be monitored from November 1 to April 30, but bison would not be hazed. Within the park, selected roads would be closed or not groomed for snowmobile travel during winter.

The Department of Livestock, with help from other agencies, would maintain a boundary at Yankee Jim Canyon (see Alternative 2 map), about 12 miles north of the current park border at Reese Creek. Yankee Jim Canyon is a narrow part of the Yellowstone Valley located on national forest land, and agencies would enforce the boundary through hazing and shooting. The majority of land in the valley bottom north of Yankee Jim Canyon is privately owned.

Eagle Creek/Bear Creek

Under the interim plan, bison attempting to cross the Little Trail Creek/Maiden Basin hydrographic divide and travel onto private property in the Gardiner Valley are shot by agencies. This would continue until appropriate acquisitions or changes in cattle operations were made. When they were made, bison would not only be allowed to freely roam in the Eagle Creek/Bear Creek area, but also the Little Trail Creek/Maiden Basin hydrographic divide. Agencies would not maintain any boundary at this entry into the Gardiner area.

WESTERN BOUNDARY

While the interim plan was in effect, bison would be captured and tested in capture facilities in the western SMA. Seronegative-nonpregnant bison would be released onto public lands outside the park for the winter, and hazed back into the park in May to avoid conflicts between bison and cattle that would be entering national forest grazing allotments for the summer. Agencies would maintain a northernmost boundary in the western SMA in the Cabin Creek Recreation and Wildlife Management Area.

When allotments have been changed and/or private cattle operations modified, this boundary would be moved north to Buffalo Horn Creek (see Alternative 2 map) on the northwest side of the park. This would add some federal lands north of the Lee Metcalf Wilderness to the western SMA, and establish a boundary to keep bison from occupying private lands to the northeast. Bison movements would be monitored both as they moved toward the park boundary on the west side in the winter and in the SMA. Bison crossing the boundary at Buffalo Horn Creek would be hazed back into the management area or shot. Those leaving to the west along Hebgen Lake Dam would also be hazed or shot. Capture facilities in the western SMA would be dismantled, as this alternative would not include any capture or slaughter by agencies in phase 2.

SPECIAL MANAGEMENT AREAS

During phase 1, while the interim plan was in effect, bison would be allowed to range outside the park in areas described in alternative 1, including the Eagle Creek/Bear Creek area; the

ALTERNATIVE TWO
Yellowstone National Park
United States Department of the Interior • National Park Service
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Madison County
Gallatin County
Gallatin County
Park County
Park County
Sweet Grass County
Stillwater County

GALLATIN NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
CUSTER NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
GALLATIN NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS

to Livingston
Yankee Jim Canyon
Corwin Springs Bridge
Maiden Basin
BEAR CR.
Eagle Creek/
Bear Creek Area
BUFFALO HORN CREEK
FEESE CREEK
Gardiner
YELLOWSTONE RIVER
HELL ROARING CR.
MONTANA
WYOMING
Cooke City
Silver Gate
to Red Lodge
SHOSHONE NATIONAL FOREST
LEE METCALF WILDERNESS
LEE METCALF WILDERNESS
Stephens Creek Area
Mammoth Hot Springs
SLOUGH CREEK
Cabin Creek Recreation & Wildlife Mgmt. Area
Hebgen Dam
GALLATIN RIVER
Tower-Roosevelt
LAMAR RIVER
YELLOWSTONE NATIONAL PARK
to Butte, Sheridan, and Dillon
MADISON RIVER
This road to be evaluated for hison movement Possible closure or road not to be groomed for snowmobiles
HEBGEN LAKE
DUCK CREEK
Horse Butte Peninsula
COUGAR CREEK
BEAVERHEAD NATIONAL FOREST
Groomed roads to be considered for closure or no grooming during the winter
Norris
Canyon Village
Hayden Valley
West Yellowstone
Madison Junction
MADISON RIVER
GIBBON RIVER
FIREHOLE RIVER
MONTANA
IDAHO
MONTANA
WYOMING
Fountain Freight Road
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE
TARGHEE NATIONAL FOREST

ROADS TO BE CONSIDERED FOR CLOSURE OR NOT TO BE GROOMED IN WINTER
NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY
HYDROGRAPHY
SPECIAL MANAGEMENT AREA
AREAS WHERE BISON MAY OCCUR OUTSIDE OF YELLOWSTONE NATIONAL PARK BOUNDARY

MILES
0 5 10
NORTH

Absaroka-Beartooth Wilderness north of the park, including the Hellroaring and Slough Creek drainages;, and the West Yellowstone area, Cabin Creek Recreation and Wildlife Management Area, and Monument Mountain Unit of the Lee Metcalf Wilderness west of the park. Agencies would maintain boundaries at Reese Creek and the Little Trail Creek/Maiden Basin hydrographic divide, and would capture or shoot bison crossing these boundaries and on private property. Carcasses would be retrieved by the Department of Livestock and distributed as described in the "Actions Common to All Alternatives."

The agencies would attempt to acquire winter range and expand the SMAs to include what are now private lands between Reese Creek and Yankee Jim Canyon on both sides of the Yellowstone River. They might also offer incentives to change livestock operations, acquire winter range from willing sellers, or modify grazing allotments in the western SMA.

Following acquisition through purchase or easement, or appropriate changes in cattle operations, capture facilities would be dismantled and bison allowed to range freely. The northern boundary would move north to Yankee Jim Canyon, and the north edge of the western SMA would shift north to Buffalo Horn Creek.

In the western SMA, bison would no longer be hazed back from the West Yellowstone area into the park in May. Most of these bison return to the park on their own in late spring, and agencies would expect only a few, if any, to stay behind.

If needed, agencies would haze remaining bison from private to public land in the SMA.

RISK MANAGEMENT

The primary means to minimize risk in this alternative would be those used to maintain the separation of cattle and bison. These include the provisions of the interim plan described in alternative 1 for phase 1, and changes in livestock operations and the return to ungroomed conditions of certain key sections of park roads in phase 2 of this alternative.

On private land in the SMAs, which now is used for cattle grazing or other livestock operations, agencies might offer incentives to change operations so susceptible cattle were removed. Nonbreeding cattle, such as steers or spayed heifers, would not transmit the disease if they were infected through contact with bison. Brucellosis is spread primarily through ingestion of reproductive fluids and birth materials from infected cows. Therefore, convincing operators to change management practices to raising nonsusceptible livestock such as steers would eliminate the risk of spreading the disease. Also, procurement of access to winter range by acquiring grazing rights, easements, or outright purchase of property from willing sellers could be used to remove cattle altogether on private property in the designated SMAs. Until these measures were in place, agencies would maintain boundaries as described above (see "Special Management Areas" section) and capture and test on the west side. Seronegative bison would be released, and seropositive bison would be shipped to slaughter, as they are now.

The agencies would seek agreements with grazing permittees to modify grazing allotments on the national forest where bison might roam. Potential modifications include working with permittees to change class of livestock or operations so that there would be no conflict between cattle and bison, close allotments and move cattle to areas where bison are never present, or other modifications to minimize exposure of susceptible cattle to bison.

The National Park Service would modify its winter road management plan to eliminate winter grooming and snowmobile use of some roads in Yellowstone National Park. Bison have "discovered" these pathways, and routinely use them in the interior of the park to avoid traversing areas of deep snow. It is hypothesized that the energetic cost of traveling these roads is low, and that bison using them are more likely to

survive the winter than those who do not use them. In other words, they are made to pay what some believe is "the true cost" of travel. Some bison also could be accessing areas of the park near its borders because of groomed trails and plowed roads.

Bison herd along road in Yellowstone National Park in the winter.

Alternative 2 is the only alternative to propose routine changes in some segments of park roads to control distribution, although other alternatives include research on the use of roads and potential barriers to bison travel (alternative 3), and/or plowing to access capture facilities (alternatives 5 and 6). Some changes in road grooming might occur in phase 1 of this alternative as well help control distribution (see discussion on bison distribution in the "Background" chapter of the "Purpose of and Need for Action").

Roads left ungroomed could include sections from Madison to West Yellowstone, Madison to Norris, and Madison to the Fountain Freight Road (see Alternative 2 map), which would isolate herds inside the park from boundary areas, and increase natural winter kill. The agencies would conduct research to determine the effectiveness of those closures in preventing bison from leaving the park during winter, and to evaluate the contribution of other groomed roads to bison movements out of the park. Based on those investigations, additional changes and NEPA compliance to further inhibit bison from leaving the park or to maintain bison population size are possible.

In addition to measures to ensure separation of cattle and bison, state animal health authorities would encourage livestock owners throughout the area whose cattle might come in contact with bison to vaccinate female calves (4–12 months old) against brucellosis with RB51 or other approved vaccine. Operators in boundary areas would be encouraged to annually vaccinate all subadult cattle as well as calves. Cattle herds in contact areas would continue to be surveillance tested periodically, and any herd whose member or members was in contact with bison would be checked for exposure to *B. abortus*. Livestock owners on private property would continue to be responsible for all costs and materials associated with calfhood vaccination.

When a safe and effective vaccine was developed for bison, it would be administered to bison inside Yellowstone National Park through remote means. Depending on the vaccine,

calves, yearlings, or possibly adults might be vaccinated as long as the vaccine was safe and effective.

POPULATION MANAGEMENT

No actions specifically to control or maintain population numbers, other than changes in road grooming described above, would be anticipated. It is expected that these changes would ultimately force more bison to experience the full brunt of natural processes, such as harsh winters and ongoing predation and competition, and would maintain the population within the natural range of 1,700 and 3,500 animals. However, it is unknown whether, or the degree to which, changes in road grooming would affect bison distribution. Allowing bison to occupy additional range beyond the park boundaries in the northern and western SMAs would help keep population numbers from falling below 1,700.

ESTIMATE OF COST

Table 3 indicates the costs that would be incurred by the interagency team for alternative 2.

TABLE 3: ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 2

	National Park Service	U.S. Forest Service	State of Montana	APHIS	Shared Costs
Test/sample				$22,000	
Monitoring	$25,000	$15,000			
Operations	57,000		$150,000		
Acquisition[1]		$65,000[2]			$44.1 million
Easement[1]					Unknown[3]
Conversion of livestock operations[1]					Unknown[3]
Vaccination	150,000			8,000	
Increased snowmobile enforcement		50,000			
Wildlife/winter use monitoring		25,000			
Allotment modification[1]		15,000[2]			
TOTALS	($232,000)	($170,000)	($150,000)	($30,000)	(Up to $44.1 million)

1. One time only.
2. Administrative costs (one time only).
3. Easement and conversion would substitute for acquisition, and costs would be less than $44.1 million.

ALTERNATIVE 3: MANAGEMENT WITH EMPHASIS ON PUBLIC HUNTING

Alternative 3 relies on the hunting of bison to regulate population numbers and distribution of bison outside the park, and on separation of bison in time and space to preclude contact with cattle. Where hunting was infeasible or inappropriate, capture and shipment of seropositive bison to slaughter and seronegative bison to quarantine would used to maintain separation and manage the risk of disease transmission. As in other alternatives, bison would be vaccinated when a safe and effective vaccine was developed to further reduce this risk. This alternative has two phases. Phase 2 is a long-term strategy to manage bison through hunting, quarantine, and use of acquired land or easements for additional winter range and bison management options. Because many of these require additional permits, environmental review, or changes not within the complete control of the agencies, alternative 3 also envisions continuing appropriate features of the interim plan (alternative 1) until these features were in place. This is referred to as phase 1.

Alternative 3 includes the use of capture, test and slaughter, creation of SMAs, quarantine of some seronegative bison, hunting, vaccination of bison, acquisition of additional winter range, and creation of an SMA on that range as bison management tools. Vaccination of bison requires a safe and effective vaccine, which does not currently exist. Construction and operation of a quarantine facility would require environmental review and compliance, as well as a funding source and management entity. The acquisition of winter range, whether through purchase or easement or changes in cattle operations, is a time-consuming and uncertain process. In alternative 3 (as well as in alternatives 4 and 7), bison hunting is assumed; yet, this would require approval by the Montana Legislature, which does not convene until 1999. In addition to the inherent uncertainty of several of these factors, some management tools, such as the construction of a quarantine facility or use of a bison vaccine, would also likely require additional time for environmental review and compliance.

For purposes of analysis, each of these management tools or regulatory changes was assumed to occur by a certain date. If they occurred earlier or later, the impacts of alternative 3 could be slightly different than reported. Also, the mix of management tools could be slightly different than described herein, as agencies would use whichever tools are approved and available. The necessary changes in regulations to allow bison outside the park were assumed to be made immediately upon the agency decision to select an alternative (documented in both a state and a federal record of decision). Hunting was assumed to be approved by the legislature and to begin in 2000. The quarantine facility was assumed to be built and operating by 1999. A safe and effective vaccine was assumed to be available in the year 2000. Because less land was targeted for acquisition in alternative 3 than alternative 2, acquisition was assumed to be completed by 1999. Phase 1 in this alternative refers to the time prior to 1999.

Until land acquisition occurred (phase 2), the separation of cattle and bison on the northern (Reese Creek) boundary would be maintained through capture at Stephens Creek and the shipment of seronegatives to quarantine (or slaughter if the facility was not yet built) and seropositives to slaughter. The National Park Service now ships all bison captured at Stephens Creek (under the provisions of the *Interim Bison Management Plan*) to slaughter, as capture facilities were not designed to hold animals for more than a day or so. A quarantine facility would give the National Park Service flexibility in the disposition of seronegative bison it does not now have.

Bison that completed the full quarantine procedure would be shipped live to requesting tribes or organizations, or used to repopulate herds on public lands. The location, design, and operation of the facility has not been determined,

and would require subsequent MEPA/NEPA analysis, including public input, before any decision was made. Until the time a quarantine facility was constructed, bison captured at Stephens Creek would be sent to slaughter.

The Department of Livestock, with help from the agencies, would maintain a boundary at Little Trail Creek/Maiden Basin hydrologic divide similar to alternative 1. Bison on private land moving north of this boundary would be removed by agency personnel with the permission of the landowner.

No capture would occur in the West Yellowstone area in either phase 1 or phase 2, but bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. As in alternatives 1 and 4, agencies would also maintain a boundary at the northern end of the Cabin Creek Recreation Area/Monument Mountain Unit of the Lee Metcalf Wilderness. Hunting would be used in both the Eagle Creek/Bear Creek and western SMAs to help control population numbers and distribution. Research on the degree to which the winter grooming of park roads contributes to migration out of the park may continue, and changes in road grooming practices made in phase 2 if research showed they were warranted. These changes would be implemented through amendments to the park's winter use plan and appropriate NEPA documentation.

Alternative 3 calls for acquisition of bison winter range through purchase of grazing rights, easements, or property from willing sellers, modifications in cattle allotments, and/or changes in livestock operations to remove susceptible cattle in phase 2. This newly acquired winter range would be designated an SMA (referred to as the Reese Creek SMA throughout the remainder of the description of alternative 3), and would include lands on the west side of the Yellowstone River between Reese Creek and Yankee Jim Canyon. If appropriate, the park's capture facility at Stephens Creek would be dismantled and relocated between the park boundary and Yankee Jim Canyon at a suitable site. The Department of Livestock, with help from the agencies, would maintain a boundary at Yankee Jim Canyon, and hunting in the Reese Creek SMA would be used to control population size and distribution of the bison herd.

If this alternative was selected, the agencies would request the 1999 Montana Legislature to authorize a fair-chase hunt for bison. Public hunting would then become the primary tool for agencies to maintain population sizes in the new Reese Creek SMA as well as the western SMA.

Modifications in grazing allotments in the West Yellowstone area would be an option in this alternative, which could mean bison would be allowed to occupy public lands year-round. The area over which bison would eventually be able to range (e.g., the SMAs) is shown on the Alternative 3 map.

NORTHERN BOUNDARY

Reese Creek

The National Park Service would continue to operate the capture facility at Stephens Creek inside Yellowstone National Park at the Reese Creek boundary in phase 1 of this alternative. Features of the facility are described in alternative 1, and no changes in the Stephens Creek operation except the additional shipping of seronegative bison to quarantine would be anticipated.

Bison evading capture inside the park may be shot by park or other agency personnel with permission from the National Park Service. Those crossing the Reese Creek border and unresponsive to hazing would be shot by the Department of Livestock with help from other agencies, and with permission of the landowner. Currently, efforts would be made to keep all bison from crossing onto private land, and only those unresponsive to hazing and crossing the

Reese Creek boundary would be shot. When a quarantine facility was constructed, some or all seronegative bison that would be captured could be quarantined.

Captured bison would be divided into groups for safety reasons, and blood tested for exposure to *B. abortus*. Seropositive bison would be shipped to slaughter at approved slaughter facilities. If a safe and effective vaccine was available, seronegative bison would be vaccinated. If population numbers were high or winter conditions were harsh, seronegative bison would be shipped to quarantine. If numbers were low, seronegative bison may be held and released when the weather moderated. Under normal circumstances, bison would not remain at the Stephens Creek facility longer than 24 hours. However, if the quarantine facility was not built or room was not available, if population numbers were low, or if winters were harsh, the agencies estimate between 100 and 125 bison could be safely held in the Stephens Creek capture facility.

In phase 2 of this alternative, agencies would dismantle the Stephens Creek capture facility and would not maintain any boundary control at the northern border of Yellowstone National Park. Bison could be hunted in the expanded SMA outside the park. Bison movements would be monitored from November 1 to April 30, but bison would not be hazed unless they approached Yankee Jim Canyon, a narrowing of the valley on national forest land about 12 miles north of Reese Creek. The majority of land north of this point in the valley bottom is privately owned, and agencies would enforce a boundary to keep bison from migrating beyond it. The capture facility would be relocated to a suitable area north of the park and south of Yankee Jim Canyon to provide agencies an option of shooting bison crossing the boundary and to help regulate population numbers.

Eagle Creek/Bear Creek

Agencies would monitor bison movements in the Eagle Creek/Bear Creek area and maintain a boundary at the Little Trail Creek/Maiden Basin hydrographic divide through hunting, hazing, and shooting.

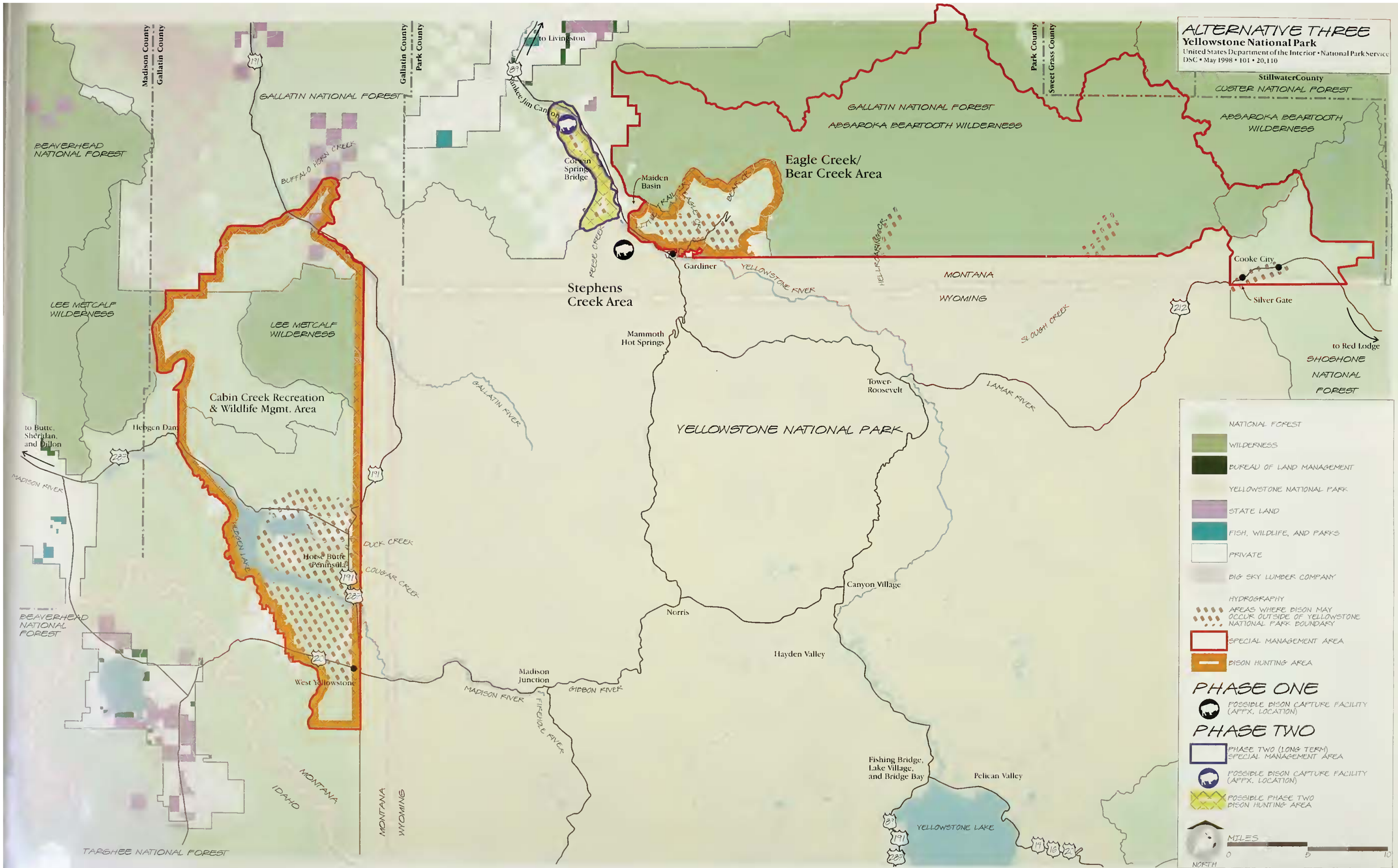
WESTERN BOUNDARY

Agencies would monitor and shoot bison leaving the West Yellowstone area north of Cabin Creek Recreation and Wildlife Management Area/Lee Metcalf Wilderness. Those leaving to the west along Hebgen Lake Dam, or south on private property, would also be hazed or shot (see Alternative 3 map). Public hunting would be allowed in the western SMA on appropriate public lands and on private lands if landowners were willing. Existing capture facilities in the Duck Creek and Madison River area would be dismantled, as this alternative would not include capture or slaughter in the western SMA.

Bison would be hazed by agencies to move them from private to public land. Bison would also be hazed to remove them from the West Yellowstone area in May so cattle can occupy existing allotments in summer. Longer term modifications in allotments would also be possible in alternative 3, although hunting might reduce bison numbers in West Yellowstone to where they would provide no particular advantage to bison.

SPECIAL MANAGEMENT AREAS

In alternative 3, SMAs in phase 1 would be established in the Eagle Creek/Bear Creek area; the Absaroka-Beartooth Wilderness, including the Hellroaring and Slough Creek drainages; and the western boundary area south of Buffalo Horn Creek, including the Cabin Creek Recreation and Wildlife Management Area/Lee Metcalf Wilderness and West Yellowstone area (see Alternative 3 map). When either acquisitions were completed or modifications in cattle operations to remove susceptible cattle were accomplished, the Gardiner Valley west of the Yellowstone River from Reese Creek to Yankee Jim Canyon would also become an SMA (the Reese Creek SMA). The usable winter range


ALTERNATIVE THREE
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,110
Madison County
Gallatin County
Park County
Sweet Grass County
Stillwater County
GALLATIN NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
LEE METCALF WILDERNESS
Cabin Creek Recreation & Wildlife Mgmt. Area
Hebgen Dam
to Butte, Sheridan, and Dillon
MADISON RIVER
BUFFALO HORN CREEK
HEBGEN LAKE
Horse Butte Peninsula
DUCK CREEK
COUGAR CREEK
West Yellowstone
TARGHEE NATIONAL FOREST
IDAHO
MONTANA
WYOMING
to Livingston
Yankee Jim Canyon
Corwin Springs Bridge
Maiden Basin
Eagle Creek/ Bear Creek Area
Stephens Creek Area
Gardiner
Mammoth Hot Springs
YELLOWSTONE NATIONAL PARK
Tower-Roosevelt
Canyon Village
Norris
Hayden Valley
Madison Junction
GIBBON RIVER
FIREHOLE RIVER
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE
GALLATIN RIVER
YELLOWSTONE RIVER
HELLROARING CR.
SLOUGH CREEK
LAMAR RIVER
ABSAROKA BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
Cooke City
Silver Gate
to Red Lodge
SHOSHONE NATIONAL FOREST
NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY
HYDROGRAPHY
AREAS WHERE BISON MAY OCCUR OUTSIDE OF YELLOWSTONE NATIONAL PARK BOUNDARY
SPECIAL MANAGEMENT AREA
BISON HUNTING AREA
PHASE ONE
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)
PHASE TWO
PHASE TWO (LONG TERM) SPECIAL MANAGEMENT AREA
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)
POSSIBLE PHASE TWO BISON HUNTING AREA
MILES
0
5
10
NORTH

available to bison without agency management in this alternative would be similar to but less than alternative 2.

Winter hunting would be a primary population management tool in the Eagle Creek/Bear Creek SMA, the newly created Reese Creek SMA, and the western SMA (including Cabin Creek/Lee Metcalf). The hunt would likely be conducted periodically between October 1 and February 28 as bison move into the SMAs. Any capture operations, should they be needed, would occur during the remainder of the winter following the hunt, e.g., from March 1 to April 30.

In the West Yellowstone area cattle would be grazed during the summer months and bison hazed back into the park during May as long as required. Bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Hunting would help control population numbers and distribution in this SMA. In phase 2, if modifications in grazing allotments and other acquisitions and incentives allowed it, bison could remain year-round on public lands in the West Yellowstone area, although most would be probably be killed through hunting or would return inside park boundaries during the summer.

RISK MANAGEMENT

Strategies to ensure separation of cattle and bison explained above would be the primary means to manage the risk of transmission. These include temporal separation, capture, test, slaughter, and shooting in phase 1, and changes in existing cattle operations and boundary control measures in phase 2. Hunting in all SMAs would reduce the number of bison and the chances of bison migrating toward the boundaries maintained at Yankee Jim Canyon and Buffalo Horn Creek, and therefore the risk of transmission through contact with cattle grazed to the north of these areas.

In phase 1 of this alternative, the separation of cattle and bison at the northern border would be maintained by restricting bison at Reese Creek and Little Trail Creek/Maiden Basin hydrographic divide. At Reese Creek, this would include monitoring, hazing, capture and slaughter, and shooting as described above under the "Northern Boundary." At Eagle Creek/Bear Creek, monitoring, hazing and shooting would be used to prevent entry into the Gardiner area. Hunting would reduce the number of bison overall, hence the number migrating toward the Little Trail Creek/Maiden Basin hydrographic divide boundary.

In the western SMA, separation would be maintained through temporal means on public lands in the short term. Bison in the West Yellowstone area would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Bison would not be allowed back into the SMA until cattle have been removed in October. Topography, availability of habitat, hazing, hunting, and shooting would also keep bison from moving beyond SMA boundaries.

In phase 2, the primary means of separation on both the northern, newly created Reese Creek SMA, and the western SMA would shift to modifications in livestock operations or acquisition of property, easements, or other rights of use. On private land in the SMAs, which now is used for cattle grazing or other livestock operations, agencies might offer incentives to change operations so susceptible cattle were removed. Also, acquisition of private grazing rights, easements, or outright purchase of property from willing sellers might be used to remove cattle altogether on private property in the designated SMAs. In the western SMA, hunting would be expected to reduce the number of bison substantially, although modifications in grazing allotments might allow them to remain year-round. Until such changes were made, bison remaining after the winter hunt would be hazed into the park in May to ensure cattle

occupying the allotments during the summer did not commingle with bison.

Agencies would continue to maintain boundaries between public and private land at Yankee Jim Canyon on the north, and Buffalo Horn Creek to the west to ensure separation of bison and cattle in phase 2. Also, hunting in all SMAs would reduce the number of bison migrating toward these boundaries.

Vaccination of cattle calves in the western SMA on public lands would reduce risk of transmission. State animal health authorities would encourage livestock owners in the western SMA whose cattle might come in contact with bison to vaccinate female calves (4–12 months old) against brucellosis with RB51 or other approved vaccine. Operators in boundary areas would be encouraged to annually vaccinate all subadult cattle as well as calves. Cattle herds in contact areas would continue to be surveillance tested periodically, and any herd whose member (or members) was in contact with bison would be checked for exposure to *B. abortus*. Livestock owners on private property would continue to be responsible for all costs and materials associated with calfhood vaccination.

When a safe and effective vaccine was developed for bison, it would be administered to bison captured at the northern boundary capture facility, held at the quarantine facility, and/or through remote means to bison inside Yellowstone National Park.

POPULATION MANAGEMENT

Bison population numbers at the northern park boundary would be controlled through capture and quarantine or slaughter in phase 1, and hunting, capture, and quarantine in phase 2. Hunting would also be used to control numbers in phases 1 and 2 in the Eagle Creek/Bear Creek SMA and West Yellowstone area of the western SMA.

Quarantine

A quarantine facility would operate intermittently to give agencies flexibility in handling captured bison that they do not now have (see Alternative 3 map). It would also provide a source of live, disease-free bison for tribal governments and requesting organizations that would not be returned to the park. Current regulations do not permit removal of any part of the Yellowstone bison herd for quarantine and eventual release to interstate movement. Accordingly, APHIS, in cooperation with state livestock regulatory authorities, is developing a proposed change to 9 CFR 78 that would allow quarantine and eventual release of seronegative bison completing quarantine for interstate movement (see appendix B). Seronegative bison could be shipped to the quarantine facility and complete an approved quarantine protocol to ensure they were disease free, rather than slaughtered as they are now. Each animal initially assigned to a quarantine facility would have tested seronegative. When the bison have completed the procedure, they would be released live to requesting organizations or agencies.

If bison were migrating out of the park (or Reese Creek SMA in phase 2), and movements were large, making hunting infeasible, they would be captured. Seropositives would be sent to slaughter, and seronegatives would be quarantined and available for eventual release. If a winter was unusually severe and the herd size was low, some bison might be held through the winter and returned to the park.

At a minimum, all bison must have three consecutive negative serological tests, with at least 12 months between the first and last tests to complete quarantine protocol. To minimize the effect of finding reactors (seropositives), bison would likely be kept in several separated groups rather than one large group. Any bison showing signs of exposure to *B. abortus* during this quarantine period would be slaughtered, and testing of the remaining bison in contact with it begun again. Because of this, bison may need to remain in quarantine for several years to be declared disease-free. Bison successfully

completing the full quarantine procedure without contact with any infected animals would be available for release. Concurrent with testing, bison in quarantine could be vaccinated.

Quarantine facilities could be constructed on Gallatin National Forest in the vicinity of Gardiner, other public lands in the vicinity of Yellowstone National Park, lands elsewhere in Montana that would be leased or purchased for this purpose, or on the lands of a cooperating tribe or other organization. Possible designs and costs for a quarantine facility vary widely from a small feedlot-type approach to multiple pasture operation. Because a quarantine facility must ensure potentially diseased animals are not released, they include precautions such as double or triple fencing. Costs range from $500,000 to $800,000 and more to construct such a secure facility. If alternative 3 was selected, the agencies would sign a memorandum of understanding to formalize commitments regarding the quarantine facility.

A quarantine facility can only be operated in a class-free state if (1) APHIS allows the bison to be moved to the facility and (2) the state animal health authorities of that state permit the operation of a quarantine facility and allow the bison to be imported into the state. Also, evaluation of alternative locations and designs could be subject to additional compliance requirements, including criteria described in the "Actions Common to all Alternatives" section and NEPA analysis. For purposes of analysis, this environmental impact statement assumed all needed approvals were received and the quarantine facility was sited, built, and available in 1999 or within one year of the decision to select any alternative that included quarantine as a management tool (alternatives 3, 4, and 7).

Public Hunting

Upon issuance of the records of decision for the environmental impact statements, the agencies would request the 1999 Montana Legislature to authorize Montana to establish regulations for the public hunting of bison. Any public hunting program would be coordinated with the Department of Livestock and the state veterinarian in identifying acceptable animals and areas. In addition to controlling bison numbers, hunting would also help prevent bison on public lands in the Eagle Creek/Bear Creek area, bison on acquired winter range in the Reese Creek area (Reese Creek SMA) and in the western SMA from migrating to private lands, and help maintain bison population numbers and distribution.

This alternative envisions a fair-chase hunt to the extent possible. This would be in contrast to the hunts of the late 1980s, which were widely criticized as unfair to bison and unsporting. Features of a fair-chase hunt would include training or orientation to ensure accurate marksmanship, knowledge of and respect for bison, and emphasizing that all meat, as well as the hide and heads should be used. Hunters would be "on their own" and not accompanied by agency personnel as they were in the 1980s hunts. Hunters would be given no unfair mechanical advantage. Only a few permits would be issued for any given hunting period. Permit numbers would vary, depending on population size and the season format approved by the Montana Fish, Wildlife and Parks Commission. Bison might be hunted in more rugged and remote terrain in the neighboring Gallatin National Forest (Eagle Creek/Bear Creek).

It is not possible to completely describe how the bison season would be administered because Montana statutes do not currently authorize bison hunting. The analysis in this environmental impact statement assumed an application and selection process similar to procedures used to issue permits and licenses for other big game species.

The state's Department of Fish, Wildlife and Parks, in consultation with all cooperating agencies, would prepare recommendations for season length and format, permit quotas, and special regulations for the bison season. The department's recommendations would be developed to be consistent with the purpose of this alternative and in response to current

population levels, anticipated migrations, and current bison management issues. The Montana Fish, Wildlife and Parks Commission would approve these recommendations, with or without amendments, as tentative regulations. Upon approval, the commission would provide notice of publication and request public comment on the tentative regulations. Thereafter, the commission could adopt as final, amend, or disapprove the tentative regulations. Upon final approval, the general bison hunting regulations would be in effect for two years, except that permit quotas could change annually.

Each licensed hunter would be authorized to hunt bison only during the time period and only in the area designated on the person's license. The hunting license would not provide the assurance that bison would actually occupy the specified area during the designated hunting period. License fees would not be refunded to licensed hunters who chose not to hunt, nor would fees be refunded because bison were not available during the designated hunting period.

Hunting regulations would be strictly enforced. Hunters would be notified of the health risks and appropriate precautions for handling dead bison. Hunters would be required to attend a bison hunting orientation program prior to hunting. Successful hunters would be required to properly dispose of the offal and to report their kill to a designated official. Blood and tissue samples could be collected from hunter-killed bison. Prior to implementing the bison season, the cooperating agencies would negotiate agreements with affected landowners to provide private land access for bison hunting where possible. Licensed hunters would not be otherwise restricted or assisted by agency personnel. Hunting is assumed to begin in the year 2000. The analysis assumed that initial quotas would provide for a minimum of 10 permits in the Eagle Creek/Bear Creek area and that bulls would likely be harvested in this area. Twenty permits would be offered in the Reese Creek area. Bulls and larger females would likely be harvested in this area. Due to projected increasing bison numbers moving into the Reese Creek area, 25 permits could be offered beginning in 2005. Thirty permits would be offered in the West Yellowstone area, and nearly all bison, except possibly calves, would be harvested. Based on bison population numbers, winter distribution on public and private lands, and other factors, the agencies may hold additional special drawings to harvest additional bison.

Research on the degree to which winter road grooming inside the park contributes to migration outside the park (i.e., bison distribution) would be initiated if this alternative was selected. If the research showed bison use these roads, segments could be left ungroomed to keep more bison inside the park boundaries (see description of alternative 2 for more information).

ESTIMATE OF COST

Table 4 indicates the costs that would be incurred by the interagency team for alternative 3.

TABLE 4: ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 3

	National Park Service	U.S. Forest Service	State of Montana	APHIS	Shared Costs
Test/sample				$25,000	
Capture facility (Stephens Creek)[1]	$120,000				
Operations (capture, hunting, and bison management)	158,000	$25,000	$225,000		
Vaccination	150,000			8,000	
Relocate capture facility[1]	60,000				
Quarantine facility[1]				500,000 – 800,000[2]	
Quarantine operations (50/yr)				400,000	
Acquisition[1]					$33.1 million
Easement[1]					Unknown[3]
Conversion of livestock operations[1]					Unknown[3]
Allotment modification[1]		15,000			
TOTALS	($488,000)	($40,000)	($225,000)	($933,000 – $1,233,000)	(Up to $33.1 million)

1. One time only capital costs (costs for Stephens Creek facility have already been incurred).
2. Does not include land costs for quarantine facility.
3. Easement and conversion would substitute for acquisition, and costs would be less than $33.1 million.

ALTERNATIVE 4: INTERIM PLAN WITH LIMITED PUBLIC HUNTING AND QUARANTINE

The interim plan (no action, or alternative 1 in this analysis) has served to ensure spatial separation of the bison herd from domestic cattle on the north and west borders of Yellowstone National Park. However, it has given agencies few options when population numbers are high, and/or when harsh winters force more than the average number of bison toward the boundaries of Yellowstone National Park. The capture facility at Stephens Creek on the northern boundary was not designed to hold bison for more than a day or so; yet, because the 1996–97 winter was severe and unprecedented numbers of bison were being removed by management actions, the facility was used to keep more than 100 bison throughout the winter. For this reason, alternative 4 includes a quarantine facility to keep seronegative bison captured at Stephens Creek. Removal of bison to quarantine would also help keep population numbers from growing too large, as bison completing the quarantine protocol would be released to tribes, requesting organizations, or to repopulate herds on public lands. The location of the facility has not been determined, and would require subsequent MEPA/NEPA analysis, including public input, before any decision is made. The details of a quarantine facility are described in alternative 3.

Hunting is also a tool proposed for alternative 4 to help control population sizes and distribution. Except for these differences, alternative 4 is identical to the interim plan, alternative 1.

Vaccination of bison, which is part of all the alternatives, requires a safe and effective vaccine, yet one does not currently exist. Alternative 4 also assumes a quarantine facility would be available and hunting would be approved. A quarantine facility located on public land would require environmental review and compliance, and hunting could not take place unless the 1999 Montana Legislature approves it. This environmental impact statement assumes for purposes of analysis certain dates by which each of these events would occur. Any regulation changes needed to allow bison into SMAs outside the park are assumed to take place immediately upon signing the records of decision to select an alternative. Both the quarantine facility and hunting are assumed to be available by 2000. The provisions of the interim plan would continue until these features were in place. If the dates were not met, analysis in the "Environmental Consequences" part of this document for alternative 4 would be as described in alternative 1, the no-action alternative 1.

NORTHERN BOUNDARY

Reese Creek

The NPS capture facility located at Stephens Creek inside Yellowstone National Park at the Reese Creek boundary would continue to operate. Features of the facility are described in alternative 1, and no changes in the Stephens Creek operation except the additional shipping of seronegative bison to quarantine would be anticipated. Bison not captured and crossing the property would be hazed back into the park, or shot with permission of the landowners, as they are now. All captured bison would be tested for exposure to *B. abortus*. Bison evading capture inside the park or unresponsive to hazing would be shot on private land. When the quarantine option was available, some bison would be quarantined.

Captured bison would be divided into groups for safety reasons, and blood tested for exposure to *B. abortus*. Seropositive bison would continue to be shipped to slaughter at approved slaughter facilities. If a safe and effective vaccine was available, seronegative bison would be vaccinated. If population numbers were high or winter conditions were harsh, seronegative bison (including pregnant females) would be shipped to quarantine. If numbers were low, seronegative

bison could be held until weather moderated and released for return to the park's interior. Under normal circumstances, bison would not remain at the Stephens Creek facility for longer than 24 hours. However, if the quarantine facility was not yet built or room was not available and population numbers were low, it could be used to keep some bison through the winter. The agencies estimate between 100 and 125 bison could be safely held in the Stephens Creek capture facility.

Eagle Creek/Bear Creek

Agencies would continue to monitor bison movements in the Eagle Creek/Bear Creek area and maintain a boundary at the Little Trail Creek/Maiden Basin hydrographic divide from November to April. However, if the Montana Legislature approved it, a fair-chase hunt from approximately October 1 to February 28 would be the primary tool used to control population numbers in this area. Details of the hunt are described in alternative 3. Fewer bison would likely attempt to cross over into the Little Trail Creek/Maiden Basin area if hunting reduced their numbers.

WESTERN BOUNDARY

Entry into the western boundary area would continue to be controlled using capture facilities (now located at Duck Creek and along the Madison River) from November 1 to April 30. Facilities might be moved to take advantage of changing bison migration routes from year to year. Bison evading capture at these facilities on public lands would be shot. Those evading capture on private lands would be shot at the request or with permission of the landowner. Bison on both private and public land in the area of each of these facilities might respond to baiting or hazing and be captured by agency personnel. Captured bison would be blood tested for exposure to *B. abortus*. All seropositive bison would be shipped to slaughter. Seronegative-nonpregnant females and all seronegative males would be identified with a small metal ear tag and a temporary visual marker, and released on public lands in the West Yellowstone area, where they could remain until May. If necessary, bison might need to be shipped a short distance from the capture facility to public lands. Seronegative-pregnant bison would be shipped to quarantine, where they would follow the quarantine protocol. Following successful completion of the quarantine protocol (see quarantine description in alternative 3), bison would be released to requesting tribes and organizations or used to repopulate herds on public lands. Limited hunting in the western boundary area, primarily as a recreational opportunity rather than as a population management tool, is also a part of this alternative.

SPECIAL MANAGEMENT AREAS

In this alternative, SMAs would be established in the Eagle Creek/Bear Creek area; the Absaroka-Beartooth Wilderness, including the Hellroaring and Slough Creek drainages; and the western boundary area south of Buffalo Horn Creek, including the Cabin Creek Recreation and Wildlife Management Area/Lee Metcalf Wilderness and the West Yellowstone area (see Alternative 4 map).

Cattle would continue to be grazed in the West Yellowstone area on Gallatin National Forest lands from about June 15 to October 15. Cattle graze on private land from approximately June 1 to November 15. Bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Bison would be allowed back into the West Yellowstone area following the departure of livestock. Bison would be shot by agencies if they occupied private lands in the area (by request or with permission of the landowner), or left the SMAs. Because there is very high elevation country to the west and private lands to the south, bison would only be able to leave the West Yellowstone area on public lands via a

narrow corridor around Hebgen Lake Dam. Those that did so would be shot.

Bison would be able to occupy the Cabin Creek Recreation and Wildlife Management Area/Lee Metcalf Wilderness to the north of the West Yellowstone area without interference from the agencies. These are public lands free of cattle, although topography and snow depths limit the number of bison that actually use them. Hunting from October 1 to February 28 would be allowed in both the Eagle Creek/Bear Creek SMA and West Yellowstone area of the western SMA. It would be the primary means of controlling population numbers in the Eagle Creek/Bear Creek area, and be used mostly for recreational purposes in West Yellowstone, although some secondary population control benefits would be expected.

RISK MANAGEMENT

Alternative 4 would rely on separation, capture, and slaughter to minimize the risk of brucellosis transmission.

The primary means to ensure separation of cattle and bison would be the enforcement of controlled entry at the northern border described above, and temporal separation at the western border on public lands. At Reese Creek, this would include monitoring, hazing, capture and slaughter, quarantine, and shooting. At Eagle Creek/Bear Creek, monitoring, hazing, hunting and agency shooting would be used to prevent entry into the Gardiner area.

In the western SMA, bison would be hazed back into the park from the West Yellowstone area to prevent them from mingling with cattle during the time livestock were present. Any remaining bison would be shot. Hunting would reduce the number of bison and slightly reduce pressure of migrating bison on boundary areas. As described above, bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Bison would not be allowed into the SMA until cattle have been removed in October. Topography, availability of habitat, hazing, and agency shooting would also keep bison from moving beyond SMA boundaries or onto private land.

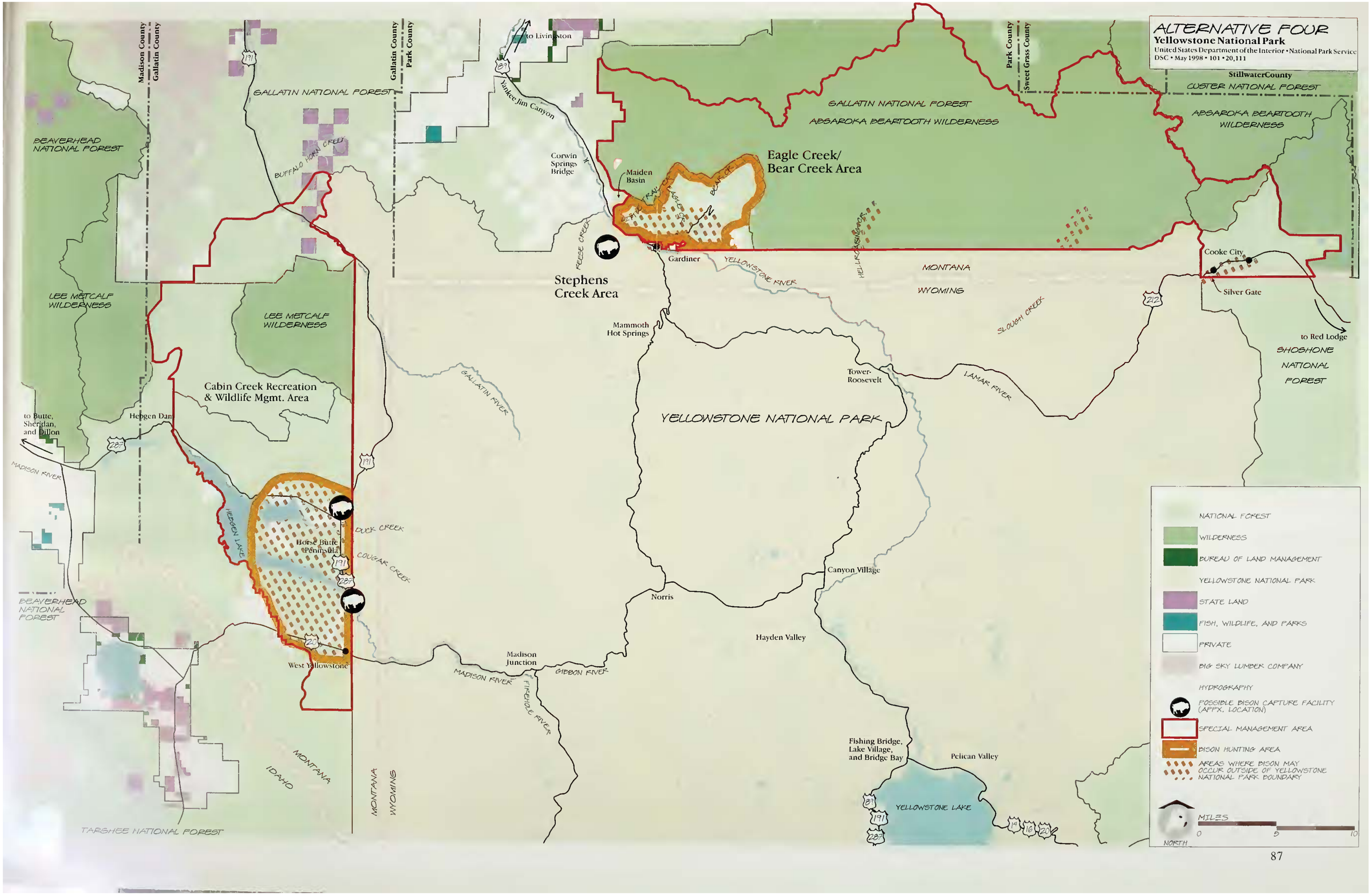
In addition to separation, this alternative would reduce risk of transmission through capture and slaughter, and quarantine (see below for more information on quarantine). All seronegative bison captured in the Stephens Creek facility and seronegative-pregnant bison in the western SMA would be quarantined, and all seropositives would be slaughtered. This would remove all possible reactors from the vicinity where cattle would eventually be. Removing pregnant bison would ensure their birth materials did not remain onsite when cattle returned to the allotments.

State animal health authorities would encourage livestock owners in the western SMA whose cattle might come in contact with bison to vaccinate female calves (4–12 months old) with RB51. Operators in boundary areas would be encouraged to annually vaccinate all subadult cattle as well as calves. Cattle herds in contact areas would continue to be surveillance tested periodically, and any herd whose member or members might be in contact with bison would be checked for exposure to *B. abortus*. Livestock owners on private property would continue to be responsible for all costs and materials associated with calfhood vaccination.

When a safe and effective vaccine was developed for bison, it would be administered to bison in capture facilities testing negative. It might also be delivered through remote means to bison inside Yellowstone National Park.

POPULATION MANAGEMENT

Bison population numbers at the Reese Creek boundary would be controlled through quarantine or slaughter. In the West Yellowstone area, slaughter, quarantine, and to a lesser extent, hunting would be used to control population numbers. Hunting would be the primary means


ALTERNATIVE FOUR
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,111
Madison County
Gallatin County
Park County
Sweet Grass County
Stillwater County
GALLATIN NATIONAL FOREST
CUSTER NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
BEAVERHEAD NATIONAL FOREST
LEE METCALF WILDERNESS
Eagle Creek/ Bear Creek Area
Stephens Creek Area
Cabin Creek Recreation & Wildlife Mgmt. Area
Horse Butte Peninsula
Gardiner
Mammoth Hot Springs
Tower-Roosevelt
Canyon Village
Norris
Hayden Valley
Madison Junction
West Yellowstone
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
Cooke City
Silver Gate
to Red Lodge
to Livingston
Yankee Jim Canyon
Corwin Springs Bridge
Maiden Basin
Hebgen Dam
to Butte, Sheridan, and Dillon
MONTANA
WYOMING
IDAHO
YELLOWSTONE NATIONAL PARK
SHOSHONE NATIONAL FOREST
TARGHEE NATIONAL FOREST
YELLOWSTONE LAKE
HEBGEN LAKE
BUFFALO HORN CREEK
DUCK CREEK
COUGAR CREEK
FEESE CREEK
YELLOWSTONE RIVER
SLOUGH CREEK
LAMAR RIVER
GALLATIN RIVER
MADISON RIVER
GIBBON RIVER
FIREHOLE RIVER
NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY
HYDROGRAPHY
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)
SPECIAL MANAGEMENT AREA
BISON HUNTING AREA
AREAS WHERE BISON MAY OCCUR OUTSIDE OF YELLOWSTONE NATIONAL PARK BOUNDARY
MILES
0
5
10
NORTH

of controlling numbers in the Eagle Creek/Bear Creek SMA.

Quarantine

A quarantine facility would give agencies flexibility in handling captured bison that they did not have (see "Alternative 3"). It would also provide a source of live, disease-free bison for tribal governments, requesting organizations, or to establish populations on other public lands. Seronegative bison could be shipped to the quarantine facility and complete an approved protocol to ensure they were disease free, rather than slaughtered as they are now. When they have completed the quarantine procedure, they would be released live to requesting organizations or agencies (see appendix B for quarantine protocol). If population numbers in the Yellowstone herd were high and bison were migrating out of the park, more seronegative bison captured on the west side might be quarantined, rather than released into the SMA. If numbers were low and unusually severe weather caused migration out of the park, seronegative bison might be held through the winter at the capture facilities and returned to the park rather than quarantined. Quarantined bison would be available for release to requesting tribes, organizations, or to repopulate herds on public lands, but would not be returned to the park. Any bison showing signs of exposure to *B. abortus* during the quarantine period would be slaughtered, and testing of the remaining bison in contact with it begun again. Because of this, bison might need to remain in quarantine for several years to be declared disease free. Bison successfully completing the full quarantine procedure without contact with any infected animals would be available for release. (See "Quarantine" section in alternative 3 for more information on facility descriptions and procedures.)

Public Hunting

Procedures for administering a bison hunting season would be similar to that described for alternative 3. Upon issuance of the records of decision, the agencies would request the Montana Legislature to authorize Montana to establish regulations for the public hunting of bison. If approved, regulated public hunting seasons would be administered primarily for the purpose of providing recreational hunting; to control bison numbers on public lands in the Eagle Creek/Bear Creek area; and, as a secondary method to control bison numbers in the West Yellowstone areas.

ESTIMATE OF COST

Table 5 indicates the costs that would be incurred by the interagency team for alternative 4.

TABLE 5: ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 4

	National Park Service	U.S. Forest Service	State of Montana	APHIS
Test/sample				$20,000
Capture facilities[1]	$120,000		$175,000	50,000
Operations (capture, hunting, and bison management)	158,000	$25,000	275,000	100,000
Quarantine facility[1]				500,000 – 800,000[2]
Quarantine operations				400,000
Vaccination	150,000			8,000
Average income from the sale from meat, hides, and heads			+42,000	
TOTAL	($428,000)	($25,000)	($408,000)	($1,078,00 – $1,378,000)

1. One time only (costs for existing facilities at Stephens Creek and western SMA have already been incurred).
2. Does not include costs for land acquisition.

ALTERNATIVE 5: AGGRESSIVE BRUCELLOSIS CONTROL WITHIN YELLOWSTONE NATIONAL PARK THROUGH CAPTURE, TEST, AND REMOVAL

This alternative would implement an aggressive three-year capture and test program for all bison in the park, including those in its interior. Those testing negative would be released in the park, and seropositives would be shipped to slaughter. If a safe and effective vaccine was available, seronegative bison would also be vaccinated. Bison would not be allowed outside the park anywhere in Montana (see Alternative 5 map), and agencies would maintain northern and western boundaries. Bison at these boundaries would be hazed back into the park if possible, but shot if they were unresponsive to hazing and leave the park. Capture facilities at Stephens Creek and at the western boundary area would be retained. In addition, an estimated seven temporary capture facilities would be set up in interior areas of the park. All untested bison would be shot in the latter stages of the capture, test, and slaughter program.

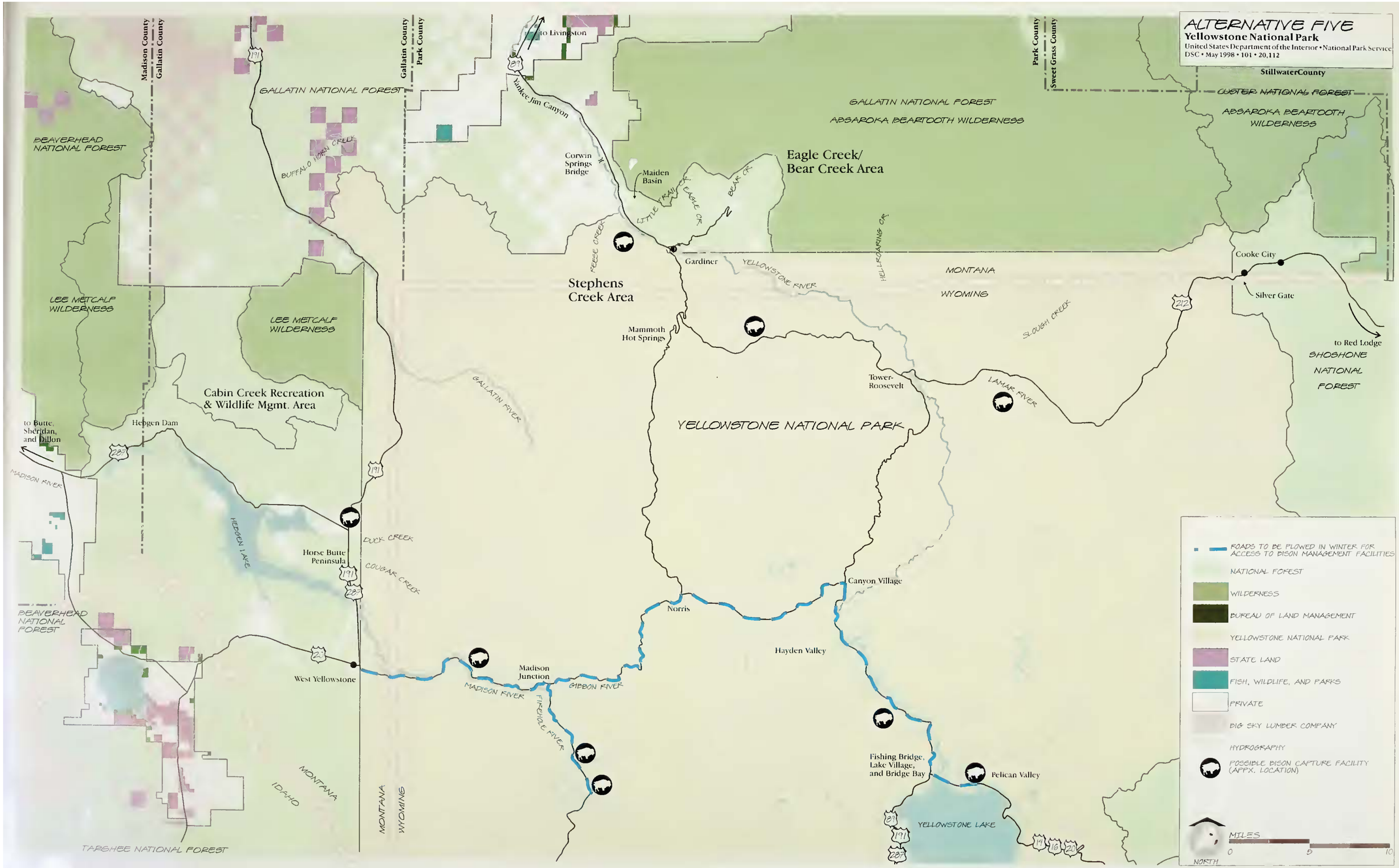
After all park bison have been tested or removed, the herd would be monitored for re-appearance of brucellosis. After a number of years, the entire herd would be captured and retested. Some or all of the capture facilities would be retained for this purpose. If seropositive bison were found, they would be sent to slaughter and the herd monitored and retested again after a period of time. If the entire herd tested free of brucellosis (i.e., less than .1% seropositive for five years), the agencies would devise a new long-term bison management plan recognizing the herd as brucellosis free. For this reason, management under alternative 5, should it be selected, might not extend the full 15 years assumed for other alternatives.

Fewer unknowns exist for this alternative than most of the other alternatives. Quarantine, SMAs, or land acquisition are not part of alternative 5. Although a safe and effective vaccine for bison is not yet available, implementation of this alternative does not depend on such a vaccine, but would only use it as a follow-up to parkwide capture and slaughter of seropositive bison. Each of the capture facilities would require environmental clearance to prevent impacts on natural or cultural resources, in particular threatened or endangered species or archeological resources. However, the agencies believe the areas where capture facilities would be needed are broadly defined enough that a suitable location within each (where these resources would not be affected) could be identified.

NORTHERN BOUNDARY

Reese Creek

Although the NPS capture facility located at Stephens Creek inside Yellowstone National Park at the Reese Creek boundary would continue to operate, boundaries would primarily be controlled through monitoring of bison movements (see "Actions Common to All Alternatives"), hazing to return them to the park, and shooting. The Stephens Creek facility and its operation is described in alternative 1. Agencies would monitor bison prior to and during capture operations to locate bison groups for capture. Monitoring to assist with capture would occur at least twice a month during the period in which capture operations are taking place. During winter as bison approached the northern boundary, agency personnel would record bison locations once per week. When bison approached the Reese Creek area, the northern boundary area east of Gardiner, and the West Yellowstone area, their movements would be monitored daily. Because numerous capture and slaughter operations would be located throughout the park, fewer bison would likely be available to migrate to Reese Creek or other boundary areas. Agency personnel could haze on foot or horseback, in vehicles or aircraft, and might use cracker shells, rubber bullets, or other techniques, or any combination of those methods


ALTERNATIVE FIVE
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,112
Madison County
Gallatin County
Park County
Sweet Grass County
Stillwater County
GALLATIN NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
CUSTER NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
Eagle Creek/ Bear Creek Area
Stephens Creek Area
Cabin Creek Recreation & Wildlife Mgmt. Area
LEE METCALF WILDERNESS
YELLOWSTONE NATIONAL PARK
SHOSHONE NATIONAL FOREST
TARGHEE NATIONAL FOREST
MONTANA
WYOMING
IDAHO
to Livingston
Yankee Jim Canyon
Corwin Springs Bridge
Maiden Basin
Gardiner
Mammoth Hot Springs
Tower-Roosevelt
Cooke City
Silver Gate
to Red Lodge
Hebgen Dam
to Butte, Sheridan, and Dillon
Horse Butte Peninsula
West Yellowstone
Madison Junction
Norris
Canyon Village
Hayden Valley
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE
BUFFALO HORN CREEK
LITTLE TRAIL CR.
EAGLE CR.
BEAR CR.
FEESE CREEK
YELLOWSTONE RIVER
HELLROARING CR.
SLOUGH CREEK
LAMAR RIVER
GALLATIN RIVER
MADISON RIVER
HEBGEN LAKE
DUCK CREEK
COUGAR CREEK
GIBBON RIVER
FIREHOLE RIVER
ROADS TO BE PLOWED IN WINTER FOR ACCESS TO BISON MANAGEMENT FACILITIES
NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY
HYDROGRAPHY
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)
MILES
0
5
10
NORTH

to move bison back into the park or into the Stephens Creek capture facility. Those bison crossing the Reese Creek border and unresponsive to hazing would be shot on private land by agencies with permission of the landowner.

Eagle Creek/Bear Creek

Agencies would monitor bison movements in the Eagle Creek/Bear Creek area from November to April, and, unlike other alternatives, would shoot any bison in this area. The frequency of monitoring would be the same as in other alternatives, except bison would not usually be able to make it to the Little Trail Creek/Maiden Basin hydrographic divide without being detected and shot. Hazing would not normally be a viable option to return bison to the park, unless bison were near the park boundary.

WESTERN BOUNDARY

Bison would be monitored as they approached the western park boundary. They would be hazed to return them to the park, and shot or captured outside the park if unresponsive to hazing. Two Department of Livestock capture facilities located at Duck Creek and along the Madison River might be retained to aid in the brucellosis eradication effort and help enforce the western boundary.

SPECIAL MANAGEMENT AREAS

No SMAs would be created in this alternative, as bison would not be allowed outside park boundaries.

RISK MANAGEMENT

The primary means of managing the risk of transmission in this alternative would be the confinement of bison to park boundaries and the parkwide capture and slaughter of seropositive bison. The National Park Service would maintain temporary capture facilities and carry out capture and testing operations in some or all of the following locations inside Yellowstone National Park in an attempt to capture every bison inside the park (see Alternative 5 map):

- Stephens Creek (existing capture facility)
- Blacktail Plateau
- Lamar/Crystal Bench
- Pelican Valley
- Hayden Valley
- Firehole River/Old Faithful (two facilities)
- Madison River

Capture facilities in the western boundary area could also be retained.

The precise locations of these facilities is unknown. However, the criteria listed in the "Actions Common to All Alternatives" chapter would apply in siting the facilities.

Capture operations in the north and west boundary areas (Stephens Creek and West Yellowstone) would take place throughout winter, with interior park capture operations occurring during early to mid winter (November to January) when areas were accessible by wheeled vehicles. Park roads now left unplowed would be plowed to transport seropositive bison to slaughter (see Alternative 5 map). NPS personnel would shoot untagged bison in remote areas where capture operations would not be feasible during the latter stages when few seropositive bison remain in the herd. Agencies would monitor at least twice a month during the period when capture operations are taking place. If bison approached either the northern or western boundary area, their locations would be recorded weekly. As they approached the park boundary line, their movements would be monitored daily.

Captured bison would be divided into groups for safety reasons, and blood tested for exposure to *B. abortus*. Seropositive bison would continue to be shipped to slaughter at approved slaughter facilities. Therefore, temporary capture facilities would be located adjacent to existing roads. Seronegatives would be identified with a small

metal ear tag and a temporary visual marker, and released into Yellowstone National Park. Features of the capture facilities include separating pens, chutes, loading facilities, and areas to hold bison.

In addition to parkwide capture, test, and slaughter, risk would be managed by preventing bison from leaving the park. Because no cattle graze inside the park, cattle and bison would be completely spatially separated. Existing capture facilities at Reese Creek on the north, and at Duck Creek and the Madison River on the west, might be retained to provide agencies the option of capture to maintain these boundary controls. However, the primary means of controlling the exit of bison from the park would be shooting and hazing. Drops in population numbers associated with the capture and slaughter of all seropositive bison in the park would also act to reduce the number of bison migrating out of the park.

Operators in boundary areas would be encouraged to annually vaccinate all subadult cattle as well as calves. Cattle herds in contact areas would continue to be surveillance tested periodically, and any herd whose member or members might be in contact with bison would be checked for exposure. Livestock owners on private property would continue to be responsible for all costs and materials associated with calfhood vaccination.

When a safe and effective vaccine was developed for bison, it would be administered to seronegative bison in capture facilities. It might also be delivered through remote means to bison inside Yellowstone National Park.

POPULATION MANAGEMENT

The aggressive capture and slaughter program is likely to lower population numbers quickly, particularly if it was accomplished over a three-year span of time. If the herd approached the minimum viable size (estimated at 580 animals) needed to maintain genetic viability, capture and slaughter operations would be slowed or halted. When it was clear the population was not in danger of falling below this number, operations would begin again.

ESTIMATE OF COST

Table 6 indicates the costs that would be incurred by the interagency team for alternative 5.

TABLE 6: ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 5

	National Park Service	U.S. Forest Service	State of Montana	APHIS
Test/sample				$45,000
Vaccination during capture	$25,000			6,000
Vaccination during phase 2	150,000			
Capture facility (Stephens Creek)[1]	120,000			
Capture operations (continuing)	206,000	$15,000		
Other capture facilities (8)[1]	960,000			
Operation of other capture facilities (3 years) during test and slaughter	655,000			
Equipment/repair/replacement	200,000			
Road plowing (3 years)	250,000–350,000			
Average income during parkwide capture from the sale of meat, hides, and heads	+430,700			
TOTALS	($2,135,300 – $2,235,300)	($15,000)		($51,000)

1. One time only (costs for Stephens Creek facility have already been incurred).

ALTERNATIVE 6: AGGRESSIVE BRUCELLOSIS CONTROL WITHIN YELLOWSTONE NATIONAL PARK THROUGH VACCINATION

This alternative, like alternative 5, pursues the aggressive reduction of brucellosis from the Yellowstone bison herd. However, the entire bison herd would first be vaccinated (when a safe and effective vaccine was available), primarily through remote means, and tested as they attempted to exit at park boundary locations. When tests showed the incidence of exposure to *B. abortus* ceased to decline as a result of vaccination, the herdwide capture, test, and slaughter outlined in alternative 5 would begin. The vaccination stage of this alternative is referred to as phase 1; the capture, test, and slaughter as phase 2.

Unlike alternative 5, bison would be allowed in the Eagle Creek/Bear Creek and western SMAs (see Alternative 6 map), although the majority of bison in the western SMA would be tested and seronegatives released. The National Park Service would construct and operate a capture facility at Seven-Mile Bridge inside the park on the west side. Nearly all bison migrating toward the West Yellowstone area cross through this narrow area, giving agencies a better chance for capturing 100% of the bison than if existing Department of Livestock facilities at Duck Creek and Madison River were used. These facilities (at Duck Creek and Madison River) would be dismantled, although a small, backup capture facility near Horse Butte might be maintained.

Like alternatives 2, 3, 4, and 7, alternative 6 would include the creation of SMAs to allow bison outside the park. It also depends heavily on a safe and effective vaccine for bison for implementation. Both of these management tools involve some unknowns. For the purposes of this environmental impact statement, the agencies have assumed that any approvals needed to allow bison outside the park would be made immediately upon signing the records of decision to select an alternative, and that a vaccine that was safe and effective for bison, and safe for nontarget species, would be available by 2000. If these dates were not met, the impacts described in the "Environmental Consequences" of alternative 6 could be slightly different than indicated.

NORTHERN BOUNDARY

Reese Creek

The National Park Service would continue to operate the capture facility at Stephens Creek inside Yellowstone National Park to maintain boundary control at Reese Creek. Features of the facility are described in alternative 1, and no changes in the Stephens Creek operation would be anticipated under this alternative. Bison crossing the boundary would be hazed back into the park or shot. All captured bison would be tested for exposure to *B. abortus*. Bison evading capture inside the park might be shot. Those crossing the Reese Creek boundary and unresponsive to hazing would be shot on private land by agencies with permission of the landowner.

Captured bison would be divided into groups for safety reasons. All bison, whether seropositive or seronegative, would be shipped to slaughter at approved slaughter facilities. Under normal circumstances, bison would not remain at the Stephens Creek facility for longer than 24 hours.

When the aggressive capture and slaughter phase of this alternative began following the stabilization of seroprevalence in the population (predicted to occur after year 10 of vaccination), the Stephens Creek facility would become one of several capture facilities in the park, although boundary control at Reese Creek would likely be less problematic as population numbers would drop quickly. Monitoring, hazing, and shooting would remain as border control measures at Reese Creek.

Eagle Creek/Bear Creek

Agencies would monitor bison movements in the Eagle Creek/Bear Creek area and maintain a boundary at the Little Trail Creek/Maiden Basin hydrographic divide from November to April as described in alternatives 1, 3, and 4.

WESTERN BOUNDARY

During phase 1 and as needed during phase 2, entry into the western boundary area from November 1 to April 30 would be controlled with a new NPS capture facility located at Seven-Mile Bridge inside the western end of Yellowstone National Park, 7 miles from the western border of the park. Bison evading capture at this facility and exiting the park would be shot. Agencies would use hazing (as described above for the Stephens Creek facility), wing fences, and/or bait to move bison into the facility. Bison would be separated and blood tested for exposure to *B. abortus.* All seropositive bison would be shipped to slaughter. The facility would occupy approximately 13 acres, with corrals for holding bison, and four pens to separate them. Two pastures would be available to hold bison for 24 to 36 hours until testing was completed. Water would be provided from the nearby Madison River. Electricity, if needed, would be provided by diesel generators. The facility would be located adjacent to a road, so seropositive bison could be shipped to slaughter. It would also be located so as to meet all additional criteria described in the "Actions Common to All Alternatives." The 7 miles of park road between the facility and West Yellowstone would be plowed to facilitate transport of seropositives to slaughter. When a safe and effective vaccine was available, seronegative bison captured at this facility would be vaccinated.

Seronegative animals would be identified with a small metal ear tag and a temporary visual marker, and released onsite. They might continue their migration to the West Yellowstone area and occupy public lands outside the park in the West Yellowstone area (see Alternative 6 map), or remain inside the park. They can remain on public lands in the western SMA until May, when agencies would haze them back inside park boundaries. Bison would be shot by agencies if they occupied private lands in (by request or with permission of the landowner) or attempted to leave the SMA.

The Seven-Mile Bridge facility would continue to operate following the stabilization of seroprevalence rates and progression to the aggressive capture and slaughter phase of this alternative. As population numbers dropped in the interior of the park, fewer bison would be likely to migrate toward the west end of the park and be captured in the Seven-Mile Bridge facility.

SPECIAL MANAGEMENT AREAS

In this alternative, SMAs would include the Eagle Creek/Bear Creek area, the Hellroaring and Slough Creek drainages, Cabin Creek Recreation and Wildlife Management Area/Lee Metcalf Wilderness, and the portion of West Yellowstone shown on the Alternative 6 map. Cattle would be grazed on Gallatin National Forest lands in the West Yellowstone area from about June 15 to October 15. During phase 1 and as needed during phase 2 of this alternative, bison in the West Yellowstone area would be hazed back into the park in the spring, 30–60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Bison that could not be hazed back into the park would be shot. They would be allowed back into the western SMA following the departure of livestock.

Bison could occupy the Eagle Creek/Bear Creek area year-round. They would also be allowed to occupy the Cabin Creek area, Lee Metcalf Wilderness, and Hellroaring and Slough Creek drainages without agency intervention.

ALTERNATIVE SIX
Yellowstone National Park
United States Department of the Interior • National Park Service
DSC • May 1998 • 101 • 20,113

Madison County
Gallatin County
Park County
Sweet Grass County
StillwaterCounty

GALLATIN NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
LEE METCALF WILDERNESS
CUSTER NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
SHOSHONE NATIONAL FOREST
TARGHEE NATIONAL FOREST
YELLOWSTONE NATIONAL PARK

to Livingston
Yankee Jim Canyon
BUFFALO HORN CREEK
Maiden Basin
BEAR CR.
REESE CREEK
Eagle Creek/
Bear Creek Area
Stephens
Creek Area
Gardiner
YELLOWSTONE RIVER
HELLROARING CR.
MONTANA
WYOMING
Cooke City
Silver Gate
SLOUGH CREEK
to Red Lodge
Mammoth
Hot Springs
Cabin Creek Recreation
& Wildlife Mgmt. Area
GALLATIN RIVER
Tower-
Roosevelt
LAMAR RIVER
to Butte,
Sheridan,
and Dillon
Hebgen Dam
MADISON RIVER
HEBGEN LAKE
DUCK CREEK
COUGAR CREEK
Horse Butte
Peninsula
West Yellowstone
Only seronegative bison allowed on public land in West Yellowstone
7 Mile Bridge Facility
Madison
Junction
MADISON RIVER
GIBBON RIVER
FIREHOLE RIVER
Norris
Canyon Village
Hayden Valley
Fishing Bridge,
Lake Village,
and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE
IDAHO
MONTANA
WYOMING

NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY

HYDROGRAPHY
AREAS WHERE BISON MAY OCCUR OUTSIDE OF YELLOWSTONE NATIONAL PARK BOUNDARY
SPECIAL MANAGEMENT AREA

PHASE ONE
ROADS TO BE PLOWED IN WINTER FOR ACCESS TO BISON MANAGEMENT FACILITIES
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)

PHASE TWO
ROADS TO BE PLOWED IN WINTER FOR ACCESS TO BISON MANAGEMENT FACILITIES
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)

NORTH
MILES
0 5 10

RISK MANAGEMENT

Phase 1 of this alternative relies on vaccination of bison and spatial and temporal separation measures to minimize risk until seroprevalence rates stabilized. When they did (predicted to occur about 10 years after whole-herd vaccination begins), a phase 2 parkwide capture, test, and slaughter program would be implemented to reduce risk to near zero. Throughout both phases, spatial separation would be assured through the enforcement of controlled entry at the northern and western borders described above, as well as temporal separation at the western border on public lands. At Reese Creek, this would include monitoring, hazing, capture and slaughter, and shooting. At Eagle Creek/Bear Creek, monitoring, hazing, and shooting would be used to prevent entry into the Gardiner area. On the western end, the Seven-Mile Bridge capture facility would catch most bison migrating toward the West Yellowstone area, and monitoring, hazing, capture and slaughter, and shooting would be used to maintain this boundary and ensure separation of bison and cattle. Topography and availability of habitat also keep bison from straying beyond SMA boundaries.

In the West Yellowstone area of the western SMA, cattle and bison would also be separated in time. During phase 1 and as needed during phase 2 of this alternative, bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Bison would not be allowed into the SMA until cattle have been removed in October.

The capture facilities and boundary control measures would continue in phase 2 of this alternative, when aggressive capture and slaughter of all seropositive bison in the herd begins. However, since population numbers would drop quickly, fewer bison would migrate out of the park toward lands occupied by cattle.

In addition to the means described above to ensure boundary control and bison and cattle separation, this alternative would include aggressive vaccination of the entire park herd on an annual basis, and the capture and slaughter of all remaining seropositive bison. Vaccination with a safe and effective vaccine of captured seronegative bison would occur through hand injection during phase 2, as well as remote vaccination through means such as bio-bullets. Remote vaccination would occur yearly. While the vaccination effort is ongoing, the risk of transmission would be controlled by restricting bison to areas where cattle were not present (described above), or through temporal separation. Risks would be further reduced by slaughtering all captured seropositive bison.

When seroprevalence rates did not decrease for a period of two years, they would assume to have stabilized and phase 2 would begin. The National Park Service would then construct seven additional capture facilities across the park as described in alternative 5. Bison throughout the park would be captured, tested, and seropositives slaughtered. Roads inside the park indicated on the alternative 6 map would be plowed as needed to allow transport of seropositive bison to slaughter. Agencies would attempt to capture every bison in the park, and would shoot those not marked as seronegative in inaccessible areas. Capture operations inside the park would occur primarily during late fall and early winter.

Agencies would haze on foot, on horseback, or by helicopter to move bison toward capture facilities, using wing fences, bait, loud noise, or other methods. The combination of vaccination and capture and slaughter would eventually result in a very low rate of seroprevalence in the bison population, and reduce the risk of transmission to cattle to near zero. Vaccination of bison would continue following the capture and slaughter of seropositive bison to help ensure the lowest possible infection rate. The length of time vaccination of the herd continues would depend on the original efficacy of the vaccine, and the success of ongoing efforts to control brucellosis in the Wyoming elk population.

State animal health authorities would encourage livestock owners in the western SMA whose cattle may come in contact with bison to vaccinate female calves (4–12 months old) against brucellosis with RB51 or other approved vaccine. Operators in boundary areas would be encouraged to annually vaccinate all subadult cattle as well as calves. Cattle herds in contact areas would continue to be surveillance tested periodically, and any herd whose member or members may be in contact with bison would be checked for exposure. Livestock owners on private property would continue to be responsible for all costs and materials associated with calfhood vaccination.

POPULATION MANAGEMENT

The effect of capture and slaughter operations at Stephens Creek and Seven-Mile Bridge and other boundary control measures would be to reduce population numbers, particularly during harsh winters when many bison might attempt to move toward park boundaries. During phase 2 of this alternative when capture facilities were set up throughout the park, population numbers would be expected to move toward the lower, rather than higher, end of the range. If numbers moved toward the lower end of the range during phase 1 of this alternative, both capture facilities could be converted to temporary holding facilities to keep bison during harsh winters. If population numbers fell too quickly during the second parkwide capture and slaughter phase of this alternative, operations would be slowed or halted until the population numbers showed stabilization or recovery.

ESTIMATE OF COST

Table 7 indicates the costs that would be incurred by the interagency team for alternative 6.

TABLE 7: ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 6

	National Park Service	U.S. Forest Service	State of Montana	APHIS
Test/sample - phase 1	$10,000			$20,000
Test/sample - phase 2	40,000			25,000
Capture facilities at Stephens Creek and Seven-Mile Bridge - phase 1[1]	270,000			
Operations	294,000	$15,000		
Road plowing - phase 1 (10 years)	21,000			
Vaccination	150,000			2,000
Capture facilities - phase 2 (6)[1]	720,000			
Operations - phase 2 (3 years)	855,000			
Road plowing - phase 2 (3 years)	250,000–350,000			
Operations			$175,000	
Average income from the sale of meat, hides, and heads	Phase 2 - +278,000		Phase 1 - +33,000	
TOTALS	($745,000-phase 1 – $1,909,000-phase 2)	($15,000)	($142,000-phase 1 – $175,000-phase 2)	($47,000)

1. One time only (costs for Stephens Creek faeility have already been incurred).

ALTERNATIVE 7: PREFERRED ALTERNATIVE – MANAGE FOR SPECIFIC BISON POPULATION RANGE

This alternative, like others evaluated in this environmental impact statement, involves many unknowns and assumptions about future conditions and available tools to manage the bison population. These assumptions represent what the agencies believe are most reasonable time frames for these tools to become available. Should one or more be available earlier or later than assumed for the purposes of analysis in this environmental impact statement, the impacts on several resources could be slightly different than indicated in the "Environmental Consequences." It is also possible that while one management option is approved in the time frame assumed, another might not. The agencies would use whichever tools were approved when they became available. Again, this might mean slightly different impacts than those described for alternative 7.

The preferred alternative includes the use of capture, test, and slaughter, the creation of special management areas (SMAs) in the Eagle Creek/Bear Creek area and west of the park, hazing and shooting bison outside the SMAs and on private lands within the SMAs, quarantine of some seronegative bison, hunting for recreational purposes and to help control bison distribution, vaccination of bison, the potential acquisition of additional winter range and the proposed creation of an SMA on that range as management tools.

As in all alternatives except alternative 5, the preferred alternative would allow bison outside park boundaries. This, or agency actions to manage bison on these lands, would require the creation of SMAs to protect Montana's class-free status, and the approval of the state of Montana as specified by Montana law to establish SMAs.

Use of quarantine as a management tool would provide the agencies flexibility in handling captured bison they do not now have. However, such a quarantine facility does not yet exist, and environmental compliance and public review would be required to examine alternative designs and locations before it could be built or operated on public land.

For purposes of analysis, the environmental impact statement assumes any required approvals to create SMAs would occur immediately upon signing the records of decision to implement the selected alternative and that the quarantine facility would be built and operating by the year 1999. If this proved not to be the case, the agencies would continue to rely on the capture, slaughter, hazing, and/or shooting of all bison attempting to exit the park at Reese Creek as described in the *Interim Bison Management Plan* under which the agencies now operate. When the facility was built, seronegative bison captured at the Stephens Creek facility would normally be transferred to quarantine, although at very low or very high population numbers this might not be the case (See "Population Management" section). Seronegative-pregnant bison captured at facilities inside the western SMA would also be quarantined and available for release following the successful completion of quarantine protocol.

Hunting is an additional management tool this alternative assumes would be available to help maintain a prescribed population size and distribution. The agencies would request the 1999 Montana Legislature to authorize a fair-chase hunt for bison. If authorized, the agencies would recommend Montana establish regulations for the public hunting of bison in a timely manner in accordance with applicable state laws. This analysis has assumed hunting would be available as a management tool in the year 2000. However, both authorization and appropriate state environmental compliance and public review would be completed before implementation of a bison hunt could begin.

This alternative, like all others, also assumes the use of a safe and effective vaccine on bison throughout the park, as well as the use of a safe vaccine on captured or quarantined bison. As the section on "Vaccination" in Actions Common to All Alternatives" indicates, a vaccine known to be safe and effective for bison, and safe for nontarget species does not currently exist, and the administration of a vaccine would require agreement from the agencies as well as possible environmental compliance and review. The decision on when a vaccine is safe and effective "enough" is complex and depends on a variety of factors. It is unknown when such a vaccine would be available, although the agencies believed it was reasonable to assume that vaccination would begin in the year 2000.

For purposes of analysis, this alternative also anticipates acquisition through purchase or easement of private property to the north of the park. This could only occur if the current owners of the property were willing to sell or grant easements on part or all of the property the agencies believed was useful for plan implementation, money was available for such a purchase, an organization or public entity agreed to manage the land, and all necessary environmental review and compliance was completed. Any or all of these conditions might or might not be met. The agencies are currently discussing the possible acquisition of land north of Yellowstone National Park, and have assumed for the purposes of analysis that the conditions would be met and purchase or easement would occur in the year 2000. The terms of the possible acquisition or easement at this time are unknown. In part because of these unknowns, this environmental impact statement analyzes the effect of the preferred alternative on bison distribution with and without the purchase or easement. This same information for impacts on other resources is available by comparing the environmental consequences sections for alternative 4, where acquisition was not anticipated.

The preferred alternative (alternative 7) departs from all other alternatives in that a range of bison population numbers is analyzed that differs from the other alternatives. This range is from 1,700 to 2,500 bison. Agency-implemented lethal controls would decrease as the population approached 1,700 bison and would cease at 1,700 bison in certain areas as described in management sections for each area. In general, hazing bison from areas where they were not permitted such as outside SMAs or on private land would be attempted before they were shot. Untested bison in the western SMA that posed a lower possibility of transmission of brucellosis and animals testing negative and previously released, would be allowed on public land during periods of the year that cattle were not present. Bison that posed a greater possibility of disease transmission would be removed. The state of Montana reserves the right to identify bison with a lower possibility of transmission according to such criteria as the state veterinarian and the Board of Livestock deem necessary to prevent brucellosis transmission from bison to cattle and to prevent import sanctions on Montana cattle by other states. The determination of animals in the western SMA that pose a lower possibility of transmission would be within the discretion of the Montana state veterinarian. The Montana state veterinarian would consult with APHIS and other state animal health authorities and use the best available science when making this determination (see appendixes A and G). Measures to remove increasing numbers of bison would be implemented as the population approached 2,500. However, the agencies might not be able to limit the herd to 2,500 because all lethal measures would occur at or outside the park boundary and in response to bison migrations.

In phase 2, it is assumed the agencies would acquire access to additional lands in the Gardiner Valley on the west side of the Yellowstone River for uses including winter range, siting the capture facility, and other bison management activities provided willing sellers were identified and funding was available. These lands would be evaluated along with other alternative sites for a quarantine facility. This might mean purchase of grazing rights, easements, or property from all willing sellers. Assuming land or easements were acquired and

placed under state or federal management, this area could be used for winter range, siting the capture facility, and other bison management activities. Physical barriers such as heavy jack-leg fencing might be placed at the north end next to the Yellowstone River to block bison movement. Protective fencing around small private inholdings could be constructed with landowner concurrence. Allowing bison outside the park in this area, should it be acquired, would require the creation of an SMA. For the remainder of this description, this SMA is referred to as the Reese Creek SMA. The capture facility now located at Stephens Creek could be dismantled and relocated to a suitable location north of the park boundary and south of Yankee Jim Canyon in this SMA.

Although the preferred alternative is distinct, it has elements similar to other alternatives. Capture and slaughter of seropositives is the primary means of managing risk, as it is in alternatives 1, 4, and 5. As many seronegative bison as possible would be shipped to a quarantine facility, as they would be in alternative 4. Also like alternative 4, low levels of hunting would be allowed in one or more of the SMAs outside the park. As in alternative 3, the preferred alternative allows the Stephens Creek facility to be moved to a suitable location north of the park boundary and south of Yankee Jim Canyon if the land was acquired under public ownership. However, as described above (and in the "Population Management" section below), this alternative is much more specific in defining a narrower population range and management actions to keep it within that range.

NORTHERN BOUNDARY

Reese Creek

If acquisition of land from willing sellers north of the park occurred, it would be evaluated as an alternate site for the Stephens Creek capture facility managed by the park. However, if lands were not acquired, the park would continue to operate the facility throughout the life of this plan. Features of the capture facility are described in alternative 1, and no changes in operation except the additional shipment of as many seronegative bison as possible to quarantine would be anticipated. Criteria listed in "Actions Common to All Alternatives" for the location of a capture facility would apply to siting such a facility if it were moved.

Management actions at the capture facility would vary, depending on the population size. Bison evading capture at the Stephens Creek facility (or at the new capture facility on acquired property, should this occur) might be shot or hazed on private land. If population numbers approached 1,700, agencies would haze bison in the park or capture facility if possible rather than shoot them. If population numbers approached 2,500, agency personnel would likely shoot bison when they occupied private land, rather than trying to haze them back into the park or capture facility.

Captured bison would be divided into groups for safety reasons and blood tested for exposure to *B. abortus*. Seropositive bison would be shipped to slaughter at approved slaughter facilities. Until a quarantine facility was approved, sited, and built, seronegative captured bison at Stephens Creek would also be shipped to slaughter, unless population numbers were approaching 1,700. If population numbers were low (approaching 1,700), seronegative bison might be held until weather moderated and released back into the park. Should such environmental conditions recur at low population numbers, the Stephens Creek capture facility might again be used to temporarily hold overwintering bison. The agencies estimate between 100 and 125 bison could be safely held in the Stephens Creek facility.

If bison numbers were approaching 2,500 and bison left the park, seronegative bison would be sent to quarantine for release following completion of protocol described in appendix B. Bison completing the full quarantine protocol would be made available to establish bison populations on tribal lands, other appropriate public lands, or provided to other appropriate public institutions or other qualified recipients.

When a safe vaccine was available, seronegative bison would also be vaccinated at the capture or quarantine facility. If the quarantine facility was full (and population numbers at or above 2,500), captured seronegative bison would be sent to slaughter.

In phase 2, these same functions could be relocated to a new capture facility on acquired lands north of the park boundary and south of Yankee Jim Canyon. This is dependent on the acquisition from willing sellers of private lands, easements, or grazing rights to property north of the park border to Yankee Jim Canyon (see Alternative 7 map). Changes to allotments on the north side of the park would be possible in phase 2.

Eagle Creek/Bear Creek

Agencies would monitor bison movements in the Eagle Creek/Bear Creek area and maintain a boundary at the Little Trail Creek/Maiden Basin hydrographic divide through limited hunting (if approved by the Montana Legislature), hazing, and agency shooting. Hunting would also keep population numbers lower and decrease the number of bison approaching the boundary at the Little Trail Creek/Maiden Basin hydrographic divide.

WESTERN BOUNDARY

Agencies would monitor and haze or shoot bison leaving the northern boundary (to the south of Buffalo Horn Creek) of the West Yellowstone area of the western SMA (see Alternative 7 map). Those leaving to the west along Hebgen Lake Dam would also be hazed or shot. Although hunting in the West Yellowstone area is not a part of the preferred alternative in phase 1, the agencies could include hunting as a population management tool in phase 2.

The state of Montana would continue to operate a capture facility on private land at Duck Creek in the western SMA. A second facility, located on public land along the Madison River, would be moved to the Horse Butte area to take advantage of changing bison migration routes. This capture facility would likely be located south of the Horse Butte village and east of the cattle guard going onto the butte to avoid the existing designated bald eagle protection area. It would be sited using criteria outlined in "Actions Common to All Alternatives" and operated jointly by the Animal and Plant Health Inspection Service and the National Park Service. Either of these capture facilities could be relocated in future winters if bison migration paths changed.

Bison would be moved into the facilities using bait, hazing, wing fences, or other appropriate methods. They would be tested for exposure to *B. abortus*, and all seropositive bison shipped to slaughter at an approved slaughterhouse. Seronegative-pregnant bison would be sent to quarantine. Normally (e.g., when population size is in the mid-range), seronegative-nonpregnant bison would be identified with a metal ear tag and a temporary visual marker and released onto public lands in the West Yellowstone area. The treatment of seronegative bison captured on the west side would change if populations levels approached the low (1,700) end or the high (2,500) end (see "Population Management" section below).

No changes in allotments or grazing rights on the west side of the analysis area would be anticipated in either phase 1 or phase 2.

SPECIAL MANAGEMENT AREAS

In this alternative, SMAs would be established in the Eagle Creek/Bear Creek area, the Hellroaring and Slough Creek drainages, and the West Yellowstone area south of Buffalo Horn Creek, including the Cabin Creek Recreation and Wildlife Management Area/Lee Metcalf Wilderness (see Alternative 7 map). If lands were acquired north of the park border at Reese Creek, they too could become an SMA. Any SMA requires the approval of the state of Montana as specified by Montana law.

ALTERNATIVE SEVEN

Yellowstone National Park

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Madison County
Gallatin County
Park County
Sweet Grass County
StillwaterCounty
to Livingston
Yankee Jim Canyon
GALLATIN NATIONAL FOREST
ABSAROKA BEARTOOTH WILDERNESS
CUSTER NATIONAL FOREST
BEAVERHEAD NATIONAL FOREST
BUFFALO HORN CREEK
Maiden Basin
Eagle Creek/ Bear Creek Area
BEAR CR
REESE CREEK
Stephens Creek Area
Gardiner
YELLOWSTONE RIVER
HELLROARING CREEK
MONTANA
WYOMING
Cooke City
Silver Gate
212
SLOUGH CREEK
to Red Lodge
SHOSHONE NATIONAL FOREST
LEE METCALF WILDERNESS
MONUMENT MOUNTAIN UNIT OF LEE METCALF WILDERNESS
Cabin Creek Recreation & Wildlife Mgmt. Area
Mammoth Hot Springs
Tower-Roosevelt
LAMAR RIVER
GALLATIN RIVER
YELLOWSTONE NATIONAL PARK
to Butte, Sheridan, and Dillon
Hebgen Dam
287
191
MADISON RIVER
HEBGEN LAKE
Horse Butte Peninsula
DUCK CREEK
COUGAR CREEK
20
West Yellowstone
BEAVERHEAD NATIONAL FOREST
Canyon Village
Norris
Hayden Valley
Madison Junction
GIBBON RIVER
FIREHOLE RIVER
Fishing Bridge, Lake Village, and Bridge Bay
Pelican Valley
YELLOWSTONE LAKE
TARGHEE NATIONAL FOREST
IDAHO
MONTANA
WYOMING

NATIONAL FOREST
WILDERNESS
BUREAU OF LAND MANAGEMENT
YELLOWSTONE NATIONAL PARK
STATE LAND
FISH, WILDLIFE, AND PARKS
PRIVATE
BIG SKY LUMBER COMPANY

HYDROGRAPHY
AREAS WHERE BISON MAY OCCUR OUTSIDE OF YELLOWSTONE NATIONAL PARK BOUNDARY
SPECIAL MANAGEMENT AREA
BISON HUNTING AREA

PHASE ONE

POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)

PHASE TWO

PHASE TWO (LONG TERM) SPECIAL MANAGEMENT AREA
POSSIBLE BISON CAPTURE FACILITY (APPX. LOCATION)
POSSIBLE PHASE TWO BISON HUNTING AREA

MILES
0 5 10
NORTH

Agencies would use the management tools described in the "Northern Boundary" and "Western Boundary" sections of this alternative. Although hunting in the Reese Creek SMA is not part of the alternative in phase 1, it might become a part later if agencies felt it was appropriate and the legislature approved it. If so, the number of hunting permits would be increased when the population level approached 2,500, and decreased when it approached 1,700. The details of the hunt and how it would be conducted would be similar to those described in alternative 3, although the number of permits would likely be more limited.

A limited public hunt in the Eagle Creek/Bear Creek SMA would be used to help control population numbers and distribution and to provide recreation. The hunt would likely run between October 1 and February 28 (see the description in "Population Management" section below).

Cattle would continue to be grazed on Gallatin National Forest lands in the West Yellowstone area from about June 15 to October 30. Cattle graze on private land from approximately June 1 to November 15. Bison would be hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Seronegative-nonpregnant bison released from capture facilities on the west side would be allowed back into the SMA following the departure of livestock if populations were in the low or mid range. If the bison herd was approaching 2,500, a larger proportion of captured seronegatives would be shipped to quarantine rather than released.

If population numbers were high, bison would be shot by agencies (by request or with permission of the landowner) if they occupied private lands in or attempted to leave the SMA. If numbers were low, it would be the preference of the agencies to use hazing as a primary tool to keep bison off private land or from crossing out of the western SMA. If hazing was unsuccessful or the private landowner would not allow hazing, the agencies would shoot bison identified for removal. Very high elevation country to the west would help keep bison confined to the SMA.

Bison would be able to occupy the Cabin Creek Recreation and Wildlife Management Area and Monument Mountain Unit of the Lee Metcalf Wilderness to the north of the West Yellowstone area without agency management. These lands are without livestock allotments, although topography and snow depths limit the number of bison that actually use them.

Hunting bison in the western SMA might be considered as an adjunct to capture operations. If so, it would be used to help manage population size and distribution. The number of hunting permits issued would increase when the population approached 2,500, and decrease as it approached 1,700.

As described above, the Duck Creek capture facility would continue to operate at its present location, and a second west side capture facility would likely be built at Horse Butte.

RISK MANAGEMENT

Alternative 7 would rely on separation, capture, slaughter of seropositives, and vaccination of bison to reduce the risk of brucellosis transmission.

The primary means to ensure separation of cattle and bison would be the enforcement of controlled entry at the northern border and in the western SMA as described above, and temporal separation in the western SMA. On the north end, agencies would use monitoring, hazing, capture, slaughter of seropositives, and agency shooting to maintain separation at Reese Creek. At Eagle Creek/Bear Creek, monitoring, hazing, hunting, and agency shooting would prevent entry into the Gardiner area. If land was acquired north of the park and a Reese Creek SMA was established, hunting could be used in the SMA

to help control population numbers and distribution.

In the West Yellowstone area, temporal separation would be maintained by allowing seronegative-nonpregnant bison in the area in the winter months and cattle in the summer. To prevent commingling of bison and cattle, bison would hazed back into the park in the spring, 30 to 60 days before cattle occupy the area. The exact number of days, between 30 and 60, would be at the discretion of the state veterinarian. Those bison that could not be hazed back into the park would be shot. Bison would not be allowed in the SMA until cattle have been removed in October/November. Hunting, if it was approved, would help control population numbers and distribution. Topography, availability of habitat, hazing, hunting, and agency shooting would keep bison from moving beyond SMA boundaries or onto private land.

In addition to separation, this alternative would reduce risk of transmission to cattle in the West Yellowstone area of the western SMA through capture and slaughter of seropositives in two the capture facilities described above.

Seronegative-pregnant females and bison that posed a greater possibility of disease transmission, including pregnant, untested females or females with newborn calves who have not passed all birth membranes would be captured and quarantined or removed. Removing pregnant bison would ensure no birth materials are left behind when cattle reoccupy the area in the summer. Removal could be through shooting, or if logistically feasible, through immobilization via dart. If the bison has a newborn calf, the calf would be captured by hand or darted. The immobilized animals would be transported back into the park, to quarantine, or to an approved research facility. (Experience to date indicates the chance of a female with a newborn calf who has not passed all birth membranes appearing in the western boundary area is very low. None was observed in any of the past bison control operations.)

Operators in the West Yellowstone area of the western SMA on public lands would be encouraged to vaccinate female cattle calves against brucellosis. Operators in all other boundary areas would be encouraged to annually vaccinate all subadult cattle as well as calves. Cattle herds in contact areas would continue to be surveillance tested periodically, and any herd whose member or members might have come in contact with bison would be checked for exposure. Livestock owners on private property would continue to be responsible for all costs and materials associated with calfhood vaccination.

When a vaccine was developed that was determined safe for bison and nontarget animals, it would be administered to captured bison and bison placed in quarantine. When a safe and effective vaccine was developed, it would be administered through remote means to free-ranging bison.

POPULATION MANAGEMENT

Bison population numbers at the northern park boundary would be controlled through the increasing or decreasing use of lethal methods to manage bison. At low population numbers, if bison crossed the Reese Creek boundary onto private land, the agencies would attempt to haze the bison back into the park. If hazing was unsuccessful or the private landowner would not allow hazing, the agencies would shoot those bison on private land. If winter conditions were very severe, some bison could be held and fed at the capture facility throughout the remainder of the winter. If lands north of the park were acquired and a Reese Creek SMA was established on the west side of the Yellowstone River, bison would be hazed off private land within the SMA if population numbers remained low. If hazing was unsuccessful or the private landowner would not allow hazing, the agencies would shoot those bison on private land within the SMA. Also, if hunting was approved in the SMA, few or no permits would be issued if the herd size was approaching 1,700.

If the bison population approached 2,500 and bison approached the SMA boundary, captured seronegative bison would be sent to quarantine. If the quarantine facility was full, seronegative bison would be sent to slaughter. Bison released from quarantine would be made available to establish bison populations on tribal lands, other appropriate public lands, or provided to other appropriate public institutions or other qualified recipients. In phase 1, bison crossing the park boundary at Reese Creek would be shot on private land. In phase 2, bison going beyond the SMA boundary would be shot by agencies. If the Reese Creek SMA was created, bison on private land within its boundary would be shot upon landowner request. If hunting was approved in the new SMA, increasing numbers of permits would probably be issued as population numbers approached 2,500.

Hunting permits for the Eagle Creek/Bear Creek area would also increase or decrease, depending on the size of the herd. Agencies would attempt to haze bison back into the Eagle Creek/Bear Creek SMA if possible at low population levels and would rely more on shooting to maintain the boundary at Little Trail Creek/Maiden Basin hydrographic divide at higher population levels.

The agencies would use the same types of methods in the western SMA to control population size. When population numbers were low, bison would be hazed off private land, rather than shot. Those attempting to leave the SMA would be hazed if possible, and shot only as a last resort.

Bison would continue to be captured on the west side as the population approaches the low end (1,700 animals). All bison posing a lower risk of transmission and animals testing negative and previously released would be allowed on public lands in the SMA.

All bison in the SMA would be hazed back into the park in May to facilitate reoccupation of the area by cattle in the summer. If hunting was approved in this SMA, no permits would be issued until the population grew beyond 1,700.

If the population was in the mid range, seronegative-nonpregnant bison captured at the two existing capture facilities on the west side would be released onto public lands. Seronegative-pregnant bison would be sent to quarantine.

When the population numbers approached 2,500, agencies would shoot bison on private land or those bison attempting to leave the SMA. All seronegative bison captured in the two facilities operating in the western SMA would be shipped to quarantine provided facility space was available and those bison would be released upon completion of quarantine protocol to establish bison populations on tribal lands, other appropriate public lands, or provided to other appropriate public institutions or qualified recipients.

Quarantine

A quarantine facility would be proposed (e.g., when population levels were not approaching 1,700 and bison were migrating out of the park) to give agencies flexibility in handling captured bison that they do not now have (see alternative 3). It would also provide a source of live, disease-free bison for tribal governments, requesting organizations, or to establish populations on other public lands. Seronegative bison could be shipped to the quarantine facility and complete an approved protocol to ensure they were disease free. When they have completed the quarantine protocol described in appendix B, they could be released to establish bison populations on tribal lands, other appropriate public lands, or provided to other appropriate public institutions and qualified recipients. Any bison showing signs of exposure to *B. abortus* during the quarantine period would be slaughtered, and testing of the remaining bison in contact with it begun again. Because of this, bison might need to remain in quarantine for several years to be declared disease free. Bison successfully completing the full quarantine procedure without contact with any infected animals would be available for release (see "Quarantine" section in alternative 3 for

more information on facility description and procedures). The agencies would sign a memorandum of understanding to formalize commitments regarding a quarantine facility should the preferred alternative or another alternative including quarantine be selected. Details of the design, location, and other factors would be decided following appropriate environmental review and compliance.

Public Hunting

Upon issuance of the records of decision, the agencies would request the Montana Legislature authorize Montana to establish regulations for the public hunting of bison. If approved, regulated public hunting seasons would be administered to help control bison numbers and provide recreation on public lands in the Eagle Creek/Bear Creek area. In addition to controlling bison numbers, hunting would also help prevent bison on public lands in the Eagle Creek/Bear Creek area from migrating to private lands. Hunting might also be allowed in the West Yellowstone and other SMAs. If so, it would be used to help remove bison from private lands in both areas, and in maintaining bison population and distribution.

Regulations likely would authorize a season that would begin no earlier than October 1 and end no later than February 28, with several designated hunting periods within the season. Individual licensed hunters would be authorized to hunt during one designated hunting period. The regulations would specify a quota on the number of licenses to be issued for each area during each hunting season. Each licensed hunter could legally take one bison of any age and of either sex.

Each hunter interested in participating in the bison season would submit an application for a license, similar to an application for other special hunting licenses. Applicants would submit the fees for the license and a processing fee with the application.

Hunting would begin in the year 2000 at the earliest. Based on bison population numbers, winter distribution on public and private lands, and other factors, the agencies might conduct additional special drawings to harvest additional bison (see additional details of the hunt in the description of alternative 3).

ESTIMATE OF COST

Table 8 indicates the costs that would be incurred by the interagency team for alternative 7.

TABLE 8 : ANNUAL COST/INCOME ESTIMATES – ALTERNATIVE 7: PREFERRED ALTERNATIVE

	National Park Service	U.S. Forest Service	State of Montana	APHIS	Shared Costs
Test/sample				$25,000	
Capture facility (Stephens Creek)[1]	$120,000				
Capture facility (west area)[1]			$175,000	50,000	
Operations at capture facilities	337,000	$15,000	225,000	100,000	
Hunting operations		10,000	50,000		
Equipment, repair, replacement	66,000				
Vaccination	150,000			8,000	
Relocate Stephens Creek capture facility[1]	60,000				
Quarantine facility[1]				500,000–800,000[2]	
Quarantine operations (50 bison /yr)				400,000	
Acquisition[1]					$29.1 million
Easement[1]					Unknown[3]
Conversion of livestock operations[1]					Unknown[3]
Wildlife/winter use monitoring		5,000			
Average income from the sale of meat, hides, and heads			+46,800		
TOTALS	($733,000)	($30,000)	($403,200)	($1,083,000 – $1,383,000)	(Up to $29.1 million)

1. One time only capital costs.
2. Does not include land costs for quarantine facility.
3. Easement and conversion would substitute for acquisition, and costs would be less than $29.1 million.

ALTERNATIVES CONSIDERED BUT REJECTED

A segment of the public asked that agencies develop alternatives that used no lethal controls and that allowed bison to exist with no restrictions on their distribution or population size. This alternative would not resolve need or meet the purpose of the plan (see the "Purpose of and Need for Action"), and was therefore eliminated from full-scale analysis and consideration, although it was considered thoughtfully before doing so. Information and conclusions from the preliminary analysis of this alternative is presented below to show a "no management" baseline.

If bison were allowed to freely leave Yellowstone National Park, they would move north into the Gardiner, Paradise, and Yellowstone River valleys and west along the Madison River, Duck Creek, and Cougar Creek into the Madison River valley. The continental divide lies to the west of these areas, but bison could travel north, south, and east, and potentially reinhabit adjacent river valleys.

As bison travel onto private lands, or onto public lands where cattle are grazed, the chances of contact and of the transmission of brucellosis would increase, jeopardizing the state's class-free status. If the disease were to spread undetected, it could quickly move to other states since Montana exports breeding cattle. As bison move into populated areas, the risk of human injury and private property damage would increase. Areas to the north and west of the park have experienced significant increases in human occupation and development over the past few years, and this trend is not expected to change. Additional traffic accidents involving bison would likely occur as well. The corresponding social and economic consequences would be substantial.

Additional alternatives were considered but rejected for reasons outlined in the "Public Scoping" section of the "Purpose of and Need for Action."