

October 1992

# WILDLIFE MANAGEMENT

## Many Issues Unresolved in Yellowstone Bison-Cattle Brucellosis Conflict



148053

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**Resources, Community, and  
Economic Development Division**

B-248037

October 21, 1992

**The Honorable Alan Cranston  
United States Senate**

Dear Senator Cranston:

As you requested, we examined the wildlife-cattle controversy taking place in the vicinity of Yellowstone National Park. This controversy centers on the possible transmission of the Brucella abortus organism from Yellowstone's free-roaming bison and elk herds to cattle grazing on lands outside the park boundary. The Brucella abortus organism causes brucellosis, a contagious disease that can cause abortions and infertility in domestic cattle.

Montana succeeded in eradicating brucellosis from its cattle herds in 1985, which allows Montana ranchers to transport their cattle to other states without first testing them for the disease. Ranchers who graze cattle near the Yellowstone Park boundary are concerned that brucellosis-infected bison and elk will transmit the organism to their cattle when the wildlife migrate outside the park boundary, thereby jeopardizing Montana's ability to freely transport cattle across state lines. The National Park Service's (NPS) policy is to not restrict the movement of the park's bison and elk populations. However, to reduce the risk of brucellosis transmission, the state of Montana has, since 1984, killed more than 1,000 bison that migrated across park boundaries into the state.

Concerned about the killing of bison, you requested that we gather information on (1) the scientific evidence that brucellosis can be transmitted from bison and elk to domestic cattle, (2) the economic damage that might be caused by such a transmission, and (3) the management alternatives for preventing or reducing the likelihood of such transmission.

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**Results in Brief**

Resolving this controversy is difficult because many questions remain unanswered about the actual risk that brucellosis transmission will occur. Although research has proven that the Brucella abortus organism can be transmitted from bison and elk to cattle in experimental conditions, the likelihood of transmission occurring in the wild is not clear. Several factors indicate that the risk of transmission in the northwest area of Yellowstone Park may be low. For example, the most recent study of

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Yellowstone bison showed that the Brucella abortus organism was found in about only 12 percent of the bison killed in the area. A study of 151 Yellowstone elk showed that the organism was found in none of them. Furthermore, NPS and Montana wildlife officials are unaware of any documented cases of brucellosis transmission from wildlife, including bison and elk, to livestock in the wild.

If, however, the organism is transmitted to cattle, several costs will be incurred, and the economic impact on Montana ranchers could be significant. According to federal rules, if a single cattle herd in a state that is free of brucellosis becomes infected with brucellosis, the herd must be slaughtered, and herds in the surrounding area must be tested to ensure the disease did not spread. If more than one herd is found to be infected, the state must implement a brucellosis testing program for certain cattle being sold within or outside the state. The test costs about \$2.50 per head, excluding the cost of roundup and handling. The Montana State Veterinarian estimates that the cost of testing cattle exported from Montana would have been \$438,000 in 1989.

Seven alternatives for managing the bison-cattle controversy are being developed by state and federal agencies. Alternatives being considered include establishing bison management areas outside the park (from which cattle would be prohibited) to provide winter range for bison; preventing bison from migrating from the park through various methods, including shooting; and attempting to eradicate the Brucella abortus organism, which would require trapping and testing bison, as well as slaughtering, neutering, or temporarily sterilizing them. A final bison management plan is expected to be available for public comment early in 1993.

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## Background

Yellowstone National Park, comprising 2.2 million acres of federal park land located in Wyoming, Montana, and Idaho, was established as the world's first national park in 1872. Surrounded by land managed by the U.S. Department of Agriculture's (USDA) Forest Service and some small, privately owned pockets of land, the park is part of the largest and most nearly intact ecosystem in the contiguous United States.

NPS, the Forest Service, and Montana's Department of Fish, Wildlife, and Parks (MDFWP) are responsible for the management of the northwestern area of this ecosystem in which both bison and elk reside. NPS is responsible for resources located within park boundaries; the Forest

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Service manages the habitat within forest boundaries; and MDFWP is responsible for supervising Montana's wildlife, fish, birds, waterfowl, and game and fur-bearing animals.

NPS operates the park under a policy of natural regulation that relies on natural processes to control wildlife populations to the greatest extent possible. In the fall of 1991, NPS estimated the bison population in Yellowstone to be approximately 3,000 head divided into three herds—the Lamar Valley, or northern, herd, consisting of about 500 bison; the Mary Mountain herd, consisting of about 2,000 bison; and the Pelican Valley herd, consisting of about 500 bison. According to an NPS official, about 30,000 elk reside in the park. Approximately 20,000 are in the northern range. Some of these bison and elk are known to be infected with brucellosis, which was first detected in Yellowstone bison in 1917 and in Yellowstone elk between 1931 and 1933.

Bison and elk are migratory animals that sometimes cross the park boundary. In recent winters, bison migrated from the park, primarily onto Montana's private and Forest Service land that borders the park on the north and west. Beginning in an exceptionally severe winter in 1975-76, the northern movement peaked during the winter of 1988-89, with most of the 900 bison then known in the northern range either leaving the park or foraging near the boundary. The bison migration to the west has occurred since the winter of 1981-82 but has been less extensive than the northern migration. Park officials are concerned that, as man's winter activities—such as snowmobiling—continue in the park, bison from the Pelican Valley herd will travel westward along snowmobile trails, thus increasing the number of bison migrating out of the western boundary. Reasons for the migration include the bison's natural gregariousness or herding instinct, acquired knowledge of new foraging areas, and increased population. Several maps showing bison migration patterns appear in appendix I. The northern elk herd also migrates from the park, generally following the same direction as the bison but at higher elevations. Also, elk are more likely to travel farther from the park.

Montana's livestock industry is concerned about the migration of bison—and, to a lesser extent, elk—across park boundaries because of the risk that the *Brucella abortus* organism will be transmitted to and infect the cattle grazing on land outside the park. In cattle, brucellosis can cause abortions of the first calf after infection, although subsequent pregnancies can be carried to full term. The disease may also cause the birth of unhealthy calves and infertility in both sexes. Natural transmission of the

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Brucella abortus organism in cattle is primarily through ingestion of the organisms present in large numbers in aborted fetuses, membranes, and uterine discharge. Transmission can also occur when a cow comes in contact with feed or straw that has been contaminated by infected fetal tissues and fluids. The Brucella abortus organism can be transmitted to humans, most likely as they handle infected material when helping with the delivery of a calf. Brucellosis in humans is called undulant fever. It is characterized by severe and often chronic flu-like symptoms, including high fever, chills, joint pains, backache, and loss of weight and appetite. The disease can recur but is curable with antibiotics. According to the U.S. Centers for Disease Control, fewer than 100 human cases of brucellosis are reported each year.

Brucellosis concerns cattle ranchers not only because of abortion, unhealthy calves, and infertility but also because USDA and the states regulate the transport of cattle and bison infected with or exposed to<sup>1</sup> the Brucella abortus organism, which can restrict the ranchers' ability to sell livestock. Since a national brucellosis control program was first instituted in 1934, more than \$3 billion in federal, state, and industry funds have been spent trying to eradicate the disease. As part of the eradication effort, USDA's Animal and Plant Health Inspection Service (APHIS), in cooperation with state animal health authorities and the livestock industry, has developed uniform rules for controlling and eradicating brucellosis in cattle and bison. (These rules, however, do not currently apply to elk.) Under these rules, states are classified as class-free, class A, class B, or class C, primarily depending on the rate of brucellosis infection in livestock in that state. Interstate movement of cattle is restricted in all but the class-free states. In class A states, which have an infection rate of no more than 0.25 percent, exported cattle must be tested before interstate shipment. In class B states, which have an infection rate of no more than 1.5 percent, exported cattle must be tested both before and after interstate shipment. In class C states, which can have infection rates greater than 1.5 percent, exported cattle must be tested twice before and once after interstate shipment. As of May 1992, 29 states, including Montana, were class-free; 19 states were class A; 2 were class B; and none was class C.

NPS began efforts to reduce the likelihood of brucellosis transmission from bison to cattle more than 20 years ago. Under various plans, NPS personnel have shot bison inside the park that approached specified boundary areas; hazed or herded bison back into the park; placed cattleguards and fences

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<sup>1</sup>Exposed cattle and bison are those that are part of a herd known to be infected with brucellosis or that have been in contact with animals that are infected with brucellosis.

at common exit points; and used scare devices, such as sirens and taped wolf howls, to keep the bison in the park. Each of these efforts met with little success. Although Interior rescinded the park's authority to kill bison in 1978, MDFWP game wardens and hunters have, since 1984, killed more than 1,000 bison that migrated across park boundaries. The largest kill of 569 head was in the winter of 1988-89, and the most recent kill of 274 head was in the winter of 1991-92.

Elk populations are currently managed through public hunts run by the state of Montana, which controls the number and type of elk hunted each year. There are two hunting seasons: the general season, which takes place in October and November, and the late season, which occurs between December and February. In Montana, ranchers and APHIS are less concerned about elk than bison because of the belief that elk are less likely to transmit the disease to cattle than bison.

## Disease Transmission Possible, but Several Factors Suggest Likelihood May Be Low

Research on brucellosis transmission is far from definitive, but it has shown that bison and elk can transmit the organism to cattle in certain circumstances. The only study completed on bison-cattle brucellosis transmission shows that, under experimental conditions, transmission of the *Brucella abortus* organism from bison to cattle can occur as readily as from cattle to cattle.<sup>2</sup> Likewise, a 1974 study concluded that, under conditions of close association, brucellosis will spread from elk to cattle.<sup>3</sup>

While transmission has been shown in controlled situations, the likelihood of transmission occurring in the wild is not clear. For example, NPS and MDFWP officials told us that they are unaware of any documented cases of brucellosis transmission from wildlife, including bison and elk, to livestock in the wild. In a 1991 lawsuit, however, a cattle rancher in Wyoming sued the federal government for \$1.1 million in damages, claiming that his cattle herd had been infected with brucellosis by bison or elk from the Yellowstone area, specifically Grand Teton National Park or the National Elk Refuge, both of which are located south of Yellowstone Park. According to the judge's decision, the rancher failed to prove that the infection was caused by contact between the cattle herd and bison or

<sup>2</sup>Donald S. Davis, Joe W. Templeton, Thomas A. Ficht, John D. Williams, John D. Kopec, and L. Garry Adams, "Brucella Abortus in Captive Bison. I. Serology, Bacteriology, Pathogenesis, and Transmission to Cattle," *Journal of Wildlife Diseases*, Vol. 26, No. 3 (July 1990), pp. 360-371.

<sup>3</sup>E. Tom Thorne, Jamie K. Morton, and Winthrop C. Ray, "Brucellosis, Its Effect and Impact on Elk in Western Wyoming," *North American Elk: Ecology, Behavior and Management*, eds. M.S. Boyce and L.O. Hayden-Wing (Laramie, Wyoming: University of Wyoming, 1979), pp. 212-220.

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elk from Yellowstone and Grand Teton National Parks or the National Elk Refuge.<sup>4</sup>

Several factors suggest that the risk of transmission in the Yellowstone National Park area may be low:

- Only bison infected with the Brucella abortus organism can transmit it to other animals, and not all bison in the area are infected with the organism. The state of Montana and APHIS funded the most recent study on the brucellosis infection rate of bison crossing Yellowstone's boundary during the winter of 1991-92. Of the 241 bison tested for brucellosis using blood tests, 111 (about 46 percent) were positive, meaning they had been exposed to the disease sometime in the past. Tissue tests were conducted on 222 bison, and the Brucella abortus organism was found in 26 (about 12 percent). According to the NPS Veterinarian, studies have not been conducted to determine how many of these bison can actually transmit the disease.
- NPS, MDFWP, and APHIS officials agree that, while the disease can be transmitted to cattle through the artificial insemination of infected semen, the risk of male bison sexually transmitting the disease is minimal. Of the 26 Yellowstone bison in which the organism was found in the 1991-92 study, 18 were male and 8 were female.
- After the winter of 1988-89, when approximately 900 bison crossed the park's northern boundary, 810 cattle in the surrounding area were tested for brucellosis, and none was found to have been infected with the disease.
- Elk from the northern area of the park have a very low incidence of brucellosis. In a recent survey of 151 elk that crossed the park boundary into Montana, blood tests showed that only 2 elk (1.3 percent) had been exposed to the disease sometime in the past; however, tissue tests did not disclose the organism in any of them.
- It is generally accepted by wildlife researchers, APHIS officials, and ranchers that elk do not mingle with cattle and generally seclude themselves during either abortion or birth, when transmission would most likely occur.

Although these factors indicate that the likelihood of brucellosis transmission from bison and elk to cattle may be low, the research on brucellosis transmission is far from definitive. In Montana, there is more concern about bison than elk because of the higher incidence of

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<sup>4</sup>Parker Land and Cattle Company, Inc., v. U.S., No. 91-CV-0039-B, consolidated with Lyle R. Peck v. U.S., No. 91-CV-0091-B, decided June 8, 1992.

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brucellosis infection in bison and the belief that bison are more likely than elk to come in contact with cattle. Unanswered questions regarding bison include the following:

- Does the Brucella abortus organism attack the reproductive system in bison? The organism was found in the reproductive tract of only 1 female bison of the 222 bison tested in 1991-92. Some researchers, including the NPS Veterinarian, believe this indicates that the risk of disease transmission is extremely low because transmission generally occurs when contact is made with infected reproductive tissue. The NPS Veterinarian believes that more study needs to be done on the accuracy of brucellosis testing in bison and the correlation between test results and transmission capability. Others, including an APHIS brucellosis epidemiologist and the Montana State Veterinarian, believe that the organism is dynamic and that its presence anywhere in the animal poses a risk. They speculate that the organism moves to the reproductive tract only at specific times, such as during birthing or abortion. They, therefore, do not believe that the absence of the organism in the reproductive tract is strong proof that the risk of transmission is minimal.
- Does the organism affect bison from the Yellowstone herds differently than it affects other bison? The Yellowstone bison herds have been genetically isolated for many years. These bison may have had the opportunity to develop a resistance to brucellosis because of their closed population and long-term exposure to the organism. To date, research on brucellosis transmission has involved only non-Yellowstone bison. APHIS does not believe that the Yellowstone bison herd is reacting any differently to long-term exposure to the organism than cattle herds that have had long-term exposure. Furthermore, they do not believe long-term exposure affects the Yellowstone bison's ability to transmit the disease to cattle in the area.

Before any definitive conclusions can be reached on the risk of brucellosis transmission from Yellowstone bison and elk to cattle and, subsequently, on how best to manage the animals involved, the answers to these and other questions must be ascertained.

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## Economic Impact Depends on the Extent of the Transmission

APHIS rules require that certain actions be taken when either brucellosis transmission is suspected or a livestock herd is found to be infected. Costs associated with these actions, which can be significant, range from brucellosis testing if transmission is suspected to total slaughter of the herd and the potential loss of the state's brucellosis class-free status if

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transmission is confirmed. Class-free status is important because it allows free movement of cattle; that is, animals can be moved out of state without being tested for brucellosis.

According to APHIS, because no one knows which Yellowstone bison are brucellosis-infected and which are not, cattle found to be in contact with any Yellowstone bison are considered exposed to the disease and must be tested to ensure that brucellosis transmission has not occurred.<sup>5</sup> Brucellosis tests cost about \$2.50 per animal, not including the cost of roundup and handling. We could not estimate the total cost of brucellosis testing if transmission was suspected because we could not determine the number of ranches and cattle directly at risk of contact with brucellosis-infected bison in Montana. Forest Service records show that a maximum of 1,301 cattle are authorized to graze on the 11 Forest Service allotments<sup>6</sup> that bison have either visited or are likely to visit, given current migration patterns. These cattle are authorized to graze from only June to October. However, much of the land along the bison migration paths is privately owned, and we could not find any definitive data on the number of cattle directly at risk of bison contact on this land. One indication of the number of cattle in the area is that after the 1988-89 bison migration, the Montana State Veterinarian tested all cattle he believed to be at risk of brucellosis infection, which consisted of 810 animals in 18 herds. Testing costs to the state were approximately \$11,100, including veterinary salaries, tests, transportation, subsistence, and other miscellaneous expenses.

If brucellosis is found in a herd, numerous costs are incurred. According to APHIS' rules, if an animal in a herd of cattle in a class-free state like Montana tests positive for brucellosis, the entire herd must be slaughtered for the state to maintain its class-free status. Furthermore, it must be proven that the infection has not spread to other herds in the area. If brucellosis is found in an individual herd, APHIS, the state, and the ranchers incur the following costs:

- APHIS and the state pay blood collection and laboratory costs for brucellosis testing of herds in the area surrounding the infected herd. They also pay indemnity costs to the owner of the infected herd. APHIS pays a

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<sup>5</sup>This is not true of Yellowstone elk because elk are not covered under current APHIS rules and because APHIS perceives a much lower risk of transmission from elk in the northern range than from bison in the same area.

<sup>6</sup>Grazing allotments are units of land owned by the federal government and used by livestock operators to graze livestock. Operators pay a fee for this use.

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rancher \$50 for every animal sold to slaughter because it tested positive for brucellosis and \$150 for every animal that did not test positive for brucellosis but, as part of the herd's depopulation, was sold to slaughter. Indemnity costs paid by the states vary.

- Ranchers in the surrounding area pay the roundup and handling costs associated with brucellosis testing of their herds.
- A rancher with an infected herd receives reduced revenue from his cattle sale because the animals can be sold only to slaughter, not for breeding. Slaughter prices are usually less than breeding prices. This revenue reduction will be somewhat offset by the indemnities paid by APHIS and the state.

The implications of brucellosis transmission to a single herd can be costly to an individual rancher but, according to APHIS, if the disease would spread to other herds, Montana would lose its class-free status, affecting the entire state's livestock industry. States that are not certified class-free are required to test certain cattle exported from the state and, in some cases, those sold between farms in the state. The Montana State Veterinarian estimates that the costs of testing exported cattle statewide would have been about \$438,000 in 1989. The cost of testing cattle sold within the state was \$553,000 in 1983, the last year for which the data were collected. These costs include only the costs of the tests, not roundup and handling costs. In addition, according to an APHIS brucellosis epidemiologist, surveillance testing of cattle at slaughter facilities would need to be increased if a brucellosis transmission occurred. The official could not, however, provide data on the economic cost of the increased testing.

To Montana's livestock industry, another important but difficult to quantify cost involves out-of-state cattle buyers purchasing their cattle elsewhere if the state lost its class-free status. Montana's livestock industry largely depends on selling cattle outside the state for either breeding stock or feeding in feedlots before slaughter. Reduced demand may result in Montana ranchers receiving lower prices for their cattle.<sup>7</sup> Although Montana is currently class-free, ranchers near Yellowstone Park believe the mere perception that their cattle are at risk may influence cattle buyers to purchase cattle elsewhere.

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<sup>7</sup>On the other hand, because of increased demand elsewhere, ranchers in other states may receive higher prices.

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## Management Alternatives Currently Being Developed

In the past, various methods of keeping bison inside the park have been tried without success. Because of media attention and the public outcry that occurred when 569 bison were killed outside the park during the winter of 1988-89, NPS decided to develop a long-term plan for bison management. NPS, the state of Montana, and the Forest Service are jointly leading the effort with APHIS having a consulting role. As of July 1992, a team of agency representatives had scoped the issues, considered the public's concerns, and developed seven alternative plans of action. The team working on the management plan has not agreed on a preferred alternative, and any alternative can be amended or a new one developed. The seven current alternatives are as follows:

- Population and risk control: Bison management areas, (from which cattle would be prohibited) would be established outside the park, primarily on Forest Service land, to provide winter range for migrating bison. Fences, hazing, and herding of bison would be attempted to keep animals within the park and the management areas. Bison beyond established limits would not be tolerated, and bison escaping those limits would be killed, but no public hunting would be allowed. Brucellosis testing would be an ongoing process in the management areas, and bison that test positive for brucellosis would be sent to slaughter.
- Public hunting: Bison management areas (from which cattle would be prohibited) would be established outside the park, primarily on Forest Service land, to control bison activities and reduce the risk of brucellosis transmission to livestock. In the management areas, the following measures would be used alone or in combination: public hunting; shooting by state and federal agents; capturing, testing, and vaccinating bison for brucellosis; and hazing and herding.
- Control outside Yellowstone National Park boundary: Actions to remove or otherwise control bison would take place outside the park boundary. Various measures would be used to prevent bison from emigrating from the park and remaining in peripheral areas where contact with domestic livestock or damage to private property could occur. These actions could include feeding to encourage bison to remain in the park, hazing and herding bison back into the park, shooting by state and federal agents, and capturing the bison to test for brucellosis.
- Control within park boundary: Various actions would be used to prevent bison from emigrating from the park. These actions could include feeding to keep the bison in the park, hazing and herding, shooting by state and federal agents, or capturing bison for brucellosis testing. Herd size would be monitored to ensure that lethal control measures were not used when populations were at or below viable levels.

- **Brucellosis-free bison:** Various actions described in the other alternatives would be used to meet the ultimate goal of eradicating the Brucella abortus organism in bison. Trapping and testing of bison would be necessary as would the need to destroy, neuter, or temporarily sterilize bison found to test positive for brucellosis.
- **Landowner's responsibility:** Individual landowners would be primarily responsible for preventing transmission of the Brucella abortus organism to livestock and for preventing property damage. Options available to the landowners would include vaccinating cattle to reduce susceptibility to brucellosis infection and fencing to restrict cattle movement and potential contact with bison. Bison would be allowed to roam freely throughout the park and adjacent areas. Bison that posed a legitimate risk to human life or were engaged in severe damage to private property would be removed by state and federal personnel.
- **No lethal controls:** Bison management areas (from which cattle would be prohibited) would be established outside the park boundary. Management options would exclude killing the bison. It would be necessary to fence this land to prevent bison use or colonization of adjacent private land. In instances where fencing fails to halt bison movements, it would be necessary to herd bison to capture facilities from which they would be trucked back into the park or a management area.

Reaching a decision about managing the bison-cattle controversy will not be easy. The viewpoints of the parties involved vary widely, and some policy restrictions make compromise difficult. For example:

- USDA officials state that eradication of the Brucella abortus organism from the United States is a common goal shared by APHIS, state animal health officials, and the livestock industry. APHIS believes that the eradication of the Brucella abortus organism from the Yellowstone bison is attainable using various management techniques, including testing and slaughter.
- NPS operates in Yellowstone under a policy of natural regulation, allowing natural processes to control wildlife populations. Consequently, NPS officials are generally against managing the animals in a manner that is inconsistent with natural regulation or is devastating to the free-ranging nature of these animals.
- MDFWP's philosophy is that bison numbers should be controlled, preferably by NPS. Once the bison cross park boundaries, they become the responsibility of the state.
- The livestock industry in Montana is strongly opposed to management zones outside the park for fear that land will be taken away from private citizens. The industry's long-term goal is to eradicate the disease, but, in

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the short run, it believes that NPS is responsible for keeping the animals inside the park.

Although a final resolution will be difficult, the parties involved are committed to working together to reach a workable solution. A final bison management plan is expected to be available for public comment in early 1993. According to the Yellowstone National Park official coordinating the bison management plan, no elk management plan is now being developed.

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## Agency Comments

We requested and received written comments on a draft of this report from the Departments of the Interior and Agriculture, the Montana State Department of Livestock (MDOL), and MDFWP. Each of these entities suggested several revisions and additions, which we incorporated as appropriate.

The Department of the Interior stated that our draft report was technically correct and accurately portrayed the intricacies of the brucellosis issue. Interior's comments, which include some technical clarifications, and our response appear in appendix II.

USDA's comments primarily focused on our presentation of the number of bison and elk infected with brucellosis. In our draft report, we stated that about 12 percent of the bison killed in the Yellowstone area were infected with brucellosis and that none of the elk was infected with the disease. We made this statement on the basis of tests conducted on bison and elk tissue samples. USDA commented that the failure to isolate the Brucella abortus organism from tissue samples does not indicate freedom from the disease. We revised the report to state that the Brucella abortus organism was isolated from 12 percent of the bison killed in the Yellowstone area and from none of the elk in the area. We also added a sentence indicating that blood test results showed that about 46 percent of the bison tested had been exposed to the disease sometime in the past. USDA's comments and our response appear in appendix III.

MDOL and MDFWP commented on the omission of property damage and public safety concerns as an aspect of the bison-cattle conflict. MDFWP also noted a lack of discussion of bison overpopulation in Yellowstone Park. Even though we were aware of property damage and public safety concerns, we were specifically asked to address the issue of brucellosis transmission from bison and elk to cattle and limited our review to this topic. Regarding the park's bison population, we did add several sentences

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to the background section of the report to describe the bison population issue. MDOL's and MDFWP's comments and our response appear in appendixes IV and V, respectively.

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## Scope and Methodology

In conducting our review, we interviewed officials from NPS; the Forest Service; APHIS; MDFWP; MDOL; the Montana Stockgrowers Association; the Greater Yellowstone Area Conservation Districts; and several academicians in the fields of range science, range ecology, and biology. We collected and reviewed available documentation regarding brucellosis transmission, economic impacts, and management alternatives. We conducted 3 days of field visits in the Yellowstone Park area, including federal and private land, accompanied by NPS and Forest Service officials and Montana livestock industry representatives.

To specifically gather information on the scientific evidence that brucellosis can be transmitted from bison and elk to domestic cattle, we interviewed the following officials and obtained from them the latest scientific data:

- NPS personnel located in both Washington, D.C., and Yellowstone National Park, including the NPS Veterinarian, Yellowstone's Resource Manager, and an NPS wildlife biologist who has studied Yellowstone bison for more than 30 years;
- Forest Service personnel at the Gallatin National Forest Office in Bozeman, Montana; the Gardiner Ranger District Office in Gardiner, Montana; and the Hebgen Lake Ranger District Office in West Yellowstone, Montana;
- APHIS officials in Washington, D.C., and Hyattsville, Maryland, including a brucellosis epidemiologist in the brucellosis eradication program;
- the Montana State Veterinarian; and
- MDFWP's staff in Bozeman, Montana, including the Deputy Director.

To obtain information on the economic costs associated with brucellosis transmission, we interviewed APHIS officials, Forest Service officials, the Montana State Veterinarian, and representatives of the Montana Stockgrowers Association, including eight local ranchers. With these ranchers we visited private land outside the park to which bison migrate and asked them to identify the costs they associated with brucellosis. Forest Service officials provided information on the number of livestock operators who had the authority to graze cattle on the Forest Service land outside the park.

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To identify the alternatives being considered for long-term bison management, we reviewed the latest draft management plan and discussed various management alternatives with NPS, Forest Service, MDFWP, and APHIS officials.

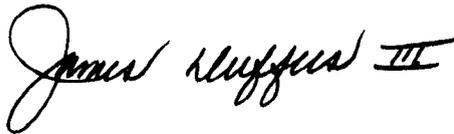
Our review was performed between October 1991 and July 1992 in accordance with generally accepted government auditing standards.

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Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to appropriate congressional committees; the Secretary of the Interior; the Director, National Park Service; the Secretary of Agriculture; the Chief, Forest Service; and the Administrator, Animal and Plant Health Inspection Service. We will also make copies available to others on request.

Please contact me at (202) 275-7756 if you or your staff have any questions. Major contributors to this report are listed in appendix VI.

Sincerely yours,



James Duffus III  
Director, Natural Resources  
Management Issues



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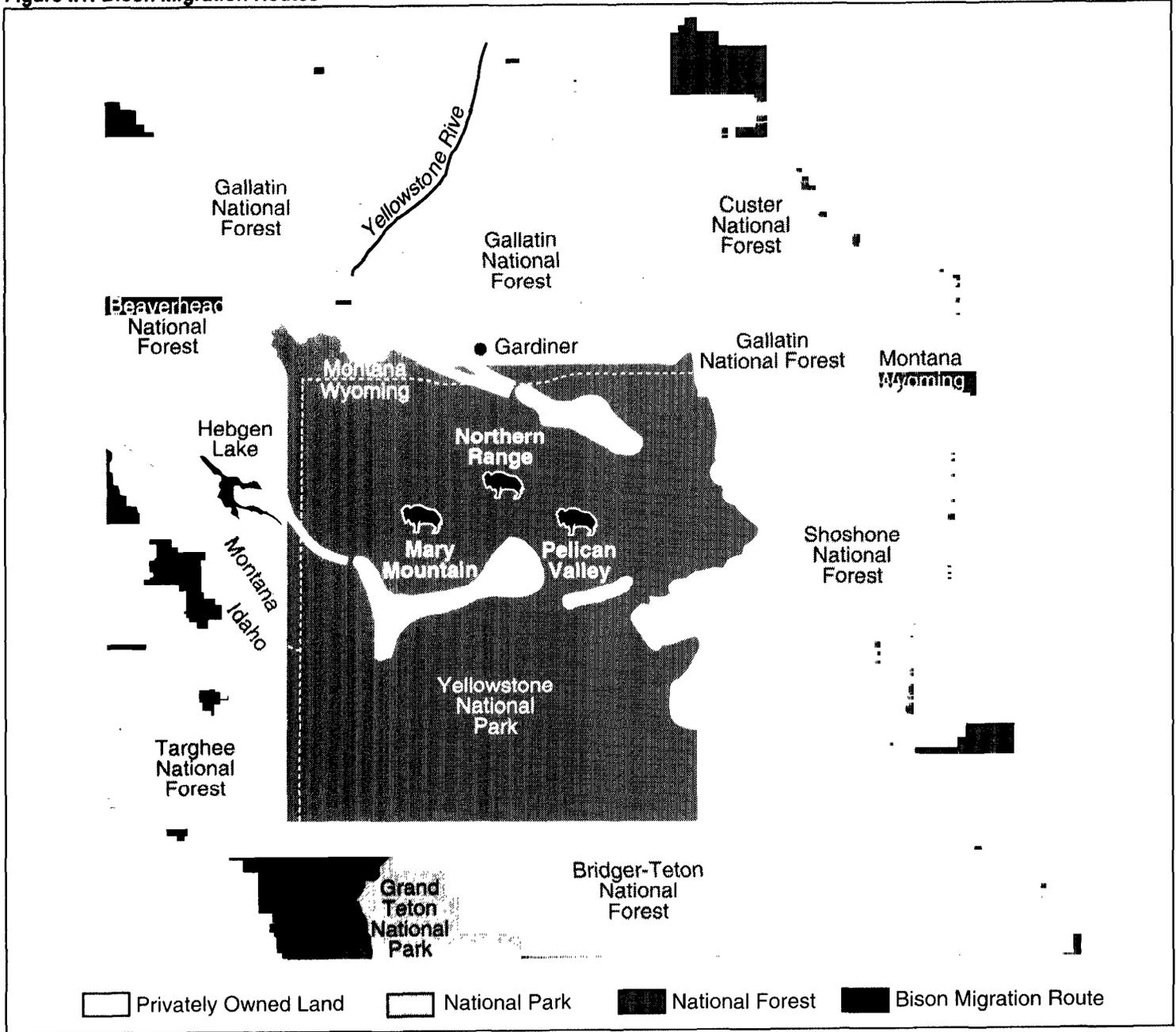
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**Abbreviations**

APHIS	Animal and Plant Health Inspection Service
GAO	General Accounting Office
MDFWP	Montana Department of Fish, Wildlife, and Parks
MDOL	Montana Department of Livestock
NPS	National Park Service
USDA	United States Department of Agriculture

# Bison Migration Routes

Figure I.1: Bison Migration Routes



Source: Yellowstone Bison: Background and Issues, state of Montana, Department of Fish, Wildlife, and Parks; U.S. Department of the Interior - National Park Service, Yellowstone National Park; U.S. Department of Agriculture - U.S. Forest Service, Gallatin National Forest, May 1990, p. 12.

Figure I.2: Northern Range Bison Migration

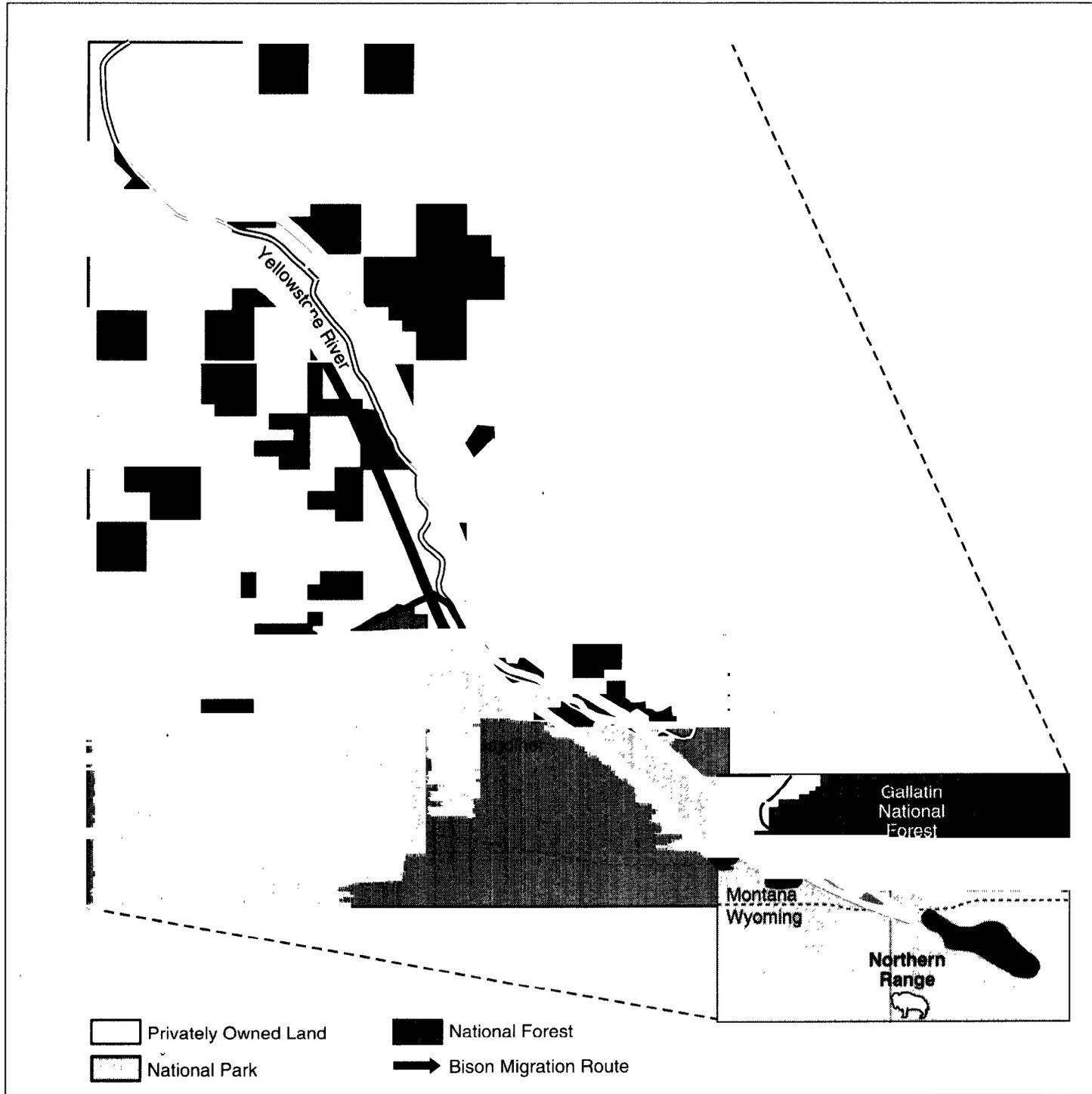
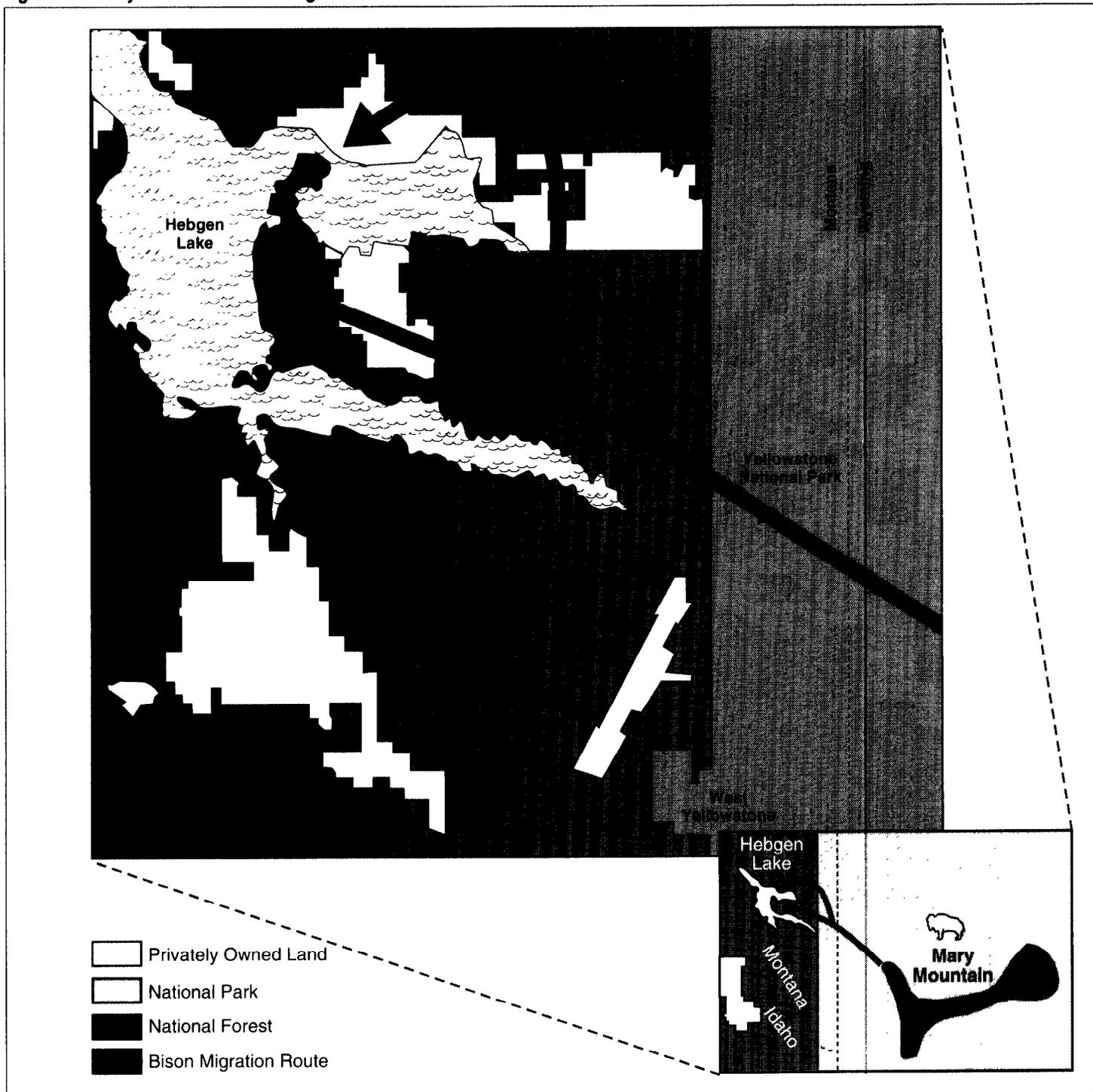


Figure I.3: Mary Mountain Bison Migration



# Comments From the Department of the Interior

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



United States Department of the Interior



OFFICE OF THE SECRETARY  
Washington, D.C. 20240  
September 15, 1992

N1615(490)

James Duffus, III  
Director  
Natural Resources Management Issues  
U.S. General Accounting Office  
Washington, D.C. 20548

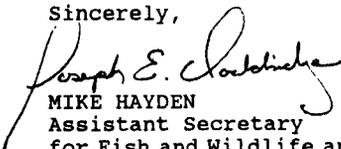
Dear Mr. Duffus:

Thank you for your recent letter requesting our comments on the draft report entitled Wildlife Management: Many Issues Unresolved in Yellowstone Bison-Cattle Brucellosis Conflict (GAO/RCED-92-161). Enclosed with this letter are our comments. Overall, our agency found this report to be well written and an accurate portrayal of this issue.

The National Park Service is committed to developing an effective solution to the bison management issue that will be in concert with the fundamental policy of preserving park natural resources and natural resource processes for the benefit of this and future generations. The Service is also attempting to be as responsive as possible to the legitimate concerns of park neighbors.

If we can provide any further assistance on this matter, please contact my office.

Sincerely,

For   
MIKE HAYDEN  
Assistant Secretary  
for Fish and Wildlife and Parks

Enclosure

The report number is now  
GAO/RCED-93-2

Appendix II  
Comments From the Department of the  
Interior

National Park Service  
Review Comments

Wildlife Management: Many Issues Unresolved in  
Yellowstone Bison-Cattle Brucellosis Conflict  
(GAO/RCED-92-161)

General Comments

Overall, the report was well written and technically accurate. It accurately reflects this difficult and intricately controversial issue.

See comment 1.

When referring to the organism Brucella, the word should be capitalized and underlined.

See comment 2.

Recommend including a section on how the States of Idaho and Wyoming deal with this issue since they also contain parts of Yellowstone, graze cattle and have NPS bison migrate to their lands.

Specific Comments

See comment 1.

Page 1

line 7: Please specify that Brucella abortus is the organism involved in this issue. There are many different species of Brucella, that affect many different animals.

See comment 3.

line 11: Recommend rewording: a contagious disease that in domestic cattle may cause infertility and abortion of first calf after infection, however subsequent calves are usually normal.

See comment 4.

Page 2

line 11: Recommend rewording: bison and elk to cattle under unnatural experimental conditions ...

Now on p. 3.

See comment 3.

Page 5

line 13-15: Recommend rewording: In cattle, brucellosis may cause abortion of the first calf after infection, however subsequent pregnancies are usually normal. The disease may also cause unhealthy calves and infertility.

See comment 1.

line 18-20: Recommend rewording: Transmission can also occur when a cow comes in contact with feed or straw that has been contaminated by infected fetal tissues and fluids.

See comment 5.

line 27: Recommend adding: According to the CDC, less than 100 human cases of brucellosis were reported in 1991.

Now on p. 4.

See comment 6.

Page 6

line 1: Please clarify that APHIS's regulations on brucellosis apply to domestic cattle and captive bison herds and not free-ranging wild bison populations.

Appendix II  
Comments From the Department of the  
Interior

Now on p. 5.  
See comment 7.

Page 7

line 22: Please include information on the substantial income generated within the State of Montana through park visitors viewing free-ranging wildlife and hunting related activities. This should be discussed as a reason that elk are more tolerated.

See comment 4.

line 29: Recommend rewording to: that, under experimental unnatural conditions, transmission of the ...

Now on p. 5.  
See comment 4.

Page 8

line 4: Recommend rewording to: While transmission has been shown in controlled unnatural situations, ...

Now on p. 6.  
See comment 1.

Page 9

line 10: Recommend adding: Studies have not been conducted to determine what percentage of those bison infected with brucellosis are actually able to transmit the disease.

Now on p. 7.  
See comment 8.

Page 10

line 23: Please add: The NPS veterinarian feels that further research needs to be conducted on the correlation and accuracy of serological and culture testing in bison for brucellosis before many conclusions can be drawn.

Now on p. 7.  
See comment 1.

Page 11

line 3: Recommend rewording and adding: The Yellowstone bison herds have been genetically isolated for many years. These bison may have had the opportunity to develop immunological resistance to brucellosis, due to their closed population and long-term exposure to the organism.

See comment 1.

line 22: Should this read: that is animals can be moved out of state without being tested for brucellosis.

See comment 9.

line 24-28: Is APHIS or the Montana State Veterinarian currently, actually testing all cattle that have been potentially exposed to Yellowstone bison on public or private grazing allotments?

Now on p. 9.  
See comment 10.

Page 14

line 10-11: Are these dollar amounts for only testing by the state or are they including estimated roundup costs that would have been incurred for the exportation of range cattle by ranchers regardless of whether brucellosis testing occurred. Often at cattle roundups for exportation, other diagnostic work is done as well as deworming and branding.

See comment 11.

The report discusses the economic concerns and dollar values of the cattle industry. However it does not mention the economic value obtained by Montana in the Greater Yellowstone Area through conservation, hunting and visitors who come to see free-ranging wildlife such as bison and elk.

Appendix II  
Comments From the Department of the  
Interior

Now on p. 10.  
See comment 12.

Now on p. 11.  
See comment 13.

Now on p. 11.  
See comment 1.

Page 15

line 24: Please clarify how you are using the term "exposed".  
Should this read: found to be serologically exposed to  
brucellosis?

Page 17

line 27: Please clarify this statement, isn't APHIS's goal to  
eradicate Brucella abortus from domestic cattle from the  
United States. There are many species of Brucella, which  
may affect many different animal species.

Page 18:

line 4: Recommend adding: generally against managing the  
animals in a manner that is inconsistent with natural  
regulation, or devastating to the free-ranging wild  
nature of these animals.

---

The following are GAO's comments on the U.S. Department of the Interior's September 15, 1992, letter.

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## **GAO Response**

1. Revised as suggested.
2. We restricted our discussion to the state of Montana because it is the only state working with the NPS and the Forest Service to develop a long-term bison management plan.
3. This addition was made in the body of the report but not in the introduction.
4. This revision was not made because it is not universally accepted that the experimental conditions were "unnatural."
5. A sentence was added to indicate that the Centers for Disease Control reports less than 100 cases of human brucellosis each year.
6. No revision was made. According to an APHIS brucellosis epidemiologist, APHIS' rules on brucellosis apply to all cattle and bison whether captive or free-ranging.
7. This revision was not made because ranchers did not cite economic gain as a reason elk are more tolerated than bison.
8. After discussion with the NPS Veterinarian, a sentence was added to reflect this official's belief that more study needs to be done on the accuracy of brucellosis testing in bison and the correlation between test results and the ability of the bison to transmit the disease.
9. According to the Montana State Veterinarian, who has responsibility for this testing, all cattle that he suspects have come in contact with Yellowstone bison are tested for brucellosis. No revision was made.
10. These costs include only the cost of testing, not roundup and handling. A sentence was added to reflect this.
11. We were asked to address the economic costs that would be incurred if brucellosis transmission occurred from bison and elk to cattle. The economic value of free-ranging wildlife, such as bison and elk, to the state of Montana is beyond the scope of our review.

---

12. This revision was made to show that bison that tested positive for brucellosis would be sent to slaughter.

13. After discussing this comment with APHIS, the statement was changed to reflect APHIS' goal to eradicate the Brucella abortus organism in the United States.

# Comments From the Department of Agriculture

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



DEPARTMENT OF AGRICULTURE  
OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20250

September 3, 1992

Mr. James Duffus III  
Director, Natural Resources  
Management Issues  
General Accounting Office  
Washington, D.C. 20548

Dear Mr. Duffus:

This response represents the U.S. Department of Agriculture's comments on the draft version of the General Accounting Office's (GAO) report on the controversy surrounding brucellosis infection in Yellowstone bison and the potential consequences of the disease problem. Our comments and suggested revisions address various sections of the report and designate specific page and paragraph locations in the document.

RESULTS IN BRIEF

Page 2, first paragraph. The statement that only about 12 percent of the bison killed in the area were infected with the disease is misleading. This figure is the percentage of animals from which *Brucella abortus* (the causative agent of brucellosis) was isolated by bacteriological culturing. Failure to isolate does not indicate freedom from the disease. It indicates there were no organisms -- or no viable organisms -- in the particular tissues cultured. Experience has shown that serological results are more accurate indicators of the prevalence of brucellosis in a known-infected herd, such as the herd in Yellowstone. Based upon serological tests, the infection rate in Yellowstone bison killed outside the park has been about 50 percent.

BACKGROUND

Page 5, second paragraph. We suggest a revision to the reference concerning brucellosis in humans. The next to the last sentence should read: "Brucellosis in humans is called undulant fever; it is a disease characterized by severe and often chronic flu-like symptoms, including high fever, chills, joint pain, backache, and loss of weight and appetite."

See comment 1.

Now on p. 4.  
See comment 2.

Mr. James Duffus III

2

DISEASE TRANSMISSION POSSIBLE, BUT SEVERAL FACTORS SUGGEST  
LIKELIHOOD MAY BE LOW

Now on p. 6.  
See comment 1.

Page 9, last paragraph. This paragraph implies that the 2 elk (1.3 percent) which were positive to the serological test were not infected. As indicated in our comments regarding the section on page 2, it is incorrect to assume that a serological positive animal is not infected with brucellosis simply because the causative organism was not isolated.

Now on p. 7.  
See comment 3.

Page 11, first paragraph. This paragraph addresses the question of whether the disease organism affects Yellowstone bison differently than other bison herds. The primary issue, however, is whether the organism is reacting differently in the Yellowstone bison than would be expected in any chronically-infected herd when compared to an acutely-infected herd. Extensive program experience indicates that the chronically-infected Yellowstone bison herd is reacting no different than a chronically-infected cattle herd under the same conditions.

ECONOMIC IMPACT DEPENDS ON EXTENT OF TRANSMISSION

Now on p. 8.  
See comment 4.

Page 11. The various costs cited in this section do not address the need to maintain a high level of slaughter surveillance in all States if brucellosis is allowed to remain in the Yellowstone herd. The intent of the brucellosis program is to continue full-scale disease surveillance for a period of time after the last case of brucellosis is identified in the United States; surveillance activities would then be discontinued. However, if brucellosis is not eliminated from Yellowstone, the surrounding States will be at perpetual risk of disease reintroduction into their cattle populations. These surrounding States transport cattle to many other States (36 States according to a recent study). Therefore, it will be necessary for those States and the national brucellosis program to maintain surveillance to detect infection which might be introduced by animal movements. This activity will cost millions of dollars annually.

Now on p. 9.  
See comment 2.

Page 13, second paragraph. This paragraph references the \$150 payment by the Animal and Plant Health Inspection Service (APHIS) for exposed animals. The sentence should be revised to state that APHIS pays \$150 for exposed animals only when they are in an infected herd that is being depopulated.

Mr. James Duffus III

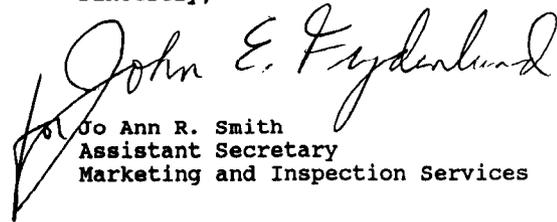
3

MANAGEMENT ALTERNATIVES CURRENTLY BEING DEVELOPED

Page 17, last paragraph. This paragraph states that it is APHIS' goal to eradicate brucellosis from the United States. We suggest your comment be expanded to read: "Brucellosis eradication in the United States is a common goal shared by APHIS, all of the States, as well as the livestock industry."

Thank you for this opportunity to review and respond to the report. We look forward to receiving the final version of GAO's report upon issuance.

Sincerely,

  
Jo Ann R. Smith  
Assistant Secretary  
Marketing and Inspection Services

Now on p. 11.  
See comment 5.

---

The following are GAO's comments on the U.S. Department of Agriculture's September 3, 1992, letter.

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## GAO Response

1. We revised this paragraph to state that the Brucella abortus organism was found in about only 12 percent of the bison killed in the Yellowstone area and that the organism was found in none of 151 Yellowstone elk tested. We made similar changes to statements in the body of the report. We also added data showing that 46 percent of the bison tested using blood tests were positive, meaning that they had been exposed to the disease sometime in the past.

2. Revised as suggested.

3. After a discussion with an APHIS brucellosis epidemiologist, a sentence was added to reflect APHIS' belief that the Yellowstone bison herd is not reacting any differently to long-term brucellosis exposure than any cattle herd that has had long-term exposure. APHIS does not believe long-term exposure affects Yellowstone bison's ability to transmit the disease to cattle in the area.

4. According to an APHIS official, surveillance testing at slaughter facilities would need to be increased if brucellosis transmission occurred. The official could not quantify the increase. We added a sentence to address APHIS' concerns. We did not, however, address APHIS' concern about the need for prolonged slaughter surveillance testing. Brucellosis currently exists in 21 states as well as the Yellowstone area and, according to APHIS, surveillance testing will continue as long as brucellosis exists anywhere.

5. After a discussion with an APHIS official, this sentence was revised to reflect APHIS' goal of eradicating the Brucella abortus organism from the United States. This goal is shared by APHIS, state animal health officials, and the livestock industry.

# Comments From the Montana Department of Livestock

## DEPARTMENT OF LIVESTOCK



STAN STEPHENS, GOVERNOR

CAPITOL STATION

### STATE OF MONTANA

BRANDS ENFORCEMENT DIV. 406-444-2045  
ANIMAL HEALTH DIV 406-444-2043  
BOARD OF LIVESTOCK - CENTRALIZED SERVICES 406-444-2023  
MEAT, MILK & EGG INSPECTION DIV. 406-444-5202

HELENA, MONTANA 59620

August 13, 1992

James Duffus, III  
Director of Natural Resources  
Management Issues  
US General Accounting Office  
Washington DC 20548

**SUBJECT: COMMENTS ON REVIEW OF DRAFT DOCUMENT GAO/RCED-92-161  
WILDLIFE MANAGEMENT: MANY ISSUES UNRESOLVED  
IN YELLOWSTONE BISON-CATTLE BRUCELLOSIS CONFLICT**

Dear Sir:

The following are my comments based on my review of the above referenced document. First, I am more than a little surprised that the dimension of property damage and public safety as an important aspect of the bison-cattle brucellosis conflict was not introduced. One day was spent with the Department of Fish, Wildlife & Parks representatives and the matter of property damage and public safety are a direct legal mandate to that agency. By the same token, the matter of brucellosis and other disease transmission is a direct legal mandate to the Department of Livestock. It may be that the non-brucellosis dimension is beyond the scope of the legislative mandate to the GAO; however, I can not help but remark on this omission.

My second comment has to do with costs of testing cattle per head for brucellosis. I submitted documentation of an average cost of \$2.50 per head per test based on the range of professional charges encountered. I recall that several ranchers testified that the producer's cost to present one animal for test or vaccination ranged from \$7.50 to \$13.00 per head. That testimony supports that professional fees are only a part of total costs. The GAO report should perhaps express these additional costs in their impact analysis.

Yours very truly,

**DONALD P. FERLICKA, D.V.M.**  
Administrator & State Veterinarian  
Montana Department of Livestock  
Helena, Montana

es

Call Montana Livestock Crimestoppers 800-647-7464

The report number is now  
GAO/RCED-93-2

See comment 1.

See comment 2.

---

The following are GAO's comments on the Montana Department of Livestock's August 13, 1992, letter.

---

## **GAO Response**

1. We agree that a complete picture of the wildlife-cattle controversy taking place in the vicinity of Yellowstone National Park would include the dimensions of property damage and public safety. These issues, however, lie beyond the scope of this report. As agreed with the requester, our report was limited to the possible transmission of brucellosis.
2. We did not revise this report because we believe we adequately qualify the \$2.50 test cost by stating that this excludes the cost of roundup and handling. We had no definitive data on these costs and therefore did not attempt to quantify them.

# Comments From the Montana Department of Fish, Wildlife, and Parks

**Montana Department  
of  
Fish, Wildlife & Parks**



Helena, MT 59620  
August 25, 1992

James Duffus III  
Director, Natural Resources Management Issues  
US General Accounting Office  
Washington, DC 20548

Dear Mr. Duffus,

Thank you for the opportunity to review the draft report on Yellowstone bison.

An issue that gets lost in the debate over the threat of brucellosis is the over-population of bison in Yellowstone Park. You rightly note the Park has operated on a theory of natural regulation. On page 4, you state that bison and elk sometimes migrate across the Park border. Elk migrate in large numbers every year. The natural regulation is a combination of over-winter mortality due to starvation and permitted hunting.

The bison, on the other hand, only started to migrate in large numbers since the population increased to the levels we have had the past five to seven years. The threat of brucellosis is only one factor in the need to control bison leaving Yellowstone Park. But a more fundamental problem is that the bison are trying to leave the Park. The Park's own expert says the bison in the northern herd (near Gardiner) would migrate outside the park and stay there. This is quite unlike the elk migrations to and from their winter ranges.

The fundamental problem is natural regulation no longer works in the Park for bison. The roads are plowed for winter travel making easy corridors and the bison population has increased. They are very social and follow the lead cows in their movements.

The migrations out of the Park do not just cause a threat to cattle, but cause property damage and safety concerns for people. We are not prepared to repopulate the Great Plains with Yellowstone bison.

We appreciate the objective content of the report and the work done in the investigations. However, limiting it to a brucellosis issue as complex as that is, misses the issue of how we control population numbers of bison in the Park.

Sincerely,

Patrick J. Graham  
Deputy Director

See comment 1.

See comment 2.

---

The following are GAO's comments on the Montana Department of Fish, Wildlife, and Parks' August 25, 1992, letter.

---

## **GAO Response**

1. We added several statements to the background section of the report that describe NPS officials' concerns that more bison may migrate to the west and the possible reasons for the migration, including an increasing population.
2. We agree that property damage and public safety are important issues in the wildlife-cattle controversy taking place in the Yellowstone National Park area. These issues, however, lie beyond the scope of this report. As agreed with the requester, our report was limited to the possible transmission of brucellosis.

---

# Major Contributors to This Report

---

Resources,  
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Economic  
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Ralph W. Lamoreaux, Assistant Director  
Eileen M. Cortese, Evaluator-in-Charge

---

Office of General  
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Stanley G. Feinstein, Senior Attorney



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