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Bison, Bsrucellois, and Law in the Greater Yellowstone Ecosystem

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INTRODUCTION

Not long ago, endless bison herds roamed the Great Plains. With the advent of white settlement, though, the bison were slaughtered nearly to extinction. Only a last second rescue effort saved a priceless part of America’s natural and frontier heritage.¹ Today, remnant populations of bison are preserved in Yellowstone and Grand Teton national parks, where they represent the nation’s largest — and most visible — free roaming bison herds. But these bison are now running out of room. Because bison carry brucellosis, a disease that causes cattle to abort, they are viewed as a threat to domestic livestock and subject to being killed upon leaving the parks.² In recent years, six

² M. Mary Meagher & Jack Dennis, Bison and Brucellosis Management at Yellowstone National Park 2 (1991) [hereinafter Yellowstone Bison Management]; Wyoming Game and Fish Department, U.S. Fish and Wildlife Service, Grand Teton National Park, and Bridger-Teton National Forest, Annual Interagency Bison Management Program: Jackson Bison Herd 1 (1990); 22 more Yellowstone bison killed; total 172, Casper Star Tribune, January 21, 1992 at B1. Bison are also a threat to people and property: Bison bru-
different lawsuits have been filed in federal and state court challenging federal bison management policies. Western senators have even sought to bring Congress into the fray. The controversy reveals deep divisions between agricultural and wildlife interests, and it reflects a serious lack of clarity in the existing law.

The current controversy centers around the fact that roughly half of the Yellowstone bison test positive for brucellosis, and the fear that they may transmit the disease to domestic livestock upon leaving the parks. Although there is no documented evidence that bison have ever passed brucellosis to cattle on the open range, research has demonstrated that bison can infect cattle in a controlled environment. Neither cattle nor wildlife can be fully protected against the disease by vaccination. The Yellowstone bison herds, nurtured by the National Park Service's "natural regulation" wildlife management policy, have grown in population, and they are now dispersing beyond park boundaries to forage on surrounding lands during the harsh winter months. But once the bison leave the park, they are likely to encounter domestic livestock, either on Forest Service grazing leases or on lower elevation private ranch lands. And once the bison pass onto these adjacent lands, they become the responsibility of state game and fish departments and subject to being shot.

cellosis can cause undulant fever in humans; bison have caused more human injuries in Yellowstone National Park than any other species of wildlife; and bison are notorious for destroying fences and other property. Bison management policies are designed to address all these concerns. YELLOWSTONE BISON MANAGEMENT, supra this note, at 2.


5. See infra text accompanying notes 167-207 for further discussion of the science of wildlife brucellosis.


7. See infra text accompanying notes 196-203 for a further discussion of brucellosis and vaccination.


9. WYO. STAT. § 23-2-107 (1991); MONT. CODE ANN. § 87-1-214 (1991); IDAHO CODE

10. 1976-203 (1991); MONT. CODE ANN. § 87-1-214 (1991); IDAHO CODE
For Montana, Wyoming, and Idaho, brucellosis represents a very real concern for the domestic livestock industry. A sixty year old federal law, designed to eradicate brucellosis from the nation's livestock population, prohibits the interstate transportation of infected livestock.\textsuperscript{10} As implemented by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), the federal program classifies states as brucellosis-free and brucellosis-infected, and imposes expensive testing and export limitations on cattle from infected states.\textsuperscript{11} Because Montana, Wyoming, and Idaho have achieved brucellosis-free status,\textsuperscript{12} ranchers from these states can now freely move their cattle interstate without limitations or additional expense. But neither federal nor state law directly addresses the issue of wildlife brucellosis, thus providing little guidance for managing this disease in wildlife and potentially jeopardizing the national brucellosis eradication campaign. Moreover, federal brucellosis eradication requirements are being interpreted quite differently in Montana and Wyoming, which undermines formulation of a coherent, coordinated policy.

Indeed, the bison-cattle brucellosis controversy is being addressed under a system of federal and state law that is ill-suited for resolving such a complex resource management problem. The legal issues have surfaced in two quite different litigation contexts, one involving the sufficiency of federal bison management plans and the other involving the question of governmental liability for brucellosis-caused damages. In Montana, animal rights groups, relying upon the National Environmental Policy Act (NEPA),\textsuperscript{13} have challenged—unsuccessfully—an interim federal-state bison management program that sanctions shooting bison that wander outside Yellowstone National Park.\textsuperscript{14} Other litigation initiated by animal rights groups has temporarily enjoined Wyoming and federal officials from culling Grand Teton National Park's bison herd\textsuperscript{15} and stopped Yellowstone officials from shooting park bison for research purposes.\textsuperscript{16} After having to slaughter his entire cattle herd upon discovering a brucellosis infection, Wyoming rancher

\textsuperscript{14} The Fund for Animals, Inc. v. Lujan, No. 90 Civ. 142-M-CCL (D. Mont. 1991), aff'd, 962 F.2d 1391 (9th Cir. 1992).
\textsuperscript{15} Legal Action for Animals v. Wyoming Game and Fish Dept., Stipulated Settlement and Joint Motion of Parties to Dismiss Suit, No. 90CV-294-B (D. Wyo. Nov. 20, 1990).
Thomas Parker sued federal and state officials seeking damages for his losses, alleging that current bison management policies allowed infected bison to transmit the disease to his cattle.\textsuperscript{17} Although a Wyoming federal district court denied Parker’s federal tort claim, it nevertheless suggested that federal officials are negligently managing the infected bison.\textsuperscript{18} And the Wyoming Supreme Court must decide whether the Game & Fish Commission correctly concluded that the state’s wildlife damage compensation statute does not cover disease claims and that wildlife were not responsible for Parker’s brucellosis outbreak.\textsuperscript{19}

The stakes are high in this brucellosis controversy. At one level, the issue has been posed as involving a choice between the Greater Yellowstone bison population and the local livestock industry. In the Parker litigation, it was suggested that a damage award for brucellosis transmission would compel federal land managers to eliminate public grazing rights on federal multiple-use lands, which could force some ranchers out of business.\textsuperscript{20} Most observers believe that brucellosis can only be entirely eliminated from wildlife by depopulating (or exterminating) Yellowstone’s bison and elk herds. But throughout the West, owing to a profound shift in public values, wildlife is now widely viewed as a valuable economic resource as well as an important aesthetic resource, while the cattle industry is primarily of local economic importance.\textsuperscript{21} At another level, the controversy reveals the irrelevance of park and other boundaries and the need to formulate wildlife policy on an ecosystem scale.\textsuperscript{22} It calls into question the validity of the Park Service’s “natural regulation” management policy when adjacent private interests are adversely affected, as well as the validity of traditional private property right concepts in Yellowstone’s wilderness-like setting where such conflicts are unavoidable.\textsuperscript{23} And it raises

\begin{itemize}
\item \textsuperscript{17} Parker Land and Cattle Co., Inc. v. United States, No. 91 Civ. 0039-B (D.Wyo. 1991); Parker Land and Cattle Co., Inc. v. Wyoming Game and Fish Commission, No. 91-147 (Wyoming Supreme Court 1991). Parker also alleged that brucellosis-infected elk were responsible for infecting his cattle herd, not distinguishing between bison and elk as the source. See infra notes 245-294, 310-316 for further discussion of the Parker cases.
\item \textsuperscript{18} Parker Land and Cattle Co., Inc. v. United States, No. 90-CV-0039-B, Findings of Fact and Conclusions of Law, at 19-21 (D. Wyo. 1992) [hereinafter Parker Findings and Conclusions].
\item \textsuperscript{19} Parker Land and Cattle Co., Inc. v. Wyoming Game and Fish Commission, No. 91-147 (Wyoming Supreme Court 1991).
\item \textsuperscript{20} Julia Prodis, Dubois rancher sues interior department over infected cattle, \textit{Casper Star Tribune}, January 5, 1992, at B1.
\item \textsuperscript{22} Robert B. Keiter, Taking Account of the Ecosystem on the Public Domain: Law and Ecology in the Greater Yellowstone Region, 60 U. Colo. L. Rev. 923 (1989); See generally, Robert B. Keiter, An Introduction to the Ecosystem Management Debate, in \textit{The Greater Yellowstone Ecosystem}, \textit{supra} note 6, at 3-18.
\item \textsuperscript{23} Joseph L. Sax, \textit{Ecosystem and Property Rights in Greater Yellowstone: The Legal System in Transition}, in \textit{The Greater Yellowstone Ecosystem}, \textit{supra} note 6, at 77-84.
\end{itemize}
the question of how resource managers should deal with scientific uncertainty: How much risk is acceptable in this setting where bison and cattle will almost certainly come into contact absent draconian measures to separate them?24

This article examines the Greater Yellowstone brucellosis controversy from a legal and policy perspective. We begin by describing the Greater Yellowstone region and by suggesting that it is undergoing a major socio-economic transformation. We then examine the National Park Service's bison management policy as a component of its natural regulation wildlife management policy. Next, we explore the brucellosis controversy, describing the federal-state brucellosis eradication program and existing scientific data on wildlife and brucellosis. We then review the current law governing bison and brucellosis, as well as the recent litigation, to determine which policy options are available. Drawing upon this legal analysis, we suggest that the controversy can be resolved through a comprehensive wildlife brucellosis control policy framed on an ecosystem scale and based on the principle of risk reduction. We conclude by placing the brucellosis controversy in a broader context, noting its natural resource policy ramifications.

I. THE GREATER YELLOWSTONE SETTING

Wildlife controversies are nothing new to the Yellowstone region. In Greater Yellowstone’s jurisdictional jigsaw puzzle setting, wildlife management responsibility is dispersed among various federal and state agencies. Yet other agencies are responsible for livestock policy. But bison and other wildlife do not respect jurisdictional boundary lines, wandering freely across the region’s public and private lands. Clearly, the problem calls for a regional solution—one that is based on a sensitive understanding of ecology, economics, and culture.

A. Jurisdictional and Ecological Fragmentation

Now widely described as the Greater Yellowstone Ecosystem, the Yellowstone region consists of two national parks, seven national forests, three national wildlife refuges, and other interspersed federal, state, and private lands in three different states.25 Yellowstone and Grand Teton national parks—the core of the Ecosystem—are man-

25. Duncan T. Patten, Defining the Greater Yellowstone Ecosystem, in THE GREATER YELLOWSTONE ECOSYSTEM, supra note 6, at 19; Keiter, supra note 22, at 937.
aged by the National Park Service under a preservationist mandate.\textsuperscript{26} The National Elk Refuge, which was created to insure winter habitat for elk displaced from their historic winter range by settlement in Jackson, Wyoming,\textsuperscript{27} is managed by the U.S. Fish & Wildlife Service under a "permanent conservation" standard.\textsuperscript{28} Nearly fifty percent of the Greater Yellowstone national forest lands are designated as wilderness;\textsuperscript{29} they are managed by the U.S. Forest Service under a preservationist philosophy, though hunting is permitted on these lands.\textsuperscript{30} The remaining national forest lands are managed by the Forest Service under a multiple-use mandate, which contemplates such activities as timber harvesting, grazing, and recreation.\textsuperscript{31} Private lands are not extensive, but they are often located at low elevations and near water, making them particularly important as wildlife habitat, especially during winter months.\textsuperscript{32} These private lands are not subject to federal regulation, and—owing to the traditional western aversion to government regulation—they are only lightly regulated at the state and local levels.

Outside the national parks,\textsuperscript{33} the states are responsible for wildlife. Unlike the Park Service, state fish and game agencies historically have viewed wildlife as a consumptive resource, and they intensively manage big game populations to insure sport hunting opportunities.\textsuperscript{34} On the federal lands adjacent to Yellowstone and Grand Teton national parks, the Forest Service is responsible for managing the hab-

\begin{quotation}
34. \textit{Michael Bean, The Evolution of National Wildlife Law} 9-47 (Rev. Ed. 1983); Coggins & Ward, supra note 9, at 75-85. However, Congress did provide in its enabling legislation that elk hunting was permitted in Grand Teton National Park. \textit{See also supra} note 33.
\end{quotation}
itiat, while the states are responsible for managing wildlife population numbers. On private lands, wildlife is regulated by the state game and fish agencies, while state agricultural agencies and livestock boards regulate domestic livestock production activities. In Montana, Wyoming, and Idaho, state law treats bison as wildlife rather than livestock.

Much of the Greater Yellowstone private land is used for ranching. Most local ranchers rely on federal grazing permits to provide them with access to forest lands during the summer months. Ranchers engaged in cow-calf operations winter their cattle on private lands at lower elevations near water and feed. Foraging elk and bison also use these same low elevation lands for winter habitat, particularly private ranch lands north of Yellowstone in Paradise Valley, Montana. These private ranches, often located on prime real estate in scenic river valleys, give the Yellowstone region much of its old West appearance and help preserve precious open space. But escalating real estate prices and rising operation costs and difficulties have tempted some ranchers to sell their lands for subdivision development for quick, steep profits. Not only does this adversely impact the region's aesthetic appearance and recreational opportunities, but wildlife lose important habitat and people-wildlife conflicts inevitably increase.

The Greater Yellowstone Ecosystem, though still a relatively intact ecological entity, nonetheless suffers from fragmentation and human intervention. Perhaps nowhere is this more evident than in the

42. Significantly, local communities have realized the value of preserving private ranch lands, and proposals are now being actively discussed in Jackson Hole that would enable marginally profitable ranching operations to derive some financial returns from conservation easements and thus relieve the financial pressure faced by traditional cow-calf operations. Scenic Teton ranchlands up for sale, Casper Star Tribune, February 3, 1992, at B1.
bison-brucellosis controversy. South of Grand Teton National Park, the National Elk Refuge was established to protect remnant elk winter habitat and to provide displaced elk with supplemental food. The refuge also provides the park’s bison with easily accessible winter food. In addition, the Wyoming Game and Fish Department maintains 22 other elk feedgrounds in western Wyoming to compensate for lost winter habitat.\textsuperscript{43} These feedgrounds have detoured elk from traditional migratory patterns, providing them with a highly artificial source of food and thus insulating them from the harsh impact of winter. Moreover, extensive snowmobiling and other winter recreational activities inside Yellowstone National Park have packed snow-covered park roads, which now afford bison ready—and previously unavailable—migration routes out of the park during winter months.\textsuperscript{44} In short, human development and related activities have noticeably altered natural ecological processes.

Like other natural resource controversies in the Yellowstone region, the brucellosis controversy is fueled by this crazy quilt pattern of land ownership and ecological fragmentation. With the entire Yellowstone region cross-hatched by political boundaries that make no ecological sense, conflict is virtually assured. The National Park Service’s natural regulation philosophy of wildlife management stands in marked contrast to the more intensive management policies prevailing outside the national parks. In the case of brucellosis, the Park Service’s commitment to a free ranging bison population is fundamentally inconsistent with federal and state agricultural policies designed to eradicate brucellosis in livestock. Consequently, federal and state agencies have been pitted against one another, and wildlife and livestock interests are on different sides of the issue.\textsuperscript{45} Animal rights activists—a relatively new presence on the western public domain—are in conflict with traditional sportsmen’s organizations as well as environmentalists.

B. A Region in Transition

Public land management in Greater Yellowstone is in a state of transition. Preservationist and environmental values enjoy broad pub-
lic support throughout the region. Besides the core national park lands, nearly half of the Greater Yellowstone national forest lands are designated wilderness and also managed under a "hands off" preservationist policy. With the general public's interest in wildlife shifting from a consumptive ethic to a preservationist ethic, particularly bison and elk—are a principal attraction for both residents and visitors. Indeed, the bison—a symbol of one of the nation's earliest and most successful conservation campaigns—is widely associated with Yellowstone National Park. Timber harvesting has slowed on several of the forests, as has oil and gas activity in recent years.

In fact, the Park Service and the Forest Service, acting through a Greater Yellowstone Coordinating Committee, have recently agreed to manage Greater Yellowstone's public lands to protect functioning ecosystems while insuring economically and environmentally sustainable development.

In Greater Yellowstone, this shift toward ecosystem-based management includes a major commitment to restoring ecological processes. Under the Endangered Species Act, a high profile grizzly bear recovery plan has been implemented, which critics assert is dominating land management policies throughout the region. Forest Service officials are working with state game and fish officials to restore elk migration routes in the Bridger-Teton National Forest and elsewhere. The Park Service and the U.S. Fish & Wildlife Service are seeking to restore the wolf to its original biological niche. Both

52. FRAMEWORK FOR COORDINATION, supra note 51, at 4.
55. UNITED STATES FOREST SERVICE, BRIDGER-TETON NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN IV-238 (1990); FRAMEWORK FOR COORDINATION, supra note 51, at 4.
the Forest Service and Park Service appear committed to fire management policies that eventually should allow natural fire to play a dynamic role in shaping the forest landscape.\(^{57}\) And in an effort to avoid endangered species listing, a major habitat protection effort is underway to increase dwindling trumpeter swan numbers.\(^{58}\) As we will see, recent wildlife brucellosis policy proposals, including reduction of the elk feedgrounds in western Wyoming and designation of bison habitat management zones outside the national parks, are entirely consistent with these ecosystem restoration efforts.

These public land management changes are part of larger social and economic changes occurring throughout the Greater Yellowstone region. Recent studies and data indicate that the regional economy has already made a transition from a commodity-based economy to one based on the area's amenity values.\(^{59}\) Recreation and tourism provide the economic base for many communities, while new residents and businesses are attracted to the region's natural setting. Tourists from all over the world travel thousands of miles to view Yellowstone's scenic wonders and wildlife during the summer months, while hunters and fishers account for a multi-million dollar guiding and outfitting industry. Traditional extractive industries are in decline, but they still play a major role in the surrounding states' economies.\(^{60}\) Cattle ranching historically has not been a major factor in the Greater Yellowstone region's economy, though it is more important in some communities than others.\(^{61}\)

Underlying the Greater Yellowstone brucellosis issue, therefore, is the question of how to manage wildlife on an ecosystem scale in a setting with overlapping federal and state jurisdictional authority and conflicting management philosophies. Although the Yellowstone region's federal land managers have recently committed themselves to a coordinated, ecosystem-based management policy on the public lands,\(^{62}\) they have no direct authority over state or private lands. The states are responsible for wildlife management, and ranching is an

57. See U.S. Dept. of the Interior, National Park Service, Yellowstone National Park Wildland Fire Management Plan (June 1991); Greater Yellowstone Coordinating Committee, The Greater Yellowstone Area Inter-Agency Fire Management Planning and Coordination Guide (1990). Each national forest in the Greater Yellowstone area is currently drafting its own fire management plans, which have yet to be completed. See also Framework for Coordination, supra note 51, at 11.
60. CRS Ecosystem Report, supra note 29, at 38-42.
61. Id. at 40-41.
62. See generally Aggregation Report, supra note 32, at 1-1 to -3; Framework for Coordination, supra note 51, at 1.
important political and economic force in Wyoming, Montana, and Idaho. With 23 elk feedgrounds in Wyoming, the region is not an entirely intact ecosystem subject only to the influence of natural processes. People are an ubiquitous presence, as reflected in the growing tourism economy and escalating winter visitation in the national parks. In addition, scientists continue to disagree among themselves over the region’s ecological health, particularly whether Yellowstone’s northern range is overpopulated with elk and bison. And animal rights activists, generally committed to the view that animals should be treated as individuals rather than managed as populations or species, have interjected the moral issue of whether it is proper to kill animals, even for management purposes. How the brucellosis controversy is resolved will reveal just how far the transition to ecosystem-based management has progressed in Greater Yellowstone and what it actually means in practice.

II. THE NATIONAL PARK SERVICE AND BISON: PUSHING THE LIMITS OF NATURAL REGULATION?

Under the National Park Service’s natural regulation philosophy, bison population numbers have escalated sharply in Yellowstone and Grand Teton national parks. Ignoring park boundaries, Yellowstone’s proliferating bison are now regularly wandering onto neighboring ranch property, perhaps intent on reestablishing long dormant migratory patterns that could extend their range far beyond the national park. Grand Teton’s bison, on the other hand, are wintering on the National Elk Refuge, where they commingle with elk and transmit brucellosis back and forth among themselves. In both cases, bison behavior increases the risk of brucellosis transmission to domestic livestock.

A. Yellowstone’s Bison: An Historical-Ecological Overview

Yellowstone National Park, the world’s first public park, was created in 1872 to preserve the region’s “mineral deposits, natural curiosities, or wonders” and to “provide against the wanton destruction of the fish and game.” In 1883, alarmed by reports of rampant poaching, Congress amended the Yellowstone Park Act and gave the


military responsibility for protecting the park's wildlife from poachers.\textsuperscript{65} In 1916, with passage of the National Park Service Organic Act, Congress established the Park Service and gave it responsibility "to conserve the scenery and the natural and historic objects and the wildlife" in the national parks.\textsuperscript{66} In Yellowstone and elsewhere, the Park Service concluded that this mandate authorized it to manage wildlife intensively, to provide park visitors with wildlife viewing opportunities, and to keep population numbers in check.\textsuperscript{67} But in 1963, in response to the now famous Leopold Report,\textsuperscript{68} the Park Service reversed itself and adopted a policy of natural regulation in Yellowstone and elsewhere. Based upon the principle of minimal human intervention in the natural world, this policy has often put the Park Service at odds with the prevailing policies on adjacent public lands and with the interests of neighboring ranchers.

Yellowstone's bison are a mix of two subspecies, namely mountain bison and plains bison. A small population of mountain bison, which originally may have only summered in Yellowstone,\textsuperscript{69} survived the 19th century Great Plains buffalo slaughter and took up permanent residence on the Yellowstone plateau. In 1901, with the bison population dipping to only twenty-five animals, Yellowstone's military caretakers imported plains bison from Montana and Texas, hoping to begin an interbreeding program to save the species from extinction.\textsuperscript{70} Under this breeding program, bison numbers increased rapidly, eventually growing to over 1,000 bison by 1930.\textsuperscript{71} Until 1963, when the Park Service adopted its natural regulation policy, Yellowstone's bison were in the process of hybridizing with the plains bison. However, in 1963, the Park Service adopted a policy of natural regulation, which has continued to the present day. This policy has been controversial and has been the subject of much debate and research.

\textsuperscript{67} See Runte, supra note 8, at 168-169. As part of this policy, the Park Service also aggressively worked to eliminate predators, like wolves and cougars, which were regarded as "bad" wildlife that threatened the existence of "good" species. Id. at 111.
\textsuperscript{68} Leopold Report, supra note 8. See generally Runte, supra note 8, at 198-208; Mark S. Boyce, Natural Regulation or the Control of Nature, in THE GREATER YELLOWSTONE ECOSYSTEM, supra note 6, at 183-208.
\textsuperscript{69} An ongoing debate persists between those who believe the bison (as well as other prominent species) did not originally inhabit the region now known as Yellowstone National Park and those who assert that the bison (and other species) were original year-round inhabitants of the park. Compare Chase, supra note 63, at 16-19 (asserting that bison did not originally inhabit the park) with Margaret M. Meagher, Bison, in BIG GAME OF NORTH AMERICA, ECOLOGY AND MANAGEMENT 123, 130-131 (1978) (concluding that bison were an original inhabitant). See also Cathy Whitlock, et al., A Prehistoric Perspective on the Northern Range, in THE GREATER YELLOWSTONE ECOSYSTEM, supra note 6, at 304, using prehistoric data to conclude that bison and other species have inhabited Yellowstone's Northern Range for the past one thousand years; William T. Hornaday, THE EXTERMINATION OF AMERICAN BISON WITH A SKETCH OF ITS DISCOVERY AND LIFE HISTORY, 367, 512, 522 (1889), describing Yellowstone's bison circa the 1880's.
\textsuperscript{70} Haines, supra note 1, at 54-77; Hampton, supra note 65, at 165-67.
\textsuperscript{71} Margaret M. Meyer, BRUCELLOMA IN THE YELLOWSTONE NATIONAL PARK BISON HERD 3 (Report to the Department of the Interior, Yellowstone National Park, Mar. 18, 1992); Hampton, supra note 65, at 167.
stone’s bison population either was corralled or kept in check by culling.\footnote{72}

Today, Yellowstone is home to more than 3,000 bison, which traditionally have used three separate winter ranges.\footnote{73} The Northern Range herd primarily winters in the Lamar Valley and numbers approximately 600-800 bison. It poses a threat to ranchers in the Paradise Valley area, where private ranch lands border the park and account for most of the low elevation, winter habitat acreage along the Yellowstone River.\footnote{74} The Mary Mountain herd, which is estimated at 1,500-2,000 bison, frequents Hayden Valley, but these bison have migrated during winter as far west as West Yellowstone, Montana, where they threaten private property and pose a potential conflict with national forest grazing leases.\footnote{75} The Pelican Valley herd, a smaller group of 200-300 bison, winters in the Pelican Valley, but it too has begun to move from the valley on snow machine trails during the winter. A few of these bison are now regularly appearing on national forest lands outside the park’s eastern border, not many miles from Cody, Wyoming. Park researchers believe that the bison’s recently acquired knowledge of travel corridors and nearby range, as well as their natural gregariousness, are indicative of new nomadic behavioral patterns that are not yet fully understood.\footnote{76} Moreover, greater levels of intermingling are now occurring among the herds than had occurred in the past.

B. Bison Management: Coping with Boundaries

The Park Service’s bison management policies have changed as its general wildlife policies have evolved. Through the first half of this century, Yellowstone officials kept the bison population in check initially by corraling them and then by culling the herds, sometimes disposing of as many as 500 animals in one year.\footnote{77} The primary impetus for the bison culling program was the then-prevailing view of the Northern Range’s limited carrying capacity.\footnote{78} But after 1917, when

\footnotesize

73. \textit{See generally id.} at 10; Thorne, et al., supra note 6, at 280-281.
74. Most of the bison shot outside the park have come from this Northern Range herd. \textit{See infra} text accompanying notes 88-92.
75. Bison from the Mary Mountain herd have recently been shot when they crossed out of the park near West Yellowstone. 22 more bison killed; total 172, \textit{Casper Star Tribune}, January 21, 1992, at B1; Telephone Interview with Bob Martinka, Montana Fish, Wildlife and Parks Department Area Supervisor (April 10, 1992).
76. \textit{Yellowstone Bison: Background and Issues}, supra note 40, at 13; Telephone Interview with Mary Meagher, Yellowstone National Park biologist (Sept. 23, 1992).
77. \textit{Yellowstone Bison: Background and Issues}, supra note 40, at 10; Schullery, supra note 40, at 35; M. Meyer, supra note 71, at 3.
brucellosis was discovered in the park’s bison, Park Service officials also tested the animals for brucellosis and slaughtered those that were carriers. When the Park Service phased out its Buffalo Ranch after World War II, the culling policy limited bison population growth and usually insured sufficient winter range for the remaining animals, thus minimizing the possibility that they might intermingle with cattle on adjacent ranches. Moreover, with the park buried in deep snows during the winter, it was difficult for bison to travel any significant distance. The Park Service’s bison management policy underwent a radical transformation in the mid 1960’s. Faced with a stiff public outcry against its bison and elk herd reduction policy, the Park Service embarked upon its natural regulation experiment, which meant that wildlife would not be managed intensively but instead left to the vagaries of nature. Drawing upon the Leopold Report recommendations, the Yellowstone Natural Resources Management Plan provides that: “Bison management in Yellowstone National Park has as a goal maintaining a truly wild, free-ranging population subject only to the influences of natural regulatory processes.” Bison numbers multiplied rapidly in the wake of this policy change, rising from 397 bison in 1967 to 2,000 in 1982 and to over 2,500 in 1988. This increase in bison numbers has been accompanied by a notable change in winter behavior patterns. Where the bison originally stayed within the park during the winter, many are now regularly leaving it in search for forage. Several explanations have been advanced for this change. Park Service critics assert that increased elk and bison numbers on the park’s Northern Range have depleted the forage and forced the animals to look outside the park for food. Park Service scientists and other researchers dispute this overgrazing charge; they suggest that the bison are simply relearning historic migration patterns and acting

79. Don Despain, et al., supra note 78, at 36-45. It is widely believed that Yellowstone’s bison contracted brucellosis from domestic livestock, which means that the disease is not native to the park’s bison. James D. Herriges, Jr., Vaccination to Control Brucellosis in Free-Ranging Elk on Western Wyoming Feed Grounds, in THE BIOLOGY OF DEER 107 (Robert D. Brown ed., 1991).
81. NATIONAL PARK SERVICE, ENVIRONMENTAL ASSESSMENT: NATIONAL PARK SERVICE INVOLVEMENT IN THE CONTROL OF YELLOWSTONE BISON 3 (1990) [hereinafter YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT].
82. Id. at 81-2 (noting that previously only bull bison crossed park boundaries); Margaret M. Meagher, Range Expansion by Bison of Yellowstone National Park, 70 JOURNAL OF MAMMALOGY 670 (1989).
83. Chase, supra note 63, at 83; Chadde and Kay, supra note 63, at 232-233.
just as they should under the natural regulation policy. A park scientist, noting that winter tourism has increased and that previously snow-covered roads are now plowed and packed to accommodate winter visitors, has concluded that the bison are opportunistically using these roads (and avoiding the deep snow) to travel outside the park in their search for food. Few disagree that the extensive 1988 summer fires seriously depleted forage on the Northern Range, thus forcing large numbers of bison and elk outside the park in the ensuing winter and accounting for the 569 bison that were shot by hunters in Montana. But even with the range now largely restored after the fires, the bison are still leaving the park during the winter, especially in heavy snow years. Another 260 bison were shot by Montana officials during the 1991-92 winter.

Yellowstone officials have employed several different management strategies to prevent or discourage bison from intermingling with cattle on adjoining ranches. In 1968, following adoption of its natural regulation management philosophy, the Park Service pursued a boundary control policy, which meant that any bison approaching designated park boundaries were shot. Beginning in 1976, when the Northern Range herd began moving toward the boundary, the Park Service implemented a hazing policy as an alternative to shooting, and it installed fencing to block migration routes. This hazing policy, however, proved unworkable; the bison were only temporarily deflected from their migration routes. With the Northern Range herd beginning to migrate instinctively out of the park in winter, the Park Service then implemented a "cropping" policy, which again subjected bison leaving the park to being shot. Although the Park Service's cropping policy survived a lawsuit, the Montana legislature's bison hunting policy did not survive the harsh glare of national publicity.

84. In the case of the Mary Mountain herd, which is now migrating toward West Yellowstone, scientists believe that population pressures are responsible for its movement—a phenomenon they have labeled an "ecological spillover" to indicate that the population is busy fully occupying available habitat. Yellowstone Bison Environmental Assessment, supra note 81, at 4.
85. Meagher, supra note 82, at 670. This same researcher also speculates that the bison's gregarious nature (i.e. their desire to aggregate on flat land where they can see and hear one another) may explain the increased winter movements of large numbers of bison. Id. at 674.
86. Thorne, et al., supra note 6, at 281.
88. Because of the relatively small population and mild winters, few bison ever ventured into the forbidden zone; only 5 bison were shot during the ten years between 1968-1978. Meagher, Evaluation of Boundary Control for Bison of Yellowstone National Park, 17 Wildlife Soc. Bull. 15 (1989).
89. Id. at 17. Under this policy, Park Service rangers would harass migrating bison, using noisemakers, helicopters, and rubber bullets, to turn them back into the Yellowstone interior.
Fearing an anti-hunting backlash after hunters were filmed shooting bison at point blank range during the severe 1988-89 post-fire winter, the Montana legislature repealed its authorization for bison hunting and left the matter to be addressed jointly by the state game and fish department and the livestock board.92

Federal and state officials have continued an interim cropping policy, and migrating bison are being shot when they leave the park.93 This policy, too, has been attacked. The Fund for Animals, arguing that the Park Service did not comply with NEPA, has unsuccessfully challenged the policy, first in a Montana federal district court and then on appeal to the Ninth Circuit Court of Appeals.94 But when Yellowstone officials proposed shooting 25 bison inside the park to sample them for brucellosis, the Fund for Animals successfully secured an injunction halting the shooting.95 Meanwhile, Yellowstone officials, working in conjunction with other federal and state agencies, are completing a comprehensive environmental review of bison management policy options.96

C. Grand Teton’s Bison and Elk: The Feedground Problem

South of Yellowstone, Grand Teton National Park is home to approximately 150 bison. Although bison are indigenous to Wyoming, the present Grand Teton bison herd was established in 1948, and then replenished in 1963 when bison were brought from North Dakota to replace the pre-existing herd that was destroyed after testing positive for brucellosis.97 Until 1969, the bison were kept in an enclosed area and regularly tested and vaccinated against brucellosis, but they are now managed as a free ranging herd, without testing or vaccination.98 The herd size has increased in number from 15 in 1975 to 150 in 1991.99 Moreover, the bison have expanded their winter range south to the National Elk Refuge just outside the town of Jackson, Wyom-

93. YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT, supra note 81, at 4. Under the interim cropping policy, the Montana Department of Fish, Wildlife and Parks is responsible for shooting stray bison, but the Park Service recently agreed that Yellowstone personnel could also shoot troublesome bison found near private property. NATIONAL PARK SERVICE, ROCKY MOUNTAIN REGIONAL OFFICE, FINDING OF NO SIGNIFICANT IMPACT, (Jan. 10, 1992).
97. NATIONAL PARK SERVICE, GRAND TETON NATIONAL PARK RESOURCE MANAGEMENT PLAN 111 (1986) [hereinafter GRAND TETON RESOURCE PLAN].
98. Id. at 112-14.
99. Id. at 112-15.
ing, which puts them in close contact with wintering elk and in close proximity to private ranch lands.\textsuperscript{100} Although studies indicate that these bison generally follow an established migratory path between the park and wildlife refuge,\textsuperscript{101} the Parker Land Company alleged that bison from this herd crossed the Continental Divide and passed brucellosis to its cattle.\textsuperscript{102}

Not surprisingly, management of the Grand Teton National Park bison herd also is engulfed in controversy. The Park Service’s resource management plan contemplates “retain[ing] a free-ranging bison herd in Jackson Hole of a size that would be most compatible with the sometimes conflicting management objectives of the responsible State and Federal Agencies, the public interest, and the interests of private property owners in Jackson Hole.”\textsuperscript{103} An interim, interagency bison management agreement provided for a free ranging herd limited to 90-110 bison.\textsuperscript{104} But opponents objected that the plan revealed no scientific basis for setting a maximum bison population, and an animal rights organization, concerned that surplus bison would be shot, successfully sued the agencies for adopting the plan without complying with NEPA.\textsuperscript{105} Under the terms of the settlement, federal officials are preparing a final management plan in accordance with NEPA, and bison hunting has been temporarily enjoined.

In western Wyoming, bison management is entwined with elk management, because elk are also a potential source of brucellosis.\textsuperscript{106} To compensate for lost winter habitat, the U.S. Fish & Wildlife Service operates the National Elk Refuge south of Grand Teton National Park, and the Wyoming Game and Fish Department maintains 22 feedgrounds for approximately 23,000 elk throughout western Wyom-

\begin{footnotesize}
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  \item \textsuperscript{100} Id. at 114.
  \item \textsuperscript{101} Parker Findings and Conclusions, supra note 18, at 7; \textit{GRAND TETON RESOURCE PLAN}, supra note 97, at 114.
  \item \textsuperscript{102} Plaintiff’s Amended Proposed Findings of Fact and Conclusions of Law at 8, Parker Land and Cattle Co., Inc. v. United States, No. 91 Civ. 0039-B (D. Wyo 1991) [hereinafter Parker’s Proposed Findings].
  \item \textsuperscript{103} \textit{GRAND TETON RESOURCE PLAN}, supra note 97, at 119.
  \item \textsuperscript{105} Legal Action for Animals v. Wyoming Game and Fish Dept., No. 90CV-294-B, Stipulated Settlement and Joint Motion of Parties to Dismiss Suit (D. Wyo. 1990).
  \item \textsuperscript{106} E.T. Thorne, J. Herriges, and A. Reese, \textit{Bovine Brucellosis in Elk: Conflicts in the Greater Yellowstone Area}, in \textit{PROCEEDINGS—ELK VULNERABILITY SYMPOSIUM} 296, 297 (1991); E.T. Thorne, J.K. Morton, and W.C. Ray, \textit{Brucellosis, Its Effect and Impact on Elk in Western Wyoming}, in \textit{NORTH AMERICAN ELK: ECOLOGY, BEHAVIOR AND MANAGEMENT} 212 (Mark Boyce & L. Hayden-Wing, eds. 1979). To support his compensation claim, Parker argued that his cattle may have contracted brucellosis from elk, asserting that three aborted elk fetuses were observed near his grazing allotment. Parker’s Proposed Findings, supra note 102, at 5.
\end{itemize}
\end{footnotesize}
ing.107 These feedgrounds have become prime sites for transmission of brucellosis, because the animals are in such close contact with one another during the critical birthing period when they can pass the disease among themselves.108 Brucellosis now infects approximately thirty-seven percent of the cow elk in western Wyoming.109 Infected elk also have been found in Montana, but none have yet surfaced in Idaho.110 Because elk give birth in seclusion and are notoriously fastidious in cleaning themselves after a birthing event, elk are considered less likely than bison to pass brucellosis to domestic livestock.111 But elk can pass brucellosis to bison on the National Elk Refuge, which means an effective eradication program must eliminate the disease in both species.

Responding to the problem, Wyoming’s governor has appointed a state-level Interagency Task Force on Brucellosis to recommend policies for addressing brucellosis in wildlife.112 Observers anticipate the Task Force’s recommendations could produce management principles for the entire Greater Yellowstone region.113 In its final report, the Task Force recommends creating a Tri-State Interagency Brucellosis Task Force, composed of federal, state, livestock, and conservation members, to address the problem regionally through intergovernmental cooperation,114 and it calls for federal legislative and financial support.115 Convinced that cattle and wildlife can coexist

107. Thorne, et al., supra note 6, at 276.
108. Id. See infra text at notes 176-178 for a description of how brucellosis is transmitted between animals.
109. Thorne, Herriges & Reese, supra note 106, at 298. See also infra text accompanying notes 171-175 for a further discussion of the brucellosis infection rates.
110. Thorne et al., supra note 6, at 276. Blood testing indicates that less than 2% of Montana elk are infected with brucellosis. Thorne, Herriges & Reese, supra note 106 at 298.
111. Thorne, Herriges & Reese, supra note 106, at 298.
112. The members of the Wyoming Governor’s Task Force on Brucellosis is composed of representatives from the Wyoming Game and Fish Department, the Livestock Board, the Agriculture Department, the Governor’s office, the Attorney General’s office, Wyoming Stockgrowers Association, Wyoming Wildlife Federation, and ranchers. Notably, the Task Force did not include any representatives from the federal government. The Task Force’s goal was to “protect the integrity of Wyoming’s free-ranging bison and elk populations and livestock industry by eradicating wildlife brucellosis by the year 2010.” Wyoming Governor’s Task Force on Brucellosis, Report Of Governor’s Brucellosis Task Force 1 (1992) [hereinafter Wyoming Task Force Report].
114. The Wyoming Governor’s Task Force proposes a Tri-State Task Force composed of the state game and fish directors, state veterinarians, APHIS veterinarians, national park superintendents, national forest supervisors, National Elk Refuge manager, B.L.M. state directors, executive directors from each state’s stockgrowers organization, and representatives from three conservation organizations. Wyoming Task Force Report, supra note 112, at 7. In addition, the Wyoming Task Force recommends that the Tri-State Task Force initiate a “region wide Environmental Impact Statement on the brucellosis problem in the [Greater Yellowstone Area].” Id. at 8.
115. Id. at 8. This recommendation, which is rather ambiguous, calls for “establishing a National consensus and Federal legislation assuring that the problem of brucellosis in wildlife
in the Greater Yellowstone region, the Task Force proposes limiting elk and bison numbers to contain the spread of brucellosis, while also imposing geographic and seasonal grazing limitations to minimize contact between wildlife and cattle. It endorses continued vaccination experiments on elk and bison rather than a test and slaughter program to control the disease, and it calls for regionwide mandatory calfhood vaccination for cattle. The Task Force also proposes expanding winter habitat while reducing reliance on the elk feedgrounds. Collectively, these recommendations acknowledge that brucellosis can not realistically be eradicated in wildlife populations and that governmental efforts should be directed toward controlling the disease and its transmission.

Meanwhile, the courts are now deeply involved in the bison management policy debate. But as we shall see, the law does not directly address the problem of brucellosis in wildlife. Moreover, the underlying science still leaves critical questions unanswered. And despite recent interagency coordination efforts, it remains decidedly unclear whether preservation of an ecologically-intact, free ranging bison population can be reconciled with the livestock industry’s commitment to brucellosis eradication. It is clear, however, that any effective solution to the bison brucellosis problem will also have to address the elk brucellosis problem.

III. UNDERSTANDING THE BRUCELLOSIS CONTROVERSY

Brucellosis in cattle (bovine brucellosis) has persisted for centuries and become a major international problem. Brucellosis causes spontaneous abortion (or miscarriages) in cattle, as well as infertility and reduced milk production. Also known as Bang’s disease or undulant fever, brucellosis can be transmitted from infected cattle to humans, causing weakness, weight loss, and fever. In the United States, economic losses attributed to brucellosis have been estimated of the [Greater Yellowstone Area] will be solved and providing for sufficient funding in all affected Federal agencies.” Id. Exactly what form such legislation would take is unclear. Would it establish substantive standards for managing brucellosis-infected wildlife, or would it address the question of priority between cattle and wildlife in Greater Yellowstone, or would it simply insure federal funding under nonspecific guidelines?

116. Id. at 18.
117. Id. at 12, 18-19.
118. Id. at 13.
119. Id. at 14.
120. Id. at 15-18.
121. IVAl AUTHORS MERCHANT, AN OUTLINE OF INFECTIOUS DISEASES OF DOMESTIC ANIMALS 252 (1951). A similar disease was described by Hippocrates. Id.
123. Id. at 150.
at $100 million annually. Consequently, the federal government and the states have joined together in a major brucellosis eradication campaign, designed to rid the nation of the disease. But the campaign does not address brucellosis in wildlife, which persists in the Greater Yellowstone region and which was known to exist before the federal eradication campaign was launched. Moreover, scientists are just beginning to explore the relationship between wildlife brucellosis and bovine brucellosis.

A. Cattle and Brucellosis: The Federal-State Eradication Program

In the United States, bovine brucellosis first surfaced in 1864, when epidemic cattle abortions were reported in the Mississippi River region of Louisiana. In 1897, Dr. Fredrick Bang isolated Brucella abortus, the organism or bacteria which causes brucellosis. In 1934, to combat the disease nationally, the federal government joined the states in a cooperative brucellosis eradication program. Relying upon the Animal Industry Act of 1884, which empowered the Secretary of Agriculture to regulate the spread of infectious diseases in domestic animals, the program was designed to eradicate—not just control—the disease within the United States. In 1947, federal and state officials began working closely with the livestock industry to implement the eradication program. Federal authority has been invoked to regulate the interstate movement of diseased cattle to prevent the spread of brucellosis, while the states have shared responsibility for testing and controlling cattle locally.

Federal law currently authorizes the Secretary of Agriculture "to control and eradicate any communicable diseases of livestock or poultry, including . . . brucellosis of domestic animals." The Secretary is empowered to seize, quarantine, and destroy infected livestock moving in interstate commerce. The federal livestock disease control statutes do not preempt state authority unless the cattle are being transported in interstate commerce; the Secretary of Agriculture can

125. I. Forrest Huddleston, Brucellosis in Man and Animals 171 (1943).
126. Hagan & Bruners, supra note 122, at 135.
127. Senate Report 734, supra note 124, at 2562.
128. 21 U.S.C. §§ 111-143 (1988). See Senate Report 734, supra note 124, at 2561-2563. The national brucellosis eradication program is based on Congress' power over interstate commerce. In Thornton v. United States, the U. S. Supreme Court sustained the Animal Industry Act against tenth amendment and commerce clause challenges, finding that federal commerce power extends to infectious diseases in animals. 271 U.S. 414 (1926).
otherwise intervene only when an "extraordinary emergency" exists and only if state officials are not responding adequately.\textsuperscript{131} Whenever federal officials destroy infected livestock, the government is required to compensate the owner at fair market value.\textsuperscript{132}

Under these statutes, the Secretary of Agriculture, in cooperation with the states and the livestock industry, has promulgated regulations establishing a comprehensive federal brucellosis eradication program.\textsuperscript{133} Administered by the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) and its Veterinary Services office,\textsuperscript{134} the regulations apply to domestic livestock but do not cover wildlife.\textsuperscript{135} The regulations divide the states into different classifications, ranging from a brucellosis-free status to various brucellosis-prevalent statuses to a quarantined status.\textsuperscript{136} The regulations also allow federal officials to subdivide a state into different areas

\textsuperscript{131} 21 U.S.C. § 134a(b) (1988).

\textsuperscript{132} 21 U.S.C. § 134a(d) (1988). See 9 C.F.R. §§ 51 -51.10 (1991) for the implementing regulations, which suggest that the Secretary of Agriculture is only responsible for compensating owners when Congress has appropriated sufficient funds. We were advised by agricultural officials in Montana and Wyoming that federal funding has been available to pay brucellosis-caused damage claims in recent years, though the compensation amount does not always cover the breeding value of a rancher’s cows. Interviews with Russ Burgess, D.V.M., Acting Wyoming State Veterinarian, and Don Ferlicka, D.V.M., Montana State Veterinarian (April 15, 1992). The regulations place a $250 compensation ceiling on cattle or domestic bison destroyed because of brucellosis. \textit{Id.} at §§ 51.1, 51.3.

\textsuperscript{133} Following an industry recommendation, the Secretary adopted a uniform system of rules governing brucellosis, which is reviewed annually by the industry organization. Paul Becton, \textit{The National Brucellosis Program of the United States}, in \textit{Bovine Brucellosis: An International Symposium} 403, 404 (Richard P. Crawford and Richard J. Hildago, eds., 1977). The industry group involved in the brucellosis eradication program was originally called the United States Livestock Sanitary Association, but it is now known as the United States Animal Health Association. Its members include both regulatory and industry representatives. \textit{Id.}


\textsuperscript{135} The regulations define the term “animals” to include cattle, bison, and swine, making no distinction between domestic and wild bison. 9 C.F.R. § 78.1 (1991). The enabling legislation, however, only gives the Department of Agriculture authority over livestock and brucellosis in domestic animals. \textit{See supra} text accompanying note 129. Given this statutory language and given that the states—not the federal government—have traditionally been responsible for wildlife, the Department’s authority plainly does not extend to wild bison. Moreover, since bison are raised domestically, just like cattle, the term “bison” in the regulations should be interpreted to apply only to domestic bison. \textit{See also} Parker Findings and Conclusions, \textit{supra} note 18, at 24-5.

\textsuperscript{136} 9 C.F.R. §§ 78.40-43 (1991). Between the class-free status and the quarantined status, a state can fall into one of three categories: Class-A, Class-B, or Class-C. Class determination is accomplished by surveillance of a state’s livestock herds to discover the incidence of brucellosis throughout the state. To be listed in a particular class, each state must not exceed a set infection rate. \textit{Id.} Significantly, the regulations define a “Class Free State or area” only in terms of the prevalence of brucellosis in domestic livestock, saying nothing about brucellosis in wildlife populations. 9 C.F.R. § 78.1 (1991). And in the case of feral swine, the regulations provide that “[a] state may qualify as a validated brucellosis-free State regardless of the brucellosis status of feral swine in that state if the feral swine are not in physical contact with domestic swine.” \textit{Id.}
when classifying it for brucellosis-status purposes. Cattle must be tested for brucellosis in all states, regardless of the state’s classification status. But as a state’s brucellosis status drops, the interstate movement of cattle is more restricted and official vaccination requirements attach. In the event of a positive brucellosis test, the regulations provide for destruction of the infected animals as well as quarantine of the herd. The quarantined herd is treated either through a test and slaughter program or depopulation (i.e. slaughtering). Neither brucellosis-infected nor brucellosis-exposed livestock can be shipped in interstate commerce, except for slaughter.

The states have also played a major role in the brucellosis eradication effort. Because federal livestock disease control statutes pre-

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137. 9 C.F.R. § 78.40 (1991). We were advised that both Montana and Wyoming have been divided into different brucellosis classifications during the past ten years for short periods of time to respond to local brucellosis outbreaks. Interview with Russ Burgess, D.V.M., Acting Wyoming State Veterinarian (March 25, 1992); Telephone Interview with Don Ferlicka, D.V.M., Montana State Veterinarian (April 15, 1992).

138. 9 C.F.R. § 78.1 (1991). Regardless of a state’s brucellosis classification status, all cattle are subjected to blood sampling tests at slaughter houses (also known as “market cattle indicator” tests) to determine whether brucellosis exists in the state’s cattle herds. States designated free of brucellosis, however, are not required to test cattle prior to interstate shipment, unlike those states where brucellosis persists in domestic herds. 9 C.F.R. § 78.9 (a) (1991).

139. 9 C.F.R. § 78.9 (1991).

140. 9 C.F.R. § 78.1 (1991). (See definition of “Class-free state or area”). In 1990, seeking to rely upon APHIS’s quarantine power, the Montana Livestock Board unsuccessfully requested a federal quarantine of Yellowstone National Park’s bison in an effort to compel park officials to take more aggressive action to control brucellosis in the bison herds. Steve Moore, Montana asks government to quarantine park because of bison, The Laramie Daily Boomerang, Dec. 15, 1990, at 10; Associated Press, Barbee ‘shocked’ by Montana’s request for Yellowstone quarantine, Casper Star Tribune, Dec. 16, 1990, at B1. However, APHIS, which has been given regulatory power over domestic livestock to combat brucellosis, probably does not have the power to quarantine wildlife with the disease. See supra text accompanying notes 129, 135. Nonetheless, APHIS has inexplicably asserted that if “bison were allowed to wander unrestricted [outside Yellowstone National Park], potentially exposing livestock, it would force us to downgrade the brucellosis status of Montana, due to the presence of an infected bison herd.” Letter from Lonnie J. King, Deputy Administrator, APHIS Veterinary Services, U.S. Department of Agriculture, to Rich Klucas, Bison Management Plan, Yellowstone National Park (Jan. 27, 1990) [hereinafter King-Klucas letter]. This assertion is inexplicable because the regulations defining a brucellosis-free state apply only to domestic livestock; they say nothing about brucellosis-infected or -exposed wildlife. See supra note 135. Moreover, brucellosis-infected bison and elk roam at will in western Wyoming and APHIS has not sought to revoke Wyoming’s brucellosis-free status.

141. Id. A test and slaughter program consists of confining the infected herd, then testing each head of cattle in the herd with the official test, and then slaughtering each one that tests positive at an official slaughterhouse.

142. 21 U.S.C. § 134a-1 (1988); 9 C.F.R. § 78.7 (1991). However, in dealing with wild bison (as opposed to domestic bison), APHIS has the apparent power to “permit the interstate movement of bison . . . under such conditions as the Deputy Administrator may prescribe in each case to prevent the spread of brucellosis.” 9 C.F.R. § 78.25 (1991).

empt state authority only when cattle are moving in interstate commerce, most states have enacted their own comprehensive livestock disease statutes to supplement federal regulatory efforts. In Wyoming, Montana, and Idaho, these statutory schemes are quite similar: They rely upon quarantine, testing, importation restrictions, and slaughter policies to eliminate the disease. All three states provide for indemnity to owners of slaughtered animals, though funds are limited by legislative appropriations. But while calfhood vaccination is required in Idaho, Wyoming and Montana only require that imported heifer calves must be vaccinated.

Until recently, these state statutes only addressed brucellosis in cattle; there were no provisions addressing brucellosis in wildlife. Indeed, state agricultural officials responsible for livestock brucellosis programs traditionally have not had any authority over wildlife. But in a significant break with tradition, following the public outcry over the bison hunt, the Montana legislature expressly gave the Livestock


149. Wyo. Stat. § 11-19-109 (1989); Mont. Code Ann. §§ 81-2-201 to 210 (1991); Idaho Code §§ 25-606, -614 (1990). Evidently, the Wyoming legislature has never appropriated any funds for this indemnity program. Interview with Russ Burgess, D.V.M., Acting Wyoming State Veterinarian (March 25, 1992). Moreover, the State Veterinarian can deny indemnity if a claim is not “equitable and entitled” or for other enumerated reasons (e.g. the animal was illegally imported into Wyoming). Wyo. Stat. §§ 11-19-106 (a) - (e) (1989).


151. Wyoming Governor’s Proclamation, supra note 144, at § 3B-III (requiring all cows born after January 1, 1984 to be “officially calfhood vaccinated” before entering the state); Mont. Code Ann. § 81-2-801 (1991) (requiring all imported female cattle over the age of four months to be vaccinated).
Board concurrent authority with the Fish, Wildlife and Parks Department over wild bison. Classifying the bison as a "species in need of management," the legislature precluded further bison hunting and authorized the Livestock Board to regulate "bison in this state that pose a threat to persons or livestock in Montana through the transmission of contagious disease."152 The Board recently has promulgated regulations requiring the removal or destruction of all bison entering Montana that have been exposed to brucellosis.153 Similarly, the Idaho legislature has recently given the state Department of Agriculture responsibility for removing or shooting wild bison entering the state that "pose a significant threat to property, livestock, or other animals."154 In contrast, Wyoming still classifies bison as wildlife and relies upon the state game and fish department to regulate bison. As a result, Wyoming tolerates bison outside the national parks, while Montana and Idaho have effectively adopted a "zero tolerance" policy, either removing or shooting all bison that venture beyond park boundaries.

Under this stringent eradication program, the costs of a brucellosis outbreak can be substantial. An individual rancher with infected cattle faces the prospect of losing the entire herd, which may include prime breeding stock, or of having the herd placed in quarantine and put through an expensive, time-consuming test and slaughter process to identify the infected cows.155 As long as the infection is confined to the one herd, federal funds cover the cost of testing,156 and compensation is available for the slaughtered animals.157 Ord-

152. Mont. Code Ann. § 87-1-215 (1991). The statute gives the Fish, Wildlife and Parks Department authority over bison that threaten people or property "other than through the transmission of contagious disease" and charges it to develop rules "to manage and reduce the number of wild buffalo or bison that leave Yellowstone national park." Id. at § 87-1-215(2)(b). The statute also threatens legal action against the National Park Service, if it does not "enter a long term management agreement . . . [that] responds adequately to the needs of Montana." Id. at § 87-1-215(4).


154. Idaho Code § 25-618 (1992 Supp.). Citing the threat of brucellosis from recent Yellowstone bison migration patterns, the statute calls for state agriculture officials first to try to remove bison from the state, then to shoot them if they cannot be safely removed. It also gives the Department of Agriculture authority to promulgate implementing regulations, and it requires Department of Fish and Game officials to cooperate with their Department of Agriculture counterparts. Id.


156. Interview with Russ Burgess, D.V.M., Acting Wyoming State Veterinarian (March 25, 1992). In the case of the Parker brucellosis outbreak, federal funds covered the expenses of testing Parker's herd as well as neighboring herds, and Parker was entitled to federal compensation for his herd, which evidently was refused.

157. Id. Ranchers complain, however, that the federal compensation amounts do not fully cover their losses, particularly in the case of breeding stock. Interview with Bob Budd, Executive Director, Wyoming Stockgrowers Association (March 19, 1992).
narily, neighboring ranchers also will be subjected to federal testing.\(^\text{158}\) If the disease has spread, though, the state faces loss (or downgrading) of its brucellosis status.\(^\text{159}\) In the case of a brucellosis-free state, like Wyoming, Montana, or Idaho, an uncontained outbreak would mean that all ranchers must meet stringent testing and inspection guidelines before shipping their cattle interstate.\(^\text{160}\) This expense is estimated at five dollars per cow.\(^\text{161}\) Cumulatively, this can add several million dollars in increased expense for a state’s livestock industry.\(^\text{162}\)

The dual federal-state brucellosis eradication program has greatly reduced the incidence of brucellosis in the United States. Over thirty states are now listed in the “class-free” category.\(^\text{163}\) But after almost sixty years and expenditures totalling $1.3 billion,\(^\text{164}\) the program has not eradicated brucellosis from American cattle,\(^\text{165}\) and it still costs in excess of $60 million annually.\(^\text{166}\) More importantly, with wildlife brucellosis prevalent throughout the Greater Yellowstone region, the national brucellosis eradication campaign ultimately may be destined to fail. As long as brucellosis persists in wildlife populations, the threat of brucellosis infection in cattle is present. But the statutes and regulations, as we have seen, say very little about brucellosis in wildlife, thus ignoring a potential source of brucellosis in three important cattle producing states. Wyoming, Montana, and Idaho livestock officials are therefore quite fearful that these states may eventually find themselves isolated from the national livestock market. Of course,

\(^{158}\) Id. See also 9 C.F.R. § 78.1 under the definition given for “Class-free state or area.”

\(^{159}\) Id.

\(^{160}\) 9 C.F.R. §§ 78.5 to 78.13 (1991).


\(^{162}\) See The Fund for Animals, Inc. v. Lujan, noting that loss of Montana’s “brucellosis-free” designation would require the state to spend over two million dollars for testing of its cattle. 962 F.2d 1391, 1402 (9th Cir. 1992).

\(^{163}\) 9 C.F.R. § 78.41 (1991); Thorne & Herriges, Brucellosis, Wildlife and Conflicts in the Greater Yellowstone Area, in Transactions of the Fifty-Seventh North American Wildlife and Natural Resources Conference 453, 454 (1992). “Class Free state or area” means that the state has met the following standards: (1) the state has conducted the proper surveillance or testing, (2) all cattle herds in the state or area must remain free of field strain Brucella abortus for 12 consecutive months, and (3) the state or area must maintain a 12 month Market Cattle Identification (MCI) rate not to exceed 1 reactor per 2,000 cattle tested (0.050 percent). MCI is a brucellosis testing program required in all state or area slaughter houses. 9 C.F.R. § 78.1 (1991). Although Montana, Wyoming, and Idaho are now classified as “class-free state or area,” the neighboring states of Colorado, Nebraska, South Dakota, and Oregon are not yet free from the disease.

\(^{164}\) Thorne, Herriges & Reese, supra note 106, at 297.

\(^{165}\) Several factors have hampered the eradication effort, including the lack of funds for compensation and testing, the program’s time consuming and inconvenient procedures, and the periodic need to respond to more pressing livestock diseases and epidemics. Becton, supra note 133, at 410-411.

\(^{166}\) Thorne & Herriges, supra note 163, at 454.
whether or not that may happen depends upon the likelihood that wildlife can or will transmit the disease to cattle.

B. **Wildlife and Brucellosis: Dealing with Scientific Uncertainty**

Brucellosis is endemic in Greater Yellowstone's wildlife populations. The disease was first detected in Yellowstone bison in 1917, which was also the first time wildlife were definitively identified as brucellosis carriers. In 1930, brucellosis was discovered in elk at the National Elk Refuge; three years later, it was detected in elk inside Yellowstone National Park. Ironically, scientists generally agree that brucellosis was first passed to bison and elk by infected livestock. Blood tests conducted on the 569 Yellowstone bison shot during the 1988-89 winter in Montana revealed that fifty-four percent of them carried the brucellosis organism. But recent culture of tissue samples—a much more reliable method of identifying active infection than blood sampling—taken from 213 bison killed during the 1991-92 winter indicate that only twelve percent were infected with brucellosis, and only one of the nine infected females tested positive for brucellosis in her reproductive tract. In 1989, eleven of the sixteen bison shot from the Grand Teton population also tested positive from blood samples for brucellosis. Moreover, recent blood tests confirm that elk from herds utilizing 18 of the 23 feedgrounds maintained in western Wyoming carry brucellosis, which means approximately 18,000 elk may have been exposed to the disease. The tests also indicate that the brucellosis organism found in bison and elk is the same one that is responsible for brucellosis in cattle.

The brucellosis organism is transmitted between animals primarily by contact with infected reproductive materials. Infection can occur when a brucellosis-free animal consumes forage contaminated by the organism after an infected animal has expelled an aborted fetus, or when a susceptible animal directly ingests the organism from

168. *Id.*
171. Thorne, et al., * supra* note 6, at 275. Although Montana officials extracted blood samples that showed approximately fifty percent of the bison were exposed to the brucellosis organism, blood sampling does not reveal whether the bison can transmit the disease. Montana officials were sharply criticized for not conducting thorough studies of tissue samples from the 569 bison slain during the 1988-89 public hunt. Jay F. Kirkpatrick, *Trouble Where the Bison Roam*, 2 ENDANGERED SPECIES 4, 8 (Winter 1992).
174. *Id.* at 276.
175. *Id.*
fetal material, or when it licks the reproductive organs of an infected animal.\textsuperscript{176} Brucellosis transmission, therefore, mainly occurs during late pregnancy in association with abortion or parturition. In Greater Yellowstone, elk usually give birth from late-May through mid-June, while bison usually begin birthing one month earlier.\textsuperscript{177} Under appropriate conditions, the brucellosis organism can survive for many days in aborted material.\textsuperscript{178}

Brucellosis is more likely to be transmitted when animals are in close contact with one another. University researchers have determined that bison in a controlled setting can pass the organism to previously uninfected cattle.\textsuperscript{179} In Greater Yellowstone, researchers had believed brucellosis persisted in the bison population because of their herding instincts, but one expert has now suggested that the organism is passed from female bison to their nursing calves through "mother's milk."\textsuperscript{180} In the case of elk, the winter feedgrounds in western Wyoming are prime locations for transmission of brucellosis.\textsuperscript{181} With elk and bison freely intermingling during late pregnancy on the National Elk Refuge, they are undoubtedly passing the disease back and forth to one another.\textsuperscript{182} Wildlife allegedly have been responsible for several brucellosis outbreaks in western Wyoming cattle, but they have never been proven to be the actual source.\textsuperscript{183}

Indeed, science has not definitively answered whether brucellosis can be transmitted from wildlife to cattle in the wild. There is no confirmed instance where free roaming wildlife have infected domestic livestock with brucellosis on the open range. After reviewing years of bison-brucellosis research, a respected scientist specializing in brucellosis recently concluded that because Yellowstone's wild bison are

\textsuperscript{176} Boyce, supra note 167, at 146.
\textsuperscript{177} Thorne, et al., supra note 6, at 277.
\textsuperscript{178} Merchant, supra note 121, at 254. Outside an animal body, the Brucella abortus organism will survive "four hours in direct sunlight, four days in bovine urine, 5 days dried in burlap and room temperature, 30 days in an unheated cellar, 37 days when dried slowly in soil, and 75 days in an aborted fetus in cool weather." Id. See also The Fund for Animals, Inc. v. Lujan, No. CV 90-142-M-CCL (D. Mont. 1991), Memorandum and Order, at 6. However, predators roam the Greater Yellowstone region widely, and they generally consume aborted material rather quickly. Meyer, supra note 71, at 16.
\textsuperscript{179} Davis, et al., supra note 6, at 366. The one confirmed case of brucellosis transmission from bison to cattle outside of a rigidly controlled setting occurred on a ranch where domestic bison were being raised with cattle. Thorne, et al., supra note 6, at 277.
\textsuperscript{180} Meyer, supra note 71, at 11. Professor Meyer concludes that brucellosis usually is transmitted among bison through "mother's milk" rather than by exposure to reproductive materials, which accounts for the high percentage of positive blood tests and the low incidence of brucellosis in reproductive tissue cultures. Id.
\textsuperscript{181} Thorne, Herriges & Reese, supra note 106, at 298.
\textsuperscript{182} Id.
\textsuperscript{183} Interviews with Tom Toman, Wyoming Game and Fish Department (April 3, 1992); Bob Budd, Executive Director, Wyoming Stockgrowers Association (March 19, 1992). See also Parker's Proposed Findings, supra note 102, at 8, alleging that Parker's herd was not infected by other cattle but was infected by bison or elk grazing on public lands near his cattle.
not affected by brucellosis in the same manner as cattle, they are not a threat to transmit brucellosis to cattle.\textsuperscript{184} In a controlled setting, however, where bison and cattle were held in close proximity to one another, researchers observed that brucellosis-infected bison passed the disease to the cattle at the same rate as cattle passed it to one another.\textsuperscript{185} Relying largely upon this study, the Ninth Circuit Court of Appeals recently affirmed a Montana federal district court's finding that "bison and livestock readily transmit the disease to each other."\textsuperscript{186} In the\textsuperscript{187} Parker litigation, a Wyoming federal district court has concluded that the "infection could have been caused by contact with either infected elk or bison.

Significantly, Yellowstone's bison do not appear to be adversely affected by the brucellosis organism. Although nearly half of the Yellowstone bison population tests positive for brucellosis in blood samples, there is very little fetal loss.\textsuperscript{188} Recent tissue samples taken from 213 bison, shot during the 1991-92 winter, revealed that only one cow bison was culture positive for brucellosis in her reproductive tract.\textsuperscript{189} The brucellosis-infected Yellowstone bison herd has been completely closed to other bison for 77 years, yet it has continued to reproduce at a rate comparable to uninfected Montana cattle herds.\textsuperscript{190} Researchers speculate that these bison may test positive for exposure to the disease, but nevertheless be immune to it and incapable of transmitting it through reproductive materials.\textsuperscript{191} One respected veterinary scientist has concluded that "brucellosis in bison, most certainly as now manifested in the Yellowstone National Park

\textsuperscript{184} See supra text and accompanying notes at notes 179-180.

\textsuperscript{185} Davis et al., supra note 6, at 369 (concluding that "brucellosis in bison does not differ from that observed in other ruminant species"). But see Margaret Meyer, \textit{Brucella abortus} Infection in Bison: Commentary on Report of Experimentally Induced \textit{Brucella abortus} Infection in Captive Bison by Davis et al. (draft manuscript) (on file at the Land & Water Law Review), which concludes that the "Davis study" was "fatally flawed" and that "[m]anifestation of brucellosis in bison do not mimic bovine brucellosis."

\textsuperscript{186} The Fund for Animals, Inc. v. Lujan, 962 F.2d 1391 (9th Cir. 1992), \textit{affirming}, Civ. 90-142-M-CCL Memorandum and Order Denying Injunctive Relief, at 8 (D. Mont., Jan. 15, 1991) [hereinafter FFA Order Denying Relief]. This same district court, however, concluded that "elk do not presently pose a significant risk of transmission of the disease due to their low rate of infection . . . and their different social behavior patterns." \textit{Id.} at 7.

\textsuperscript{187} Parker Findings and Conclusions, supra note 18, at 12. Reaching this conclusion based on the preponderance of the evidence submitted at Parker's federal tort claims trial, the court also noted that other sources largely had been ruled out as the source of the brucellosis outbreak after extensive testing. \textit{Id.} at 12. The court also concluded, however, that wildlife were the least likely potential source of a brucellosis infection, noting that imported cattle, stray cattle, artificial insemination, and domestic animals were more likely sources. \textit{Id.} at 10.

\textsuperscript{188} Meyer, supra note 71, at 4, 5, 9; \textit{YELLOWSTONE RESOURCES MANAGEMENT PLAN, supra note 80, at 81}; Kirkpatrick, supra note 171, at 5, 8.

\textsuperscript{189} See supra text accompanying note 172.

\textsuperscript{190} Meyer, supra note 71, at 3-4. See also \textit{id.} at 11 (concluding that female bison "clearly must develop an immunity to abortion, but not necessarily to infection (i.e. lymph nodes)").

\textsuperscript{191} Meyer, supra note 71, at 12, 13; Kirkpatrick, supra note 171, at 8. See supra text accompanying notes 179-180.
bison herd, is decidedly not a carbon copy of bovine brucellosis." Relying upon this data in the Parker litigation, the Wyoming federal district court concluded that "the danger of this [Yellowstone] herd spreading the disease to other animals is sharply reduced. This same immunity may not be true for the Grand Teton bison, which have suffered abortions linked to the disease. In addition, studies in elk have confirmed an abortion rate of fifty percent among naturally infected animals, and a rate of fifty to seventy percent in artificially infected animals.

Scientists believe that vaccination against brucellosis generally protects livestock from the disease. Scientific studies have established a seventy percent effectiveness rate in preventing brucellosis in cattle vaccinated against the disease. Teton County ranchers on the west side of the Continental Divide in Wyoming routinely vaccinate their calves against brucellosis, and they have never experienced a wildlife-related brucellosis outbreak despite the intermingling that occurs between cattle and wildlife on their public domain grazing leases. In fact, most scientists are convinced that vaccination of cattle against brucellosis provides substantial — but not complete — protection against the risk of disease transmission in the wild, where cattle and wildlife are not regularly in close contact with one another.

Moreover, the Wyoming Game and Fish Department is optimistic that an elk vaccination program on state feedgrounds can significantly reduce — but not eliminate — the incidence of brucellosis. Rec-
ognizing the impossibility of vaccinating all elk, the program is designed to increase resistance among uninfected elk while infected animals are gradually cycled out of the population by natural attrition. But the U.S. Fish & Wildlife Service, constrained by its own disease management policies and still skeptical that elk can be effectively vaccinated, discontinued a similar program at the National Elk Refuge after three years. Yellowstone and Grand Teton park officials are apparently agreeable to vaccinating park wildlife, so long as the vaccine is proven effective and can be delivered without jeopardizing the herd’s free ranging status. Significantly, a Wyoming federal judge has harshly chastised the Park Service and the U.S. Fish & Wildlife Service for not participating in the state vaccination program, concluding that both agencies have negligently managed their wildlife by not taking “an active role in eliminating the brucellosis problem in elk and bison which are under their control.”

Because elk and bison regularly commingle on the National Elk Refuge and come in contact elsewhere in Greater Yellowstone, an elk vaccination program would only succeed in eradicating brucellosis if the disease was also eliminated in bison. However, recent experiments with bison vaccination have not been encouraging, which means there is yet no effective means for protecting bison from brucellosis. In other words, current scientific research suggests that the only way to eliminate brucellosis in bison is to kill every one with the disease. But the only way to test bison for the disease is to trap them, and then to hold and test them over an extended time. Not only is this

conditions and involved a small sample size. Telephone Interview with Bruce Smith, National Elk Refuge biologist (April 22, 1992). But although state researchers have concluded that a vaccination program for feedground elk is feasible, they also believe that such a program will require “vaccinating elk on all feedgrounds, possibly as long into the future as elk are artificially fed during winter.” Thorne, et al., supra note 6, at 285.

200. Thorne, et al., supra note 6, at 280.
201. Parker’s Proposed Findings, supra note 102, at 6. Unwilling to compromise its general policy of dispersing animals to let wildlife diseases run their courses naturally and unconvinced that elk could be effectively vaccinated against brucellosis on the National Elk Refuge, the U.S. Fish and Wildlife Service discontinued funding for this vaccination program in 1989. Telephone interview with Mike Hedrick, National Elk Refuge Manager, May 11, 1992. See also U.S. Fish & Wildlife Service REFUGE MANUAL 17.1 to 17.16 (DISEASE PREVENTION AND CONTROL, 7 RM 17) (March 12, 1982).

202. Telephone Interview with John Varley, Yellowstone National Park’s Chief of Research (April 17, 1992); GRAND TETON RESOURCE PLAN, supra note 97, at 119. The U.S. Fish & Wildlife Service also would agree to vaccinate National Elk Refuge animals once the vaccine is proven effective. Telephone Interview with Mike Hedrick, National Elk Refuge Manager (May 11, 1992).

203. Parker Findings and Conclusions, supra note 18, at 23.
204. Thorne, et al., supra note 6, at 285.
205. The principal problem is that vaccinating pregnant bison with Strain 19, the vaccine used to control brucellosis in cattle, causes them to abort. D. Davis, et al., Brucella Abortus in Bison. II. Evaluation of Strain 19 Vaccination of Pregnant Cows, 27 JOURNAL OF WILDLIFE DISEASES 258 (1991); Thorne, et al., supra note 6, at 279-80.
process quite difficult, expensive, and harmful to the animals, but it would violate the Park Service's commitment to the herd's free ranging status. While this type of intensive management is precisely how the livestock industry handles the disease in domestic livestock, it may not be appropriate for managing Greater Yellowstone's wildlife, particularly when the risk of transmission is quite low.

IV. THE LAW OF WILDLIFE BRUCELLOSIS

The most striking feature about the law governing brucellosis is that it says so little about wildlife brucellosis. Although federal law establishes an expensive nationwide brucellosis eradication program for domestic livestock, it says nothing about brucellosis in wildlife. Federal public land management laws only establish general wildlife management principles and procedures; they do not address wildlife brucellosis. The most definitive statements on wildlife and brucellosis have come in litigation under NEPA and the Federal Tort Claims Act, hardly authoritative sources for federal wildlife brucellosis policy. Until quite recently, state law in Montana, Wyoming, and Idaho also addressed only the issue of brucellosis in livestock, leaving state officials to rely upon general wildlife management statutes to resolve wildlife brucellosis problems. In this legal vacuum, the states have taken quite different positions on whether brucellosis-infected wildlife can be tolerated outside the national parks.

A. Federal Public Land Management Laws

The National Park Service's Organic Act establishes an unambiguous wildlife preservation policy. Under the Organic Act, the Park Service prohibits hunting and trapping in national parks, unless specifically authorized by Congress. Although Congress has not sanctioned bison hunting in either Yellowstone or Grand Teton national parks, Yellowstone officials have concluded that they can legally kill bison within the park for research purposes. They also

207. Meyer, supra note 71, at 17.
211. See The Fund for Animals, Inc. v. Ridenour, No. 91 Civ. 0726 (D.D.C. 1991), where the district court halted Yellowstone's proposed research bison kill based upon NEPA violations, but did not address Organic Act claims. See also 16 U.S.C. § 3 (1988) (authorizing the Park Service to destroy animals "detrimental" to the use of the parks); 16 U.S.C. § 36 (authorizing Yellowstone National Park to "sell or otherwise dispose of" surplus bison); 36 C.F.R. § 2.5 (1992) (allowing the Park Service to kill animals for research purposes under specified conditions); New Mexico State Game Commission v. Udall, 410 F.2d 1197 (10th Cir. 1969) (upholding Park Service's decision to shoot deer believed responsible for overgrazing).
are prepared to shoot bison outside the park to prevent them from wandering onto adjacent private lands.\textsuperscript{212} While research-based bison shooting might be justified under the Organic Act, the Park Service's involvement in shooting bison to deter their migratory tendencies is inconsistent with its basic preservationist mandate.\textsuperscript{213} The Organic Act does not qualify the Park Service's wildlife preservation responsibility by acknowledging a "good neighbor" policy exception.\textsuperscript{214} Indeed, under Section 1a-1 of the Organic Act, the Park Service has extraterritorial responsibility and authority for park resources,\textsuperscript{215} which might justify federal regulations limiting bison hunting beyond park boundaries, particularly if the herd's ecological integrity was jeopardized.\textsuperscript{216}

The Forest Service administers national forest lands under a multiple-use mandate that specifically includes wildlife.\textsuperscript{217} The states nonetheless retain authority over wildlife on forest lands,\textsuperscript{218} though the Forest Service can displace state policies to protect wildlife or to meet other management responsibilities.\textsuperscript{219} The National Forest Management Act of 1976 gives the Forest Service a comprehensive forest planning responsibility.\textsuperscript{220} None of the Greater Yellowstone national forests, however, dealt with bison in their forest plans. Similarly, the


\textsuperscript{213} See \textit{supra} text accompanying notes 208-209.


\textsuperscript{216} See Minnesota v. Block, 660 F.2d 1240 (8th Cir. 1981); United States v. Brown, 552 F.2d 817 (8th Cir. 1977); United States v. Lindsey, 595 F.2d 5 (9th Cir. 1979).


\textsuperscript{218} Id. at §§ 528, 1604(a). See also 43 U.S.C. § 1732(b) (1982).


\textsuperscript{220} 16 U.S.C. § 1604 (1988). Under the NFMA, the Forest Service has a biological diversity conservation responsibility. 16 U.S.C. § 1604(g)(3)(B) (1988). See Wilkinson & Anderson, \textit{supra} note 31, at 170-73. The Forest Service has adopted regulations implementing this biological diversity provision by requiring forest plans to insure minimum viable wildlife populations and designating indicator species to monitor population trends. 36 C.F.R. § 219.12(a)(1) (1991); 36 C.F.R. § 219.19(a)(1)-(a)(7) (indicator species selection guidelines). None of the Yellowstone region national forests have included the bison as an "indicator species," presumably because bison are not dependent upon forest ecosystems and because bison have only recently been appearing on forest lands.
Greater Yellowstone Coordinating Committee’s Framework for Coordination, which endorses a regional goal of preserving “functioning ecosystems,” is also silent regarding bison or bison management.\textsuperscript{221} As with other wildlife management issues, the Forest Service has deferred to state management authority over bison on forest lands outside the national parks and not taken an active role in this controversy.\textsuperscript{222}

The Forest Service is directly responsible for livestock grazing on national forest lands, and an established body of law defines the rights of grazing permittees. Grazing permits extend revocable rights to ranchers, but do not create constitutionally protected property rights. In \textit{United States v. Fuller},\textsuperscript{223} the Supreme Court ruled that Congress, under the Taylor Grazing Act, did not intend that a “compensable property right be created in the permit lands themselves as a result of the issuance of the permit.”\textsuperscript{224} Federal land management agencies have never warranted that public land grazing is risk-free; rather, Forest Service grazing permits specifically provide that the agency “assumes no liability for injury to permittee, or to employees, agents, or property thereof.”\textsuperscript{225} As a matter of policy, moreover, Congress has never provided ranchers with compensation for wildlife-related losses,\textsuperscript{226} and the courts have consistently ruled against takings

\textsuperscript{221} Framework for Coordination, supra note 51, at 8. The document simply provides that the Park Service and Forest Service will “[r]ecognize States’ responsibilities to manage wildlife . . . outside Yellowstone National Park,” id. at 4, and that the “Forest Service will work with State wildlife management agencies and livestock permittees to define big game/ livestock inter-relationships and appropriate forage use levels on National Forest System lands.” Id. at 8.

\textsuperscript{222} Our interviews with Forest Service officials confirm that the agency has not assumed a major role in the bison controversy, preferring to let Park Service and state game and fish officials work out an acceptable management solution. Interview with Brian Stout, Bridger-Teton National Forest Supervisor (April 3, 1992); Telephone Interview with Barry Davis, Shoshone National Forest Supervisor (Oct. 16, 1992). Gallatin National Forest officials, however, have forbidden Montana officials from shooting bison on forest lands north of Mammoth Hot Springs that were designated big game winter range, believing that the bison — like other species — were entitled to forage there so long as they posed no immediate threat to livestock or private property. Telephone interview with John Varley, Chief of Research, Yellowstone National Park (April 17, 1992).

\textsuperscript{223} 409 U.S. 488 (1973).

\textsuperscript{224} 409 U.S. at 494. See also Mollohan v. Gray, 413 F.2d 349 (9th cir. 1969); Larue v. Udall, 324 F.2d 428 (D.C. Cir. 1963); United States v. Cox, 190 F.2d 293 (10th Cir. 1951), cert. denied, 342 U.S. 867 (1951).

\textsuperscript{225} U.S. Department of Agriculture, Forest Service, Grazing Permit - Pt. 3 (FS-2200-10a (9/85) (Reference FSM 2230). But in his Federal Tort Claims Act case, Parker argued that the government had a specific duty to warn against brucellosis notwithstanding the permit’s waiver of liability clause, and the district court found this duty did not fall within the Act’s discretionary policy exception. Parker Land and Cattle Co. v. United States, No. 91-CV-0039-B, Order Denying Defendant’s Motion to Dismiss, (D. Wyo. 1992) [hereinafter Parker Order]. See infra text accompanying notes 253-280.

\textsuperscript{226} Coggins & Ward, supra note 9, at 75-85. On occasion, Congress has addressed individual cases of wildlife-related property loss, but it has never passed a general compensatory statute, although it has the power. See Coggins, supra note 39, at § 18.04[5][a].
claims based on wildlife damage. In short, a grazing permit does not confer a protected property right, nor does it guarantee a risk-free environment. A grazing permittee, therefore, cannot rely upon the permit to assert federal liability for a wildlife-related brucellosis infection.

On the public domain, federal bison management policies must be formulated in accordance with NEPA procedural requirements. NEPA requires preparation of an environmental impact statement for major federal agency actions "significantly affecting the quality of the human environment." Although the courts have rigorously enforced NEPA's environmental analysis procedural requirements, they have also concluded that NEPA does not impose any substantive constraints on federal agency officials. Inside the national parks, where park officials are responsible for wildlife, the Park Service's bison management plans are plainly subject to NEPA requirements. It is less clear that NEPA applies to bison management policies on national forest lands, because bison on these lands are managed by state game and fish agencies, not by federal officials. And NEPA clearly does not cover state bison management policies involving private lands. But recognizing the need for interjurisdictional coordination under NEPA, other federal and state agencies are now cooperating with Yellowstone and Grand Teton officials in preparing long term bison management plans.


230. Yellowstone and Grand Teton park officials, as we have seen, were both estopped from implementing bison management policies when they failed to prepare adequate NEPA documentation. See supra text accompanying notes 95, 104-105.

231. Cf. Defenders of Wildlife v. Andrus, 627 F.2d 1238 (D.C. Cir. 1980) (holding that the Secretary of the Interior was not obligated to comply with NEPA when he decided not to interfere with Alaska's wolf hunt on BLM lands).

232. Cf. The Fund for Animals, Inc. v. Lujan, 962 F.2d 1391 (9th Cir. 1992) (refusing to enjoin state officials under NEPA who are voluntarily cooperating with federal officials to formulate wildlife management policies). See also Friends of the Earth, Inc. v. Coleman, 518 F.2d 323, 329 (9th Cir. 1975); Homeowners Emergency Life Protection Comm. v. Lynn, 541 F.2d 814, 818 (9th Cir. 1976). However, Montana, unlike Wyoming and Idaho, has adopted the Montana Environmental Policy Act (MEPA), which requires state agencies to prepare an environmental impact statement whenever they take "a major action significantly affecting the quality of the human environment." MONT. CODE ANN. § 75-1-101 et seq. (1991). Nonetheless, in Supplemental Memorandum at 17, The Fund for Animals, Inc. v. Lujan, No. CV 90-142-M-CCL, (D. Mont. 1991) [hereinafter FFA Supplemental Memorandum], a Montana federal district court concluded that, under MEPA, the Montana Department of Livestock was not required to prepare an environmental impact statement for its bison management policies because it had not made "an irrevocable commitment of resources."

233. See supra text accompanying notes 95, 105. Furthermore, the Wyoming Governor's Task Force on Brucellosis has called for a comprehensive, region-wide environmental impact statement on wildlife management and brucellosis. See supra text and accompanying note at note 114.
The recent NEPA-based bison litigation has placed a judicial stamp of approval on Yellowstone's interim bison management policy, which has been heavily influenced by Montana's livestock brucellosis policies. The Ninth Circuit Court of Appeals, in *The Fund for Animals, Inc. v. Lujan*, 234 rejected a NEPA challenge to the Park Service's policy that bison leaving Yellowstone may be shot, subject to the requirement that a core population of 200 bison be preserved in the northern herd.235 The Court of Appeals affirmed a Montana federal district court's findings that "the migrating bison pose a serious health risk" because of the potential for brucellosis transmission from bison to cattle,236 and that Yellowstone's three bison herds are "not genetically or biologically unique."237 Moreover, noting that nonlethal federal bison control efforts have not worked and that the bison herd is increasing in size despite the shooting policy, the court concluded that Montana's interest in protecting its citizens and livestock industry from brucellosis outweighed the environmental impact of bison hunting or shooting.238 This litigation, however, does not answer the question of whether Montana would be justified in shooting bison to protect cattle if the bison herd's biological integrity was at risk.239

234. 962 F.2d 1391 (9th Cir. 1992), aff'd, No. CV 90-142-M-CCL (D. Mont. 1991). The litigation arose when The Fund for Animals sought a preliminary injunction to enjoin the Park Service and Montana officials from shooting bison outside Yellowstone National Park, arguing that under NEPA the Park Service was obligated to prepare an Environmental Impact Statement, not an Environmental Assessment, before implementing its interim bison management plan. On appeal, therefore, the Ninth Circuit reviewed the district court ruling only to determine whether the court had abused its discretion or clearly erred in its findings of fact. *Id.* at 1400. This standard of review is both narrow and deferential.

235. 962 F.2d at 1402; *YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT,* supra note 81, at 7.

236. 962 F.2d at 1401. Relying primarily upon the Texas A & M study that showed bison can pass brucellosis to cattle in a controlled setting, the district court concluded that "bison and livestock readily transmit the disease to each other." FFA Order Denying Relief, *supra* note 186, at 8. See *supra* text accompanying notes 176-187. The district court, moreover, dismissed the likelihood of transmission between elk and cattle, explaining that "[e]lk do not presently pose a significant risk of transmission of the disease due to their low rate of infection (1.4% in Yellowstone elk), and their different social behavior patterns." *Id.* at 7. While the court of appeals affirmed the bison-brucellosis fact finding, its conclusion was less sweeping: "Although no documented case of transmission from infected Yellowstone bison to cattle has been verified, the evidence presented at the hearing supports the district court's finding that a serious potential for such transmission exists." 962 F.2d at 1401. Significantly, this litigation occurred before the tissue sampling test results were available and before the Meyer report on brucellosis. See *supra* text accompanying notes 172, 184.

237. *Id.* at 1401.

238. *Id.* at 1402. Notably, the district court ventured well beyond the issue presented in the litigation and suggested that "[w]hether Montana change its [cooperative] position and demand that Yellowstone confine its bison... [i]t could conceivably result in the court ordering confinement of the bison in the Park." FFA Order Denying Relief, *supra* note 186, at 10. While this statement is plainly advisory dicta, one still wonders where Montana or the district court would find the power to impose a quarantine on park wildlife.

239. Two other NEPA decisions, as noted, have temporarily enjoined Grand Teton National Park officials from implementing a bison management plan and Yellowstone officials from killing park bison for research purposes. See *supra* text accompanying notes 95, 105.
A separate federal statute addresses the problem of contagious wildlife on the public lands. It authorizes the Secretary of Agriculture "to conduct investigations, experiments and tests . . . in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control [on national forests and public domain lands] . . . animals injurious to agriculture . . . and for the protection of stock . . . and to conduct campaigns for the destruction or control of such animals."240 Notably, the statute does not mandate an eradication program, rather it recognizes that control measures can be used on animals posing a threat to livestock. Despite this apparent statutory authority, neither the Secretary of Agriculture nor the Secretary of the Interior have ever invoked this "animal damage control program" to address brucellosis in wildlife. More recently, Congress authorized the Secretary of Agriculture "to conduct activities and to enter into agreements with States . . . in the control of nuisance mammals . . . and those mammals . . . that are reservoirs of zoonotic diseases."241 Although brucellosis would appear to be a zoonotic disease, this statute too contemplates controlling—not eradicating—these diseases in wildlife, and then only to protect humans—not livestock—against them. Neither of these statutes, therefore, mandate a federal brucellosis eradication campaign for wildlife.

In 1990, evidently recognizing that existing federal law does not address the issue of brucellosis in wildlife, the six senators from Montana, Wyoming, and Idaho introduced a bill designed to compensate livestock owners for wildlife-caused brucellosis damages. Noting that brucellosis-infected wildlife will inevitably wander outside Yellowstone's boundaries and that the Park Service's natural regulation management philosophy precludes it from controlling brucellosis in the herds, the bill proposed to compensate cattle owners for their expenses "of testing cattle for brucellosis if there is a demonstrated risk of such cattle becoming infected with brucellosis due to exposure to national park herds."242 Rather than directly confronting the question of priority between wildlife and cattle, the senators chose the compensation approach to pressure the Park Service into a more ag-


gressive bison management program. Particularly troublesome, though, was the suggestion that public land ranchers should be afforded a risk-free environment for their livestock operations—a significant departure from past federal practices. Although the Senate passed the bill, it died in the House of Representatives and has not resurfaced.

B. Federal Tort Claims Act

Does the Federal Tort Claims Act (FTCA) provide ranchers with a cause of action against the federal government if federally managed wildlife transmit brucellosis to domestic livestock? Although the FTCA does not empower courts to review federal agency policy judgments, the threat of tort liability can obviously influence a land management agency's resource decisions. In Parker Land and Cattle Co., Inc. v. United States, a Wyoming federal district court has effectively subjected federal wildlife policy decisions to judicial review under the FTCA. While ultimately rejecting a rancher's brucellosis-based FTCA damages claim, the Parker case nonetheless provides a basis for liability in future cases—a decision with ominous ramifications for the brucellosis controversy as well as federal wildlife policy generally. Upon close scrutiny, however, the decision reflects a fundamental misapplication of FTCA precedent, namely an unabashed judicial use of the FTCA to devise federal wildlife brucellosis policy in the absence of any congressional guidance.

In Parker, a Wyoming rancher sued several federal agencies under the FTCA alleging that his cattle herd contracted brucellosis either from infected bison or elk managed by these agencies.

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243. Montana's State Veterinarian, who originally conceived of the bill, advised us that it was intended to pressure the National Park Service to address brucellosis in park wildlife by imposing heavy testing costs on the federal government whenever a wildlife-related brucellosis infection was suspected. The bill was prepared after Montana incurred approximately $11,000 in costs to test cattle in Paradise Valley after the 1988-89 winter when Yellowstone's northern bison herd left the park in record numbers, and after Department of the Interior officials refused to pay for these costs. Telephone Interview with Don Ferlicka, D.V.M., Montana State Veterinarian (April 15, 1992).


247. Parker Findings and Conclusions, supra note 18.

248. Parker's claim was against the Park Service and the U.S. Fish & Wildlife Service, which were allegedly responsible for mishandling the infected wildlife and for not warning ranchers of the brucellosis danger, and the Forest Service and Bureau of Land Management, which were also allegedly responsible for wildlife on their lands and for granting Parker grazing permits to use their lands without warning him of the brucellosis danger. Parker Order, supra note 225, at 2.
asserted that the federal government had negligently managed its wildlife and failed to warn him of the brucellosis risk. After rejecting the government’s argument that the FTCA’s discretionary policy exception protected it from liability, the court concluded that Parker’s herd was probably infected by wildlife, and that the Park Service and the U.S. Fish & Wildlife Service had negligently managed their wildlife by not taking affirmative steps to constrain free roaming bison or to vaccinate elk. Nevertheless, the court ruled Parker did not establish that federally managed animals were responsible for transmitting the disease to his cattle. In sum, the court’s decision sends a powerful message to federal land managers that they must take affirmative steps to protect domestic livestock from wildlife infected with brucellosis.

The court’s treatment of the FTCA discretionary policy exception is most troubling. Under the FTCA, the federal government is liable for its employees’ negligence just like a private person, unless the claim is “based upon the exercise or performance or the failure to exercise or perform a discretionary function or duty . . . whether or not the discretion involved is abused.” According to the Supreme Court, the discretionary function exception is designed to “prevent judicial ‘second-guessing’ of legislative and administrative decisions grounded in social, economic, and political policy through the medium of an action in tort.” The exception “protects only governmental actions and decisions based on considerations of public policy.” To decide whether the discretionary function exception ap-

249. Parker Order, supra note 225.
250. Parker Findings and Conclusions, supra note 18, at 23.
251. Id. at 15, 18.
252. The Parker decision also sends a strong message to livestock producers contemplating FTCA-based wildlife brucellosis claims against the federal government. By ruling that Parker did not establish that federally managed wildlife were responsible for his livestock infection, the court indicated that causation will not be easily proven in such cases. See infra note 292. And noting that Parker was comparatively negligent for failing to vaccinate his calves against the disease and for not asserting to federal whole-herd testing when the infection was first suspected, the court suggests that ranchers must take reasonable precautions to protect their herds against the disease. Parker Findings and Conclusions, supra note 18, at 25-26.
253. 28 U.S.C. § 1346(b) (1988). This provision generally authorizes suits against the United States for damages “for injury or loss of property, or personal injury or death caused by the negligent or wrongful act or omission of any employee of the Government while acting within the scope of his office or employment, under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred.” Id. In other words, negligence is determined by reference to state—not federal—law.
256. Berkovitz by Berkovitz v. United States, 486 U.S. 531, 537 (1988). See also id. at 539 (“The discretionary function exception applies only to conduct that involves the permissible exercise of policy judgment.”).
plies, courts must determine first whether "the challenged action is a matter of choice for the acting employee," and then whether the governmental action is "based on considerations of public policy—decisions grounded in social, economic and political policy." \^{257} Typically, in FTCA claims against the Park Service, this inquiry focuses on two questions: whether the agency is exercising discretionary authority, or whether it has a separate duty to warn against possible hazards. \^{258}

In \textit{Parker}, the district court summarily rejected the government's discretionary function argument, holding that the decision not to warn area ranchers about the brucellosis danger was not based on social, economic, or political policy. \^{259} The district court's analysis, however, is inconsistent with the Tenth Circuit Court of Appeal's analysis in recent duty to warn cases involving the Park Service. In \textit{Johnson v. United States}, \^{260} a case alleging that the Park Service had negligently failed to warn about the dangers of mountain climbing, the Tenth Circuit held that the discretionary function exception protected the Park Service against FTCA liability, finding that the decision not to warn "cannot be divorced from the overall policy not to engage in strict regulation of climbing activity in the Park." \^{261} Similarly, in \textit{Zumwalt v. United States}, \^{262} the Tenth Circuit invoked the discretionary function doctrine to reject a duty to warn claim against the Park Service for not posting warning signs on a dangerous wilderness trail, finding that the decision not to warn was "a component of an overall policy decision" to maintain the area in its natural state. \^{263}

In both cases, before determining whether a duty to warn should attach, the Court of Appeals carefully evaluated the nature of the challenged governmental action to determine whether threshold discretionary policy judgments were involved and to identify the relevant policy choices. In contrast, the district court in \textit{Parker} made no preliminary inquiry into the nature of the Park Service's or the U.S. Fish & Wildlife Service's wildlife management authority, specifically the degree of discretion they retain in establishing wildlife policy under the relevant organic legislation. \^{264} Absent such an inquiry, a court

\begin{itemize}
\item \textit{Johnson v. United States}, 949 F.2d 332, 336 (10th Cir. 1991); \textit{Zumwalt v. United States}, 928 F.2d 951, 953 (10th Cir. 1991).
\item \textit{Zumwalt v. United States}, 928 F.2d 951 (10th Cir. 1991); \textit{Martin v. United States}, 546 F.2d 1355 (9th Cir. 1976), \textit{cert. denied}, 432 U.S. 906 (1977); \textit{Smith v. United States}, 546 F.2d 872 (10th Cir. 1976).
\item \textit{Parker}, supra note 225, at 7. The court also noted that "the federal defendants didn't really consider the dangers they have posed to the domestic livestock industry." \textit{Parker Findings and Conclusions}, supra note 18, at 29.
\end{itemize}
cannot assess whether a duty to warn can be separated from threshold policy determinations or whether it is properly regarded as a component of the policy.

Had the district court inquired into the nature of federal wildlife management responsibilities, it would have confronted rather broad statutory standards. In the case of the Park Service, as we have seen, the Organic Act provides for preserving wildlife,265 which affords the agency ample authority to adopt a free roaming bison management policy.266 Indeed, the Park Service’s organic legislation provides sufficient discretionary authority for it to pursue a policy of naturalness in managing wildlife,267 regulating mountain climbing,268 and maintaining trails in wilderness areas.269 If Yellowstone’s natural regulation-based grizzly bear management policy is immunized from FTCA review under the discretionary policy doctrine despite the potential threat to human safety,270 then the Park Service surely has the discretionary power to manage its bison as a free roaming population as part of this same natural regulation wildlife management policy. In the case of the U.S. Fish & Wildlife Service, its organic legislation, while perhaps facially ambiguous, also manifests a clear commitment to wildlife conservation.271 Under this statutory standard, the agency has determined that wildlife diseases ordinarily should not be subject to aggressive human intervention and treatment, rather disease outbreaks should be controlled by dispersing the animals to prevent transmission—the policy now followed by National Elk Refuge officials to address elk brucellosis.272 Moreover, as we have seen, Congress has provided no policy direction concerning wildlife and brucellosis, effectively leaving the agencies to devise policies consistent

"The policy considerations of ... preserving the natural state of the park do not apply in this instance." Parker Findings and Conclusions, supra note 18, at 28. However, since the Park Service’s wildlife management policies, like its mountain climbing policy in Johnson, are based on a commitment to naturalness (i.e. natural regulation and minimal human intervention) derived from its organic mandate, the court’s conclusory distinction rings hollow. See supra text accompanying notes 208-216.

266. See supra text accompanying notes 80-82.
270. See Martin v. United States, 546 F.2d 1355 (9th Cir. 1976), cert. denied, 432 U.S. 906 (1977), applying the FTCA discretionary function doctrine to immunize Yellowstone’s decision abruptly closing its garbage dumps to bears, even though a camper was subsequently killed by a grizzly bear.
272. See U.S. Fish & Wildlife Service Refuge Manual 17.1 to 17.16 (Disease Prevention and Control, 7 RM 17) (March 12, 1982); Telephone Interviews with Mike Hedrick, National Elk Refuge Manager (May 11, 1992); and Bruce Smith, National Elk Refuge biologist (April 22, 1992).
with these general statutory obligations. For the Park Service and the U.S. Fish & Wildlife Service, therefore, the formulation of wildlife management policy involves precisely the type of discretionary judgments that are exempted from FTCA liability.

Similarly, the decision whether to warn nearby ranchers of wildlife brucellosis dangers also should not be subject to judicial review. The *Parker* brucellosis case, however, is unlike the other duty to warn cases, where the courts have considered whether a governmental landowner has a duty to warn the visiting public against a discrete hazard. In the case of diseased wildlife, the questions are quite different: Who has a duty to warn? How far does the duty extend? And how is it to be implemented? In *Parker*, the district court made no effort to define the scope of its duty to warn, which implies that the duty extends to all livestock permittees whose stock may come into contact with infected bison or elk. But given the low risk of brucellosis transmission between wildlife and cattle, and given the low risk of wildlife migration across the Continental Divide, there is simply no basis for imposing a duty to warn in this case. In addition, the district court found that only the Park Service and U.S. Fish & Wildlife Service were obligated to warn of the brucellosis danger, specifically excusing the Forest Service and Bureau of Land Management from such a duty, because neither agency "owes a permittee or an allottee a duty to warn of all dangers located on the public lands." This

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273. The decision of whether to warn also can be regarded as a component of the government's overall wildlife policies and therefore protected under the discretionary function doctrine. *See infra* text accompanying notes 254-257. Given the discretionary nature of federal wildlife policy, the absence of any congressional guidance on wildlife brucellosis, and the contingent nature of federal grazing permits, there is simply no basis for judicially imposing a duty to warn on federal wildlife management officials. Publicly displayed brucellosis warnings would be intrusive and violate the natural ambience of the area, just as signs along a trail violate the wilderness setting. *Zumwalt v. United States*, 928 F.2d 951 (10th Cir. 1991). And there are inherent difficulties in defining the scope of a duty involving individualized private warnings. *See infra* text accompanying note 279.

274. *See, e.g.*, Johnson v. United States, 949 F.2d 332 (10th Cir. 1991); Zumwalt v. United States, 928 F.2d 951 (10th Cir. 1991); Boyd v. U.S. ex rel. U.S. Army Corps of Engineers, 881 F.2d 895 (10th Cir. 1989); Martin v. United States, 546 F.2d 1355 (9th Cir. 1976), cert. denied, 432 U.S. 906 (1977); Smith v. United States, 546 F.2d 872 (10th Cir. 1976).


276. In *Parker*, the court concluded that neither bison nor elk crossed the Continental Divide during their critical calving periods, which suggests that neither the Park Service nor U.S. Fish & Wildlife Service could reasonably expect its duty to extend to Parker. Parker Findings and Conclusions, *supra* note 18, at 14, 17.

277. In fact, Teton County, Wyoming ranchers who live in the midst of the brucellosis-infected wildlife were fully apprised of the danger and accepted it as the price of grazing cattle on the Greater Yellowstone public lands. *See supra* note 197 and accompanying text. Their knowledge of the risks stands in stark contrast to Parker's asserted lack of knowledge, perhaps because there is such little risk that the disease will be carried east of the Continental Divide by wildlife or transmitted to domestic livestock.

278. Parker Findings and Conclusions, *supra* note 18, at 4. In addition, the court does not consider whether the state, which has concurrent responsibility with federal land managers for wildlife on the public domain, is likewise obliged to warn about brucellosis dangers.
is truly curious logic. If a livestock permittee is not entitled to be warned of the inherent dangers of public land grazing by the agencies responsible for regulating grazing on the public lands and for managing wildlife habitat on these same lands, then it is difficult to understand how another land management agency, like the Park Service or U.S. Fish & Wildlife Service, owes such a duty to livestock permittees. In the Parker case, the disease was allegedly transmitted on Forest Service—not Park Service or National Elk Refuge—lands, and only the Forest Service—certainly not the Park Service or U.S. Fish & Wildlife Service—would be able to identify and therefore readily notify livestock permittees of the brucellosis risk. In short, there is no judicially definable federal duty to warn in the case of contagious wildlife disease on the public domain.

The court, clearly troubled that neither the Park Service nor the U.S. Fish & Wildlife Service has aggressively sought to eradicate brucellosis from bison and elk populations, was evidently intent on avoiding the discretionary policy doctrine in order to chastise the agencies for their approach to wildlife brucellosis. Indeed, the court's negligence discussion is not concerned with the agencies' failure to warn ranchers about the brucellosis threat; instead, it focuses entirely on perceived shortcomings in their brucellosis management approach—a clear indication that the court was reviewing the agencies' substantive wildlife management policy judgments, not their failure to warn. Without examining whether they breached any defined legal duty by pursuing their respective wildlife brucellosis management policies, the court summarily concluded that both agencies acted negligently. In the case of the Park Service, the court asserted "there is evidence of negligence . . . in the management of an infected bison herd that is allowed to roam free and thus possibly infect cattle," but never suggested how the Park Service should manage the bison. Since vaccination is ineffective in bison, the court seems to be sug-

279. Because both the Forest Service and the BLM have wildlife management responsibilities on their own lands as well as an ongoing relationship with state game and fish officials, they possess as much knowledge about the risk of wildlife brucellosis transmission to domestic livestock as the Park Service or the U.S. Fish & Wildlife Service.

280. Moreover, under the FTCA's misrepresentation exception, 28 U.S.C. § 2680(h) (1988), the federal government cannot be held liable for a plaintiff's "economic loss as a result of a commercial decision which was based on a misrepresentation by government consisting . . . of a failure to provide information which it had a duty to provide." Green v. United States, 629 F.2d 581, 584-85 (9th Cir. 1980). Just as the FTCA's misrepresentation exception protected the Forest Service in Green from liability when it failed to warn ranchers of a pesticide spraying program that adversely impacted their grazing cattle, the Park Service and U.S. Fish & Wildlife Service should likewise be protected from any failure to warn ranchers engaged in commercial livestock grazing activities of the wildlife brucellosis risk. See also Preston v. United States, 596 F.2d 232, 237-39 (7th Cir. 1979).

281. See Parker Findings and Conclusions, supra note 18, at 15, 18, 21-23.

282. Parker Findings and Conclusions, supra note 18, at 15.

283. See supra text accompanying notes 205-206.
suggesting implicitly that a free roaming bison management policy constitutes negligence—a view that overlooks the Park Service’s Organic Act responsibilities as well as the fact that Congress has not addressed the wildlife brucellosis problem. Is the court seriously suggesting that Yellowstone’s and Grand Teton’s bison and elk, both of which are infected, should be managed as a zoo population?\textsuperscript{284} In the case of the U.S. Fish & Wildlife Service’s elk management policies, the court asserted that it “has clearly been negligent” for not undertaking a vaccination program similar to the one pursued by the state of Wyoming.\textsuperscript{285} But the Wyoming vaccination program is costly and yet unproven over the long term.\textsuperscript{286} Elk are managed and behave quite differently on the expansive 25,000 acre National Elk Refuge than on the much smaller state feedgrounds.\textsuperscript{287} And even Wyoming officials do not expect the vaccination program to eliminate brucellosis in elk.\textsuperscript{288}

In fact, the Park Service and the U.S. Fish & Wildlife Service have taken steps to address the bison brucellosis problem. Over the years, Yellowstone officials have tried several different strategies to deter bison migration, and they currently are completing the environmental analysis necessary for a new bison management scheme.\textsuperscript{289} Grand Teton National Park and National Elk Refuge officials have begun formulating a comprehensive bison management plan, which has been enjoined pending additional environmental analysis.\textsuperscript{290} As the court itself acknowledges, U.S. Fish & Wildlife Service officials have changed their elk feeding method to reduce the risk of disease transmission, and they have “grudgingly” allowed the state to con-

\textsuperscript{284} Of course, given ecological realities, any policy based on confining bison or elk inside the national parks would be virtually impossible to implement. See infra text accompanying notes 365-368.

\textsuperscript{285} Parker Findings and Conclusions, supra note 18, at 16, 18, 23. According to the court, “[t]he least they [federal officials] could have done was to cooperate whole heartedly with the state in its vaccination program.” Id. at 23.

\textsuperscript{286} See supra text accompanying notes 199-205. Needless to say, such a vaccination program would also violate the U.S. Fish & Wildlife Service’s wildlife disease management policies, which are consistent with its organic legal obligations. Id. at notes 271-272. Nonetheless, National Elk Refuge officials are evidently willing to vaccinate elk, if the vaccination is proven effective and does not threaten the long term biological health of the Jackson elk herd. Telephone Interview with Mike Hedrick, National Elk Refuge Manager (May 11, 1992).

\textsuperscript{287} On the National Elk Refuge, elk are widely dispersed, they are fed at different sites, and they spend less than an hour eating the pellets they are fed—all of which minimizes congregation and makes it difficult to use the biobullet vaccination method. In contrast, the elk are not widely dispersed on the 200 acre state feedlots, and they are fed hay which usually takes them several hours to eat—all of which makes it much easier to vaccinate using the biobullet technique. In both cases, studies indicate that many elk do not regularly “come in” to eat, which would make it impossible to vaccinate the entire population. Telephone Interviews with Mike Hedrick (May 11, 1992); and Bruce Smith, National Elk Refuge (April 22, 1992); Interview with Tom Toman, Wyoming Game and Fish Department (April 3, 1992).

\textsuperscript{288} See supra text accompanying notes 199-200.

\textsuperscript{289} See supra text accompanying notes 88-96.

\textsuperscript{290} See supra text accompanying notes 104-105.
continue vaccinating on refuge lands.\textsuperscript{291} It is simply not accurate to suggest that federal officials have ignored the problem. It is true, however, that they have neither endorsed nor funded Wyoming’s vaccination program, and they have not sought to prevent either bison or elk from leaving park and refuge lands.

The troubling fact is that the district court, evidently believing that cattle are entitled to precedence over wildlife on the public domain, has sought to use the FTCA to effectuate a fundamental policy change. This clearly contravenes the letter and spirit of the law. While the court ultimately exonerated the federal agencies on causation grounds,\textsuperscript{292} it is nevertheless well aware that its negligence finding and its concomitant threat of liability in future cases could influence the pending bison management plans. Even while recognizing that APHIS’s regulations governing the livestock brucellosis eradication program do not apply in the case of wildlife,\textsuperscript{293} the court seems to believe that Park Service and U.S. Fish & Wildlife Service officials should be managing infected wildlife intensively, similar to how ranchers deal with infected cattle.\textsuperscript{294} But in the absence of clearly established congressional standards, the FTCA does not allow courts to oversee the discretionary policy judgments of federal agency officials. Until Congress provides much clearer guidance on wildlife and brucellosis, claims like Parker’s should not be heard under the FTCA.

C. State Wildlife Law

Bison are classified as “wildlife” under state law in Montana, Wyoming, and Idaho.\textsuperscript{295} As wildlife, bison are subject to the juris-

\textsuperscript{291} Parker Findings and Conclusions, \textit{supra} note 18, at 21.

\textsuperscript{292} On the question of causation, the court found that Parker did not prove it was federal rather than state-managed wildlife that were responsible for his brucellosis outbreak. Parker Findings and Conclusions, \textit{supra} note 18, at 15, 18. As a practical matter, therefore, even though the court has opened the door for potential liability under the FTCA, it will be quite difficult in future cases to establish causation. Given the jigsaw puzzle nature of the Greater Yellowstone public, state, and private lands, the overlapping federal and state jurisdictional authority over wildlife, and the difficulty of witnessing wildlife-cattle interactions on the open range, it will not be easy for a rancher like Parker to prove that federally-managed wildlife were responsible for a brucellosis outbreak. While this should give federal wildlife management officials some solace, the possibility that liability could attach under the FTCA will undoubtedly be an important factor influencing government lawyers advising them on their bison and elk management responsibilities. But see \textit{infra} text accompanying notes 321-337 for an overall assessment of the law governing wildlife brucellosis.

\textsuperscript{293} Parker Findings and Conclusions, \textit{supra} note 18, at 25.

\textsuperscript{294} Of course, this same inability or unwillingness to distinguish between livestock and wildlife was evident in the Montana federal district court’s recent bison management NEPA opinion, which similarly chastised Yellowstone officials for not taking more aggressive actions to protect local livestock producers. In that case, as here, the court threatened to intervene if the Park Service did not stop bison from leaving the park. See \textit{supra} text and accompanying note at note 238 for further discussion of this point.

dictional authority of the state game and fish agencies, and therefore subject to being regulated for hunting purposes. Both Montana and Wyoming have sought to address the bison brucellosis problem by passing laws authorizing bison hunting,296 while Idaho has avoided specifically sanctioning bison hunting.297 In each of these states, wildlife officials are quite sensitive to the need to maintain good relations with ranchers whose lands often provide important winter wildlife habitat and who often control access to prime hunting lands. Wyoming and Idaho compensate ranchers suffering crop or property damage from foraging wildlife,298 but Montana does not provide such compensation, instead vesting state wildlife officials with authority to remove the offending animals.299

A powerful public backlash has forced Montana to repeal its bison hunting law, while Wyoming's law has not yet been implemented. Without cover, the bison are like sitting ducks; hunters can often approach them within a few yards before pulling the trigger—not a very sporting sight. Because Montana's bison hunt took place on open ground near Yellowstone's northern entrance, national and local television camera crews recorded it in gory detail, fueling public opposition to the event. Animal rights activists, who object to killing animals on moral grounds, used the adverse publicity to generate support for their litigation and legislative reform efforts. In 1991, concerned that the bison hunt was giving all hunters a bad image, the Montana legislature repealed the law and reclassified bison as a "species in need of management."300 But Wyoming's bison hunting law is still on the books and may be tested once Grand Teton National Park officials complete their bison management plan.

Significantly, Montana's 1991 legislation reclassifying the bison as a "species in need of management" split jurisdictional authority over bison between the Department of Fish, Wildlife and Parks and the Department of Livestock. Under the statute, state game and fish officials are responsible for managing bison "that threaten persons or property other than through the transmission of contagious dis-

“bison that leave Yellowstone national park.” The Department of Livestock, on the other hand, is responsible for regulating bison that “pose a threat to persons or livestock in Montana through the transmission of contagious disease.” It has promulgated regulations requiring, that bison exposed to brucellosis must either be permanently removed from the state or physically destroyed. Both departments are urged to seek agreement with Yellowstone officials over a long term bison management policy that “responds adequately to the needs of Montana.” Evidently drawing upon Montana’s experience, the Idaho legislature has also vested its state Department of Agriculture with responsibility for removing or shooting wild bison entering the state that “pose a significant threat to property, livestock, or other animals.”

This “zero tolerance” policy for bison leaving Yellowstone National Park, based upon an unflagging state commitment to the livestock brucellosis eradication campaign, is sharply inconsistent with the Park Service’s responsibility for insuring the ecological integrity of Yellowstone’s bison population. Montana’s policy is not mandated by the 1991 statutory revision, which does not take any position on eradicating rather than controlling brucellosis in wildlife. Similarly, the Idaho legislation does not mandate eradication of all migrating bison; the statute speaks in terms of “management or eradication of bison” that pose a significant disease threat. As we have seen, however, current scientific information suggests that the bison pose a minimal threat of brucellosis infection for domestic livestock. While these statutory provisions can be understood as a manifestation of the local livestock industry’s frustration with the Park Service’s bison policies, the statutes must be interpreted based upon the risk that bison actually pose to livestock. Unless, of course, the

303. Montana Dept. of Livestock, In the Matter of the Proposed Adoption of new rules for the control of migratory bison from herds affected with a dangerous disease, Sept. 3, 1991, MAR Notice No. 32-2-127. In adopting this rule, the Department of Livestock relied on its authority under MONT. CODE ANN. §§ 81-2-102, 103 (1991), which provide that “[t]he department may: adopt rules and orders which it considers necessary or proper to prevent the introduction or spreading of infectious, contagious communicable, or dangerous diseases affecting livestock in this state.” Id. at § 81-2-102(1)(d).
304. MONT. CODE ANN. § 87-1-215(4) (1991). The departments are also required to file a joint report with the next session of the Montana legislature on the present state of bison management in Montana and on Yellowstone's long term bison management plans.
305. IDAHO CODE § 25-618 (1992 Supp.).
306. YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT, supra note 81, at 7.
309. See supra text accompanying notes 184-194.
states really want to test the question of whether bison or livestock should be accorded priority in Greater Yellowstone—an issue that undoubtedly would be resolved at the federal level and in favor of the bison.

Under Wyoming wildlife law, private property owners can recover from the state for wildlife-caused damages. Besides pursuing his brucellosis infection claim against federal officials under the Federal Tort Claims Act, Parker also filed a claim in excess of one million dollars with the Wyoming Game and Fish Commission for property damage. By statute, state-funded compensation is available for "claims based upon a description of the livestock damaged or killed by a trophy game animal, the damaged land, growing cultivated crops, stored crops, seed crops, improvements and extraordinary damage to grass." § 23-1-901. The Wyoming Game and Fish Commission, however, denied the claim, concluding that the statute does not cover bison, which are not defined as a trophy game animal, or diseases. Moreover, the Commission ruled that the evidence did not establish that wildlife were the cause of the livestock brucellosis infection.

On appeal, the Wyoming Supreme Court voted 4-1 to sustain the Game & Fish Commission's decision. Two justices, after examining the statutory language and legislative history, concluded that the state wildlife damage compensation statute does not apply to bison or wildlife diseases, while four justices agreed that substantial evidence supported the Commission's conclusion that wildlife did not cause the brucellosis outbreak. Three justices were divided over

310. Wyo. Stat. § 23-1-901 (c) (1985). The statute also provides for "damages from the state for injury or destruction of property by big or trophy game animals or game birds." Id. at § 23-1-901 (b).

311. Wyoming Game and Fish Commission, Findings of Fact, Conclusions of Law and Order Denying Claim, at 22-23 (Claim No. FY90-119, 1991) [hereinafter Wyoming Game and Fish Findings].

312. Id. at 26.

313. Parker Land & Cattle Co. v. Wyoming Game and Fish Comm'n, No. 91-147, slip op. (Wyoming Supreme Court, Jan. 22, 1993) [hereinafter Parker Slip Op.]. Four of the five justices wrote opinions; only two justices agreed on all issues. See infra notes 314-316.

314. Relying on well-established principles of statutory interpretation, Justices Golden and Macy ruled that bison are not included within the statutory definition of "big game animals" or "trophy game animals." Wyo. Stat. § 23-1-901. Parker Slip Op. at 9. They also concluded that the statute did not cover livestock damage claims based on disease transmission. Id. at 9-13. Their examination of available legislative history supported these conclusions. Id. at 13-35.

315. In three separate opinions, Justices Golden, Macy, Thomas, and Cardine agreed that under the deferential substantial evidence standard of review, Mountain Fuel Supply Co. v. Wyoming Public Service Comm'n, 662 P.2d 878, 882 (Wyo. 1983), the Game & Fish Commission's decision was adequately supported by credible evidence. They noted that three brucellosis experts could not state that wildlife were the most likely source of the brucellosis outbreak. Parker Slip Op. at 36. Testimony from two experts on elk reproduction and calving behavior indicated that elk were an unlikely source. Id. at 36-7. And there was too little evidence about bison migration and calving behavior, or about bison intermingling with Parker's cattle, to establish them as a potential source. Id. at 37.
whether bison were covered under the statute, and whether Parker could pursue an alternative takings claim under the state constitution. The Court’s four separate opinions do not fully clarify the state’s potential liability in wildlife brucellosis transmission cases, though a majority agreed that bison were not covered under the statute. With four votes sustaining the Commission’s evidentiary findings on the causation question, future claimants clearly must surmount formidable proof problems to establish a claim. Nonetheless, the fractured decision does not leave the Game & Fish Commission entirely immune from future litigation over wildlife brucellosis. What this means for state wildlife management and public land grazing remains to be seen, as the state may be reluctant to ignore its potential exposure.

Remarkably, none of the three Greater Yellowstone states have legislatively addressed the issue of brucellosis in elk, even though elk carry the disease in Wyoming and Montana. Elk hunting is an important business in these three states, supporting local guides and outfitters as well as many local businesses while generating important local tax revenues. Any reduction in hunting is regularly met with stiff local opposition, making state officials understandably wary of suggesting brucellosis management actions that might impact hunting opportunities. The only fully effective means of eradicating brucellosis from the Greater Yellowstone wildlife population, however, may be depopulation of elk and bison herds—a solution that is not politically or biologically plausible. In Wyoming, at least, any effective response to wildlife brucellosis will almost certainly require reduction—if not elimination—of the elk feedgrounds, which will undoubtedly impact elk population numbers and hunting opportunities. Yet, unless brucellosis in elk is also addressed, intensive bison management—either inside or outside the national parks—cannot eradicate brucellosis in park bison. In short, the problem cannot be

316. Justice Thomas concluded that Wyo. Stat. § 23-1-901 does not cover bison, but it does reach wildlife disease damage claims. He also believed that Parker had a takings claim against the state for any damage linked to bison. Justice Cardine concluded that the statute covers bison as well as wildlife disease claims. Justice Urbigkit, relying heavily on Article I, § 33 of the state constitution, concluded that the statute covered bison as well as wildlife disease claims, that Parker also had a constitutional takings claim, and that the Commission’s decision was not supported by substantial evidence. Three justices, therefore, agree that the statute covers elk-induced brucellosis damage claims.

317. See supra text accompanying notes 106-111.

318. Recently, a Wyoming Game and Fish Department proposal to reduce the length of the elk hunting season in Jackson, Wyoming to balance bull-cow ratios met a storm of protest from local guides as well as local businesses that depend on hunter revenues during the fall. L. McKeever, Plan to restrict bull elk season protested at Jackson meeting, CASPER STAR TRIBUNE, April 15, 1992, at B1.


320. WYOMING TASK FORCE REPORT, supra note 112, at 15-17.
solved by taking the politically expedient but scientifically unsound approach of addressing only bison as brucellosis carriers while discounting elk as a source of the disease.

V. DEVISING A WILDLIFE BRUCELLOSIS POLICY: BISON, BRUCELLOSIS, AND ECOSYSTEM MANAGEMENT

Existing law does not directly address the wildlife brucellosis problem, nor does it establish any clear priority between wildlife and cattle on the Greater Yellowstone public domain. Politicians would prefer not to choose between wildlife and cattle, and the courts have avoided making an explicit choice between wildlife and cattle in the brucellosis litigation. The question, therefore, is whether the federal goal of eradicating brucellosis in livestock is also a viable wildlife management goal, or whether current efforts should be directed toward controlling wildlife brucellosis. For political as well as scientific reasons, wildlife brucellosis should be addressed through a coordinated, regional control policy designed to minimize the risk of disease transmission.

A. Clarifying the Legal Limitations

Neither federal nor state law mandates eradication of brucellosis in wildlife. As we have seen, the federal law governing brucellosis does not address brucellosis in wildlife; it only addresses the disease in domestic livestock, which also means APHIS's brucellosis regulations do not apply to wildlife. 321 Although the Wyoming federal district court's Parker decision calls for more intensive federal management efforts against the disease, 322 it does not suggest that wildlife brucellosis must be—or even can be—eradicated. State law governing brucellosis only addresses the disease in livestock, not wildlife, though Wyoming law may subject the state to liability if transmission were established. 323 Even the recently enacted Montana and Idaho statutes giving state livestock officials administrative authority over bison do not require eradication of the disease in wildlife. 324

Clearly, the states have an important interest in safeguarding domestic livestock from the disease. But neither federal nor state law dictates any particular control measure, whether it be the use of lethal force, or segregation, or some other management strategy. The Ninth Circuit's Fund for Animals ruling sanctions—but does not require—

321. See supra text accompanying notes 130, 135.
322. See supra text accompanying notes 250, 281-288.
323. See supra text accompanying notes 313-316.
324. See supra text accompanying notes 300-309.
the use of lethal force as one means of protection.325 The Wyoming federal district court’s Parker decision also is notably silent on the question of how bison brucellosis should be addressed.326 And the recent Montana and Idaho legislation, which gives state livestock officials authority to protect cattle from park bison, leaves open whether the offending bison are to be removed or killed.327 While these statutory provisions govern bison on state and private land, they may not have the same force on national forest lands.328 And with new scientific evidence suggesting that Yellowstone’s bison are not a threat to transmit the disease,329 state laws mandating destruction of all bison leaving the park could run afoul of due process reasonableness requirements.330 However, in the absence of preemptive federal legislation or definitive scientific proof, the states are within their legal authority to rely upon segregation and lethal force policies to limit bison-cattle contact on lands within their jurisdictional reach.

Whether federal officials legally must take affirmative action to address the wildlife brucellosis problem is open to question. The Wyoming federal court’s conclusion in Parker that the Federal Tort Claims Act’s discretionary policy exception does not apply to wildlife brucellosis infection claims is suspect,331 which means its finding that federal officials were negligent by not taking more aggressive action against infected bison or elk should be regarded as non-binding dicta.332

325. Indeed, the Ninth Circuit was careful to note that the Yellowstone bison herd’s biological integrity was not threatened under the challenged lethal force policy, leaving unclear how aggressively the states might implement a lethal force policy. 962 F.2d at 1401. See supra text accompanying note 239.

326. See supra text accompanying notes 281-284. The district court, however, was not ambiguous about how the U.S. Fish & Wildlife Service should deal with the infected elk, finding its failure to cooperate fully in the state’s biobullet vaccination program an indication of negligence. See supra text accompanying notes 285-288.

327. Although APHIS’s regulations purport to limit the interstate transportation of brucellosis-exposed animals, it is not clear that these regulations absolutely prohibit the transfer of brucellosis-exposed bison. See supra note 142.

328. Cf. Kleppe v. New Mexico, 426 U.S. 529 (1976) (holding that Congress’ power over the public lands includes the power to protect wildlife found there); Hunt v. United States, 278 U.S. 96 (1928) (sustaining Secretary of Agriculture’s authority to regulate wildlife populations on national forest lands). Although the states have traditionally regulated wildlife on the public lands, in the event of conflict with federal resource management policies, state law must give way under traditional supremacy principles. Coggins & Ward, supra note 9, at 75-76. On the Gallatin National Forest, for example, the Forest Service, citing a longstanding wildlife habitat management designation, has objected to hunting bison migrating from Yellowstone park on these designated forest lands. See supra note 222.

329. See supra text accompanying notes 184-194.

330. Basic due process principles require a rational relationship between statutory goals and the means used to achieve these goals. See JOHN E. NOWAK & RONALD D. ROTUNDA, CONSTITUTIONAL LAW 369-380 (4th ed. 1991). Under this standard, if Yellowstone’s bison pose no actual brucellosis threat to domestic livestock, it would be irrational to mandate that all bison venturing beyond park boundaries were to be shot, thus violating due process.

331. See supra text accompanying notes 253-272.

332. In fact, one can just as easily read the Parker ruling as standing for the proposition that ranchers have an obligation to protect themselves, by vaccinating their calves, modifying grazing seasons, and regularly testing. See supra note 252.
Similarly, it is hard to take seriously the court's summary conclusion that individual agencies have a duty to warn ranchers about the brucellosis risk, while other agencies—namely, those responsible for livestock grazing permits—have no such obligation. Although the Montana federal district court's *Fund for Animals* NEPA ruling threatened further intervention unless Yellowstone officials addressed bison brucellosis more aggressively, the Ninth Circuit was notably silent on this point in sustaining the Park Service's interim bison management plan. And while the Ninth Circuit found that the Park Service's plan was in the public interest because it protected Montana's livestock industry, the decision does not indicate that federal officials are legally obligated to take any particular management actions. In fact, the absence of any congressional policy on wildlife brucellosis suggests that federal officials are under no legal obligation to protect domestic livestock from infected wildlife. Under federal law, therefore, wildlife and cattle should be able to coexist on the public domain, notwithstanding the brucellosis risk.

In sum, the statutes and court decisions provide federal and state officials with enough flexibility to devise a workable wildlife brucellosis policy. Flexibility is appropriate given the problem's scientific and jurisdictional complexities. Indeed, in the jurisdictionally fragmented Greater Yellowstone setting, wildlife management policies require a high degree of intergovernmental cooperation. To address wildlife brucellosis effectively, federal officials must have the cooperation of state officials in managing bison beyond park and refuge boundaries, while state officials must have federal cooperation managing bison on the federal estate. While one might desire clearer guidance from the law, it should not prevent formulation of a functional wildlife brucellosis policy.

**B. Defining a Viable Policy: Eradication or Control?**

Federal and state officials, while agreeing that Greater Yellowstone's free ranging bison are an important resource, have not reached a consensus on whether eradication or control is the appropriate wildlife brucellosis management policy. Montana and Idaho, drawing heavily upon the law governing livestock brucellosis, have essentially adopted a zero tolerance policy for bison, which suggests both states

333. See *supra* text accompanying notes 273-280.
334. FFA Order Denying Relief, *supra* note 186, at 10. See *supra* note 238.
335. 962 F.2d at 1401-02. See *supra* text accompanying note 238.
336. Indeed, NEPA certainly does not obligate federal agencies to take any particular substantive action; it simply establishes procedural requisites before actions can be taken. See *supra* text accompanying note 229.
337. See *supra* text accompanying notes 265-272.
338. See *supra* text accompanying notes 300-305.
are interested in eradicating, not just controlling, brucellosis in the Greater Yellowstone bison populations. But Wyoming, with its large brucellosis-infected elk population, is willing to tolerate some brucellosis-infected bison.\textsuperscript{339} The National Park Service and the U.S. Fish & Wildlife Service are evidently willing to control, but not eradicate, brucellosis in their wildlife populations.\textsuperscript{340} Of course, even if the states would like to eradicate the disease, Montana has not addressed its elk brucellosis problem, and Wyoming has given no indication it is prepared to close its feedgrounds.

Choosing between a brucellosis eradication or control policy involves balancing the objective risks of transmission against the practical realities of eliminating the disease. An eradication program based on the proposition that no risk of transmission is tolerable is difficult to reconcile with the fact that public land ranchers face myriad risks when they turn cattle loose on the public domain. Notwithstanding the federal \textit{Parker} ruling, there is yet no confirmed case of brucellosis transmission to cattle in the wild, either from bison or elk. Teton County, Wyoming, ranchers, who rely upon public land grazing allotments, have lived uneventfully with the risk for years without experiencing a brucellosis outbreak. Contemporary research indicates that few if any of Yellowstone's infected bison are actually capable of transmitting the disease through reproductive materials.\textsuperscript{341} Drawing upon this data, a respected brucellosis researcher has concluded that "there is clearly no need either to control or eradicate brucellosis from the Yellowstone National Park bison herd."\textsuperscript{342} Moreover, after more than fifty years, the cooperative federal-state livestock brucellosis eradication campaign is far from complete, despite complete agreement among the participants and an investment exceeding one and a half billion dollars.\textsuperscript{343}

Scientists generally agree that the only certain method of eradicating wildlife brucellosis is by shooting all bison and elk in the Greater Yellowstone region and replacing them with brucellosis-free animals.\textsuperscript{344} Although depopulation or slaughter is exactly how livestock managers deal with the disease in cattle herds, this technique is not commonly employed in wildlife management circles. Depop-
ulation would be an extreme policy choice, with serious political, ecological, and economic repercussions. Just as an outraged public forced Yellowstone officials to abandon their elk reduction policy during the 1960's, under the vigilance of today's increasingly aggressive animal protection advocacy groups, an even more violent public reaction could be anticipated to any depopulation policy. De-
population of Yellowstone's bison and elk populations also would be ecologically unacceptable; it would seriously upset the regional eco-
logy and eliminate an important gene pool for both species. Even a less drastic test and slaughter strategy for bison would not be feasible and could result in complete depopulation of the region's bison herds. With wildlife a major attraction for park visitors as well as hunters, neither the general public nor local residents or businesses would tolerate such an approach. In short, the only foolproof means of eradicating brucellosis in wildlife is not a realistic option.

The choice of a wildlife brucellosis management policy also should consider the relative value of wildlife and cattle in the Greater Yel-
lowstone setting. As we have noted, the Yellowstone region is un-
dergoing a socio-economic transition, shifting toward an amenity-based economy which relies upon wildlife as a principal attraction for both visitors and residents. Within the national parks, bison and elk are an important part of the visitor experience, with the bison being the very symbol of our national park heritage. Outside the parks, elk are the charismatic big-game species that draw hunters to the area from all over the world, accounting for a multi-million dollar guiding and outfitter industry. Cattle ranching, on the other hand, has never been a major economic force in the area, though undeveloped ranch-
land provides vital open space and additional wildlife habitat. Ranch-
ers are nevertheless an important economic and political force in the surrounding states—which may explain why eradication proponents have framed the issue as a choice between wildlife and the state's cattle industry.

But this is a false and unnecessary choice. Indeed, with the issue framed as a choice between Yellowstone’s bison and the state's live-

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345. It has been suggested that wildlife brucellosis might be eradicated by vaccinating elk against the disease while putting the bison through a test and slaughter process. Interview with Bob Budd, Executive Director, Wyoming Stockgrowers Association (March 19, 1992). But the elk vaccination program is yet unproven over the long term, and it is virtually impossible to entrap and hold wild bison, and testing protocols are inherently unreliable. Meyer, supra note 71, at 16-17. See also supra text accompanying notes 188-189, 204-207.

346. See supra text accompanying notes 46-63.

347. Perhaps because elk are such an important, local economic resource, perhaps because they are managed by state—not federal—wildlife officials, or perhaps because they pose a reduced risk of transmission, no one has seriously suggested slaughtering the elk—as they have the bison—to eradicate brucellosis. One Montana official whom we spoke with responded that bison were a big enough problem without drawing elk into the controversy.
stock industry, and with the elk brucellosis problem largely ignored, the debate has developed an air of unreality. Given such stark choices, the brucellosis controversy has been unnecessarily polarized and developed into a raw political power struggle between agriculture and wildlife interests. The objective realities, as revealed in the scientific data,\textsuperscript{348} are much less stark and support the adoption of a regional brucellosis control policy based on the principle of risk reduction.

C. On Reducing Risk and Controlling Brucellosis

An effective wildlife brucellosis control policy, therefore, should be based on the principle of minimizing the risk of disease transmission between wildlife and livestock.\textsuperscript{349} Given Greater Yellowstone's jurisdictional and ecological fragmentation, such a policy will require full federal-state cooperation on a regional scale—in short, a form of ecosystem management.\textsuperscript{350} It must address brucellosis in both bison and elk, and it also must address the disease reservoirs in Yellowstone and Grand Teton national parks as well as the states of Montana and Wyoming.\textsuperscript{351} It must recognize that control strategies are more limited inside the national parks than on public and private lands outside the parks. It also must acknowledge the limitations of modern technology.

1. A Coordinated, Regional Wildlife Brucellosis Policy

Important but yet incomplete wildlife brucellosis interjurisdictional initiatives—or processes—are now underway. In Wyoming, federal and state officials are cooperating informally to prepare a bison

\textsuperscript{348} As we have seen, the risk of brucellosis transmission from wildlife to cattle is quite low and has never knowingly occurred in the wild; vaccination of cattle can significantly reduce that risk; radical bison depopulation measures will not eradicate the disease or eliminate the risk of transmission until the disease is also eliminated in elk; and there is some hope that recent elk vaccination experiments might prove effective over time, but there is yet no effective vaccine for bison. See \textit{supra} text accompanying notes 184-207.

\textsuperscript{349} The Park Service, U.S. Fish & Wildlife Service, environmental groups, and animal rights organizations have explicitly endorsed this approach, though they disagree on the particulars. State game and fish personnel, acknowledging that eradication is not feasible in dispersed wildlife populations, believe that control measures can adequately protect livestock against the disease. Interviews with Tom Thorne and Tom Toman, Wyoming Game and Fish Department, and Bob Martinka, Montana Fish, Wildlife and Parks Department. Even eradication proponents believe that control measures will be necessary as an interim measure. Interview with Bob Budd, Executive Director, Wyoming Stockgrowers Association (March 19, 1992).


\textsuperscript{351} See \textit{supra} text accompanying notes 167-207.
management plan for the Jackson herd, and the Governor’s Task Force has called for a Tri-State Interagency Brucellosis Task Force with joint federal-state representation. In Montana, the legislature has statutorily recognized the need for federal-state cooperation; federal and state officials are presently collaborating on a long term Yellowstone bison management plan. These interagency initiatives, however, have been formulated at the state level with little coordination between the Montana and Wyoming initiatives. Grand Teton and National Elk Refuge officials would prefer not to become tangled in the acrimonious litigation that has characterized Yellowstone’s relationship with Montana, while Montana officials would just as soon ignore elk brucellosis, which they perceive to be Wyoming’s problem. The Forest Service has been only marginally involved in the controversy. State agriculture officials continue to insist on a policy defined in terms of existing jurisdictional boundary lines. The process, however, should be expanded to transcend traditional boundary lines so the problem can be addressed regionally.

Substantively, the policy should be designed to insure the biological integrity of the Yellowstone and Grand Teton bison and elk populations while reducing the risk of brucellosis transmission to an acceptable level to protect livestock interests. Two separate wildlife brucellosis management proposals have now surfaced and merit serious consideration. The Wyoming Governor’s Task Force on Brucellosis, acknowledging the regional dimensions of the problem, calls for limits on bison and elk population numbers, geographic and seasonal grazing limits, continued experimentation with vaccination, and reductions in Wyoming’s elk feedground program. A Montana citizen’s coalition, addressing only the problem of Yellowstone’s bison, has proposed a control strategy that would establish bison management zones on public lands outside the park, trap and relocate bison moving toward private property, and allow bison hunting outside the park. Both proposals acknowledge the important role of wildlife in the region as well as the impracticality of an eradication policy. Both proposals also call for intensive management of both bison and cattle outside the national parks. Meshed together, these proposals would establish a comprehensive, ecosystem-based management ap-

352. See supra text accompanying notes 104-105.
353. See supra text accompanying notes 112-120.
354. See supra text accompanying note 304.
355. See supra text accompanying note 96.
356. See supra text accompanying notes 112-120.
357. See Letter from John Ragsdale et al., to Robert D. Barbee, Superintendent of Yellowstone National Park (May 15, 1991) (on file with authors). The proposal was prepared by representatives from local and national environmental organizations, local ranchers and landowners, the Greater Yellowstone Association of Conservation Districts, and retired Forest Service and state game and fish officials.
proach to wildlife brucellosis that should insure the integrity of Greater Yellowstone’s wildlife populations and provide reasonable protection for livestock.

2. The Park Service’s Limited Management Options

Inside the national parks, the Park Service’s bison management options are constrained by its legal responsibilities as well as its natural regulation policy. The Park Service cannot simply shoot park bison to protect cattle outside the parks, unless it can somehow reconcile this lethal management strategy with its statutory wildlife preservation obligation. The natural regulation policy forbids extensive human intervention that would disrupt natural ecological processes. But the policy does not entirely prohibit intervention, nor does it commit the Park Service to maintaining a static landscape—points that are often misunderstood. In fact, the Park Service has never adhered rigidly to an inflexible natural regulation policy; it has intervened in natural processes to protect other paramount values, including neighbor’s interests. In the case of bison, Park Service policy is to protect the biological integrity of the bison population as well as its free ranging character—not maintain an ever proliferating bison population free from any human manipulation. This policy does not preclude nonlethal intervention to deter natural migration tendencies or to protect other important interests.

Moreover, strict adherence to a natural regulation policy is virtually impossible in the often “unnatural” reality of the Greater Yel-

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358. Although the textual discussion focuses on the Park Service and the wildlife management constraints it faces, the U.S. Fish & Wildlife Service faces similar constraints under its own organic legislation and management policies. See supra text accompanying notes 271-272. Thus, our bison management conclusions for the Park Service apply equally to bison management by the U.S. Fish & Wildlife Service on the National Elk Refuge.

359. See supra text accompanying notes 208-214.

360. Several years ago, adhering to this “hands off” natural regulation policy, Yellowstone officials concluded that pink eye was indigenous to the park’s mountain goat population and refused to intervene when infected goats started falling to their deaths due to failing eyesight. See Chase, supra note 63, at 81-82. Drawing upon this analogy, it has been suggested that brucellosis is native to bison and part of Yellowstone’s natural ecology, and therefore not subject to human intervention. But the fact is that brucellosis is not indigenous to the park’s bison; it was probably passed on to them by domestic cattle. See supra note 79.

361. For a helpful discussion of this point, see Mark Boyce, Natural Regulation or the Control of Nature?, in THE GREATER YELLOWSTONE ECOSYSTEM, supra note 6, at 183.

362. Under Yellowstone’s revised fire policy, for example, potentially threatening fires are controlled immediately to protect adjacent landowners. DEPT. OF THE INTERIOR, NATIONAL PARK SERVICE, YELLOWSTONE NATIONAL PARK WILDLAND FIRE MANAGEMENT PLAN 11-15 (June 1991). A similar accommodation to adjacent landowners’ interests is contemplated if wolves are reintroduced into Yellowstone National Park. See L. David Mech, Returning the Wolf to Yellowstone, in THE GREATER YELLOWSTONE ECOSYSTEM, supra note 6, at 313-316; Keiter & Holscher, supra note 56, at 28-30.

363. See YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT, supra note 81, at 7. See also supra text accompanying notes 88-96.

364. See supra text accompanying notes 208-216.
lowstone Ecosystem, where pervasive human influences have disrupted natural processes. As we have seen, the Greater Yellowstone political boundaries rarely correspond to natural features or take account of ecological processes. Throughout the region, natural migration routes have been disrupted by development, and feedgrounds have been established to compensate for this loss. Wolves, a major natural predator of bison and elk, have been eliminated from the ecosystem. And the current winter-time bison migration is being facilitated by plowed and packed park roads, which certainly are not part of Yellowstone’s natural setting.

The Park Service’s bison management options are dictated by these legal, political, and ecological realities. Park Service-initiated culling (or shooting) of bison is simply not a viable option, given the agency’s organic statutory obligations and the political furor over recent bison management initiatives as well as Yellowstone’s past elk culling policies.365 Fencing the parks to quarantine infected bison also is not viable; extensive fencing would have adverse ecological impacts on other species as well as unacceptable economic-social impacts.366 Sterilization would likewise have unacceptable adverse ecological effects.367 A hazing policy modelled after the Park Service’s boundary control strategy, while more acceptable politically and ecologically, simply will not work since bison are notoriously difficult to control or handle.368 And closing Yellowstone to winter recreational activities, particularly snowmobiling, to stop bison from using the packed roads as easy migration routes is likewise untenable.369 In short, the Park Service’s bison management options are quite limited, which means an effective wildlife brucellosis control policy cannot be implemented solely within the national parks. Park officials must work with other federal, state, and local officials to protect the bison and guard against brucellosis.

3. Managing Wildlife and Cattle Outside the National Parks

Outside the national parks, federal and state officials enjoy greater management flexibility. Both bison and cattle can be managed in-

365. See supra text accompanying notes 77-92, 208-214.
366. Fencing would cut off traditional migration routes for elk and other migratory species, leaving them to starve inside the park during the winter. It would also effectively eliminate elk and other hunting opportunities outside the parks, which would surely provoke a powerful local reaction. YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT, supra note 81, at 7-8.
367. See FFA Order Denying Relief, supra note 186, at 9 ("[c]hemical sterilization of bison . . . is not a viable or effective means of herd reduction or control").
368. YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT, supra note 81, at 8; M. Meyer, supra note 71, at 17-18.
369. This approach might run afoul of the Organic Act’s human enjoyment mandate, 16 U.S.C. § 1 (1988), and it faces serious political obstacles from Yellowstone’s gateway communities, which have established a booming winter recreation business built around access to the park. See UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE, WINTER USE PLAN ENVIRONMENTAL ASSESSMENT, YELLOWSTONE AND GRAND TETON NATIONAL PARKS AND JOHN D. ROCKEFELLER, JR., MEMORIAL PARKWAY 53-4 (1990).
tensively on these lands without running afoul of the law. A policy based on separating bison and cattle would minimize the risk of disease transmission, while being legally, politically, and ecologically viable. The policy should insure the biological integrity of the bison population by establishing threshold population requirements. The policy also should include strategic elk feedground closures. Such an approach would acknowledge that wildlife and cattle are entitled to equal respect on national forest lands, advance important wildlife management policies, and still protect cattle against brucellosis and private property from bison.

Intensive bison management policies should be implemented on the national forest lands adjacent to the parks to insure separation between bison and cattle. These policies should include designation of bison habitat management zones and the use of control measures to discourage bison migration, including the use of lethal force. By acknowledging the biological reality that bison habitat needs extend beyond park boundaries, this approach would effectively zone adjacent national forest and other public land according to its habitat value as well as its proximity to grazing allotments and private lands, where the real risk of disease transmission is greatest. Although bison would be permitted to migrate onto these lands, they would not be permitted beyond the designated zones. These boundary prohibitions should be enforced by mandatory control measures, such as hazing, removing, or killing intransigent bison. Since nonlethal control measures have not worked well inside the national parks, lethal control measures will undoubtedly be necessary, but they must be limited by predetermined biological requirements. Neither the Forest Service nor state game and fish officials are constrained legally from killing bison. While public bison hunting is an option outside the parks, it may be more politically palatable if state game and fish officials dispatch the intransigent bison. In addition, intransigent mi-

370. Cf. U.S. FISH & WILDLIFE SERVICE, GRIZZLY BEAR RECOVERY PLAN (1982) (under the grizzly bear recovery plan, bear habitat in the Greater Yellowstone Ecosystem is divided into management zones according to its habitat value, taking into account human settlement and use patterns).

371. Of course, bison habitat areas could be further expanded by the acquisition of private ranchland for wildlife purposes. But there are few funds available for such purchases in this era of federal budget shortfalls. And, thus far, no private groups have stepped forward with funding to acquire additional bison habitat.

372. In other words, Montana's sole reliance on a lethal "scorched earth" policy is not an acceptable solution to the bison-brucellosis problem. While such a policy may prevent bison-cattle contact, it is neither ecologically sound nor politically popular. An indiscriminate killing policy unconstrained by pre-established population requirements is too blunt to insure the bison herd's biological integrity. YELLOWSTONE BISON ENVIRONMENTAL ASSESSMENT, supra note 91, at 9. Moreover, animal rights activists have effectively exploited the unsportsmanlike hunt to mobilize public sentiment against the policy, not only forcing Montana to cancel its hunt, but also undermining public support for the state's brucellosis control efforts. See supra text accompanying notes 91-92, 300-305.
gratory bison might be trapped and shipped to other locations.\textsuperscript{373} perhaps to Indian reservations interested in restoring native bison herds.\textsuperscript{374}

Besides bison management, an effective brucellosis control policy must provide for intensive cattle management. Cattle are much easier to locate, vaccinate, and otherwise control than wildlife in Greater Yellowstone's expansive, wilderness environment. Brucellosis-based cattle management, however, does not mean eliminating livestock grazing from the public lands.\textsuperscript{375} Rather, cattle should be separated from potentially infected wildlife. This can be accomplished by revising or shifting grazing allotments, shortening or delaying the grazing season, or perhaps limiting grazing to steers and spayed heifers.\textsuperscript{376} Grazing allotment changes should be implemented in conjunction with designation of bison management zones. And to reduce the risk of disease transmission further, state officials should require vaccination for all cattle in the Greater Yellowstone region. Combined with prohibitions on bison migration outside designated bison habitat zones,\textsuperscript{377} this policy has the advantage of being relatively easy to implement and of minimizing the need to shoot bison, which should reduce political problems.

An effective brucellosis control policy must also address the problem of infected elk; it must eliminate or at least curtail Wyoming's elk feedground program. Indeed, the Wyoming Governor's Interagency Task Force on Brucellosis recommends a gradual feedground closure program, while simultaneously supplementing and enhancing available habitat.\textsuperscript{378} Besides significantly reducing the potential for brucellosis transmission among wildlife, a feedground closure policy would help restore original elk migration patterns and reduce the level of human interference with natural ecological processes. But there is not enough winter habitat now available to sustain elk populations at current numbers.\textsuperscript{379} And closing the feedgrounds would insure com-

\begin{itemize}
\item \textsuperscript{373} See supra note 142 for the argument that the current livestock brucellosis regulations do not prohibit the shipment of brucellosis-exposed wild bison.
\item \textsuperscript{375} Although one extreme proposal calls for eliminating livestock grazing on all public lands to reduce the risk of brucellosis transmission and thus avoid any potential liability, this approach is politically and ecologically unsound. It could put some local ranchers out of business and accelerate subdivision activity, which would further fragment wildlife habitat, increase wildlife-human conflicts, and detract from the region's aesthetic appearance.
\item \textsuperscript{376} Since brucellosis primarily affects reproductive success in cattle, limiting grazing to steers and spayed heifers, which unlike cows are not raised for breeding purposes, would minimize the impact of the disease if it were transmitted to grazing cattle.
\item \textsuperscript{377} See supra text accompanying note 360.
\item \textsuperscript{378} \textit{Wyoming Task Force Report}, supra note 112, at 15-17.
\item \textsuperscript{379} Outfitters and guides, an important local industry in western Wyoming, along with many local businesses in the Jackson Hole area, are already complaining that the Wyoming Game and Fish Commission is not providing enough trophy elk. L. McKeever, supra note 318, at B1.
\end{itemize}
petition between elk and cattle on private ranchlands, which could actually increase the risk of brucellosis transmission and impose additional feeding costs on ranchers. But as unpopular as an elk feedground closure program may be with both ranching and wildlife interests, it is nonetheless an essential component of any comprehensive brucellosis policy. Otherwise, the disease will persist and continue to spread in wildlife populations, and perhaps necessitate even more drastic measures in the future.

Modern technology, specifically bison and elk vaccination, can play only a limited role in controlling the disease. Although recent elk vaccination experiments are promising, researchers are not convinced that vaccination can eliminate the disease in elk, even if the feedgrounds are closed.\textsuperscript{360} With over 23,000 elk using the feedgrounds during winter months, the task of finding and vaccinating the animals is enormous as is the price tag attached to the effort.\textsuperscript{361} Moreover, there is no acceptable bison vaccination.\textsuperscript{362} Neither the Park Service nor the U.S. Fish & Wildlife Service, still unconvincing of the technology's effectiveness and committed to minimal interruption of natural processes, have yet endorsed such an intensive management strategy. As a philosophical matter, an intrusive, technology-based wildlife management strategy—while sometimes employed to monitor or control sensitive species—seems particularly inappropriate in the Greater Yellowstone environment, one of the few settings where natural ecological processes still occur with minimal human disruption.

In the unlikely event of a brucellosis outbreak, federal agricultural officials can take remedial steps without jeopardizing the entire state's brucellosis certification status. As long as the infection does not spread beyond the initially infected herd, APHIS can treat that herd without downgrading the state's status, which is exactly how the Parker outbreak was addressed in Wyoming.\textsuperscript{363} And as we have seen, the U.S. Department of Agriculture's livestock brucellosis regulations authorize federal officials to subdivide states into different brucellosis zones to deal with particularly troublesome disease pockets.\textsuperscript{364} APHIS, therefore, could redesignate affected portions of the Greater Yellowstone region as a brucellosis-infected area without changing the brucellosis-free designation for the rest of the states of

\textsuperscript{360} Thorne, et al., supra note 6, at 279.
\textsuperscript{361} Because many of the elk using the feedgrounds will not "come in" to eat the provided feed while people are around and because many elk do not regularly use the feedgrounds, it would be virtually impossible to vaccinate all of the elk at risk from brucellosis. Interviews with Mike Hedrick and Bruce Smith, National Elk Refuge, and Tom Toman, Wyoming Game and Fish Department.
\textsuperscript{362} Thorne, et al., supra note 6, at 280.
\textsuperscript{363} See supra note 140; Parker Findings and Conclusions, supra note 18, at 8.
\textsuperscript{364} See supra text accompanying note 137.
Wyoming, Montana, and Idaho.\textsuperscript{385} Redesignation would legally (and appropriately) localize what is already a local—rather than state-wide—problem. By temporizing the consequences of a brucellosis outbreak, it would enable federal and state officials to deal with the outbreak locally without threatening the state’s livestock industry.

But because redesignation might tip the political scales in the brucellosis debate, federal and state agricultural officials as well as the livestock industry have avoided even discussing it. As a political matter, redesignation would effectively recast the brucellosis debate: Rather than pitting Yellowstone’s bison against the interests of the state’s entire cattle industry, redesignation would focus the debate on the relative value of bison and cattle in the Greater Yellowstone region. Redesignation, of course, would not be cost free: it would mean increased costs and testing for local ranchers to market their cattle,\textsuperscript{386} and it could adversely impact ranchers state-wide when they market their cattle.\textsuperscript{387} Nonetheless, the redesignation option provides a safety valve to ameliorate the worst effects of an outbreak under a risk reduction brucellosis control policy.

Governmental compensation, however, is not a panacea for the brucellosis problem in the Greater Yellowstone setting. Western senators, as noted, have proposed that ranchers faced with brucellosis-related expenses should be compensated by the federal government.\textsuperscript{388} While federal compensation has the advantage of protecting individual ranchers from the potentially crippling financial costs associated with a brucellosis outbreak,\textsuperscript{389} it would establish the troublesome precedent that western ranchers are entitled to a risk-free environment on the public domain. Nothing in current law supports this proposition,\textsuperscript{390} nor is it compatible with the reality of public range grazing, where livestock are exposed daily to the vagaries of weather, predators, and the like. Moreover, the federal brucellosis eradication program already provides free testing services to ranchers in brucel-

\textsuperscript{385.} As noted earlier, both Montana and Wyoming have been subdivided into different zones in the recent past. See supra note 137.

\textsuperscript{386.} See supra text accompanying notes 155-162. Interviews with Russ Burgess, D.V.M., Acting Wyoming State Veterinarian; Don Rolston, Wyoming Agriculture Commissioner; and Don Ferlicka, D.V.M., Montana State Veterinarian. Specifically, in western Wyoming, many ranchers market their cattle through wholesale facilities (or sale barns) located in Riverton, Wyoming, which would likely be outside the designated area, thus meaning they would have to bear expensive testing costs even when marketing cattle intrastate. Interview with Bob Budd, Executive Director, Wyoming Stockgrowers Association.

\textsuperscript{387.} We were told that cattle buyers will often bid lower on cattle from a “split” state, even those from the “free” area, fearing that brucellosis might have spread into the previously uninfected area. Interviews with Russ Burgess, D.V.M., Acting Wyoming State Veterinarian; Don Rolston, Wyoming Agriculture Commissioner; and Don Ferlicka, D.V.M., Montana State Veterinarian.


\textsuperscript{389.} See infra text accompanying note 419.

\textsuperscript{390.} See supra text accompanying notes 208-244.
losis-free states and compensation to ranchers who lose their herd because of a wildlife-caused brucellosis outbreak.\textsuperscript{391} As a philosophical and practical matter, in Greater Yellowstone's wilderness-like setting where wildlife have always roamed freely, ranchers should not expect the government to insure against the hazards of public land grazing.

VI. BEYOND BISON AND BRUCELLOSIS: PUTTING THE CONTROVERSY IN PERSPECTIVE

The bison-brucellosis controversy, though ostensibly localized to the Greater Yellowstone region, has significant ramifications that extend beyond the immediate conflict. Indeed, the controversy mirrors other natural resource policy controversies that are being played out across the American West. It touches upon the following issues: the question of the relative priority to be accorded wildlife and cattle on public lands; the validity of the Park Service's natural regulation policy; application of the emerging concepts of ecosystem management and ecosystem restoration; the increasingly shrill anti-hunting debate; and the difficult question of when private property interests are sufficiently impacted to warrant governmental compensation. In this final section, we explain how these issues are implicated in the bison-brucellosis controversy and open them for further discussion and debate.

A. The Wildlife-Livestock Conflict: A Reordering of Priorities?

Wildlife-livestock controversies are becoming increasingly commonplace throughout the West, and they are escalating in intensity. The conflict reflects a fundamental reordering of priorities on the public domain. Wildlife is now valued not only as a consumptive resource, but also for its intrinsic worth and for biological diversity purposes.\textsuperscript{392} Modern environmental knowledge, combined with a growing public interest in recreation and amenity values on the public lands, has called into question the traditional role of livestock on lands also used by wildlife. Nowhere is this conflict more pronounced than in regions like Greater Yellowstone, where park wildlife populations must depend on lands outside the parks to meet basic habitat needs. In the brucellosis controversy, the question ultimately may be whether wildlife or livestock should be accorded priority on the public domain.

\textsuperscript{391} See supra text accompanying notes 132, 156-158.

These conflicts reflect a subtle but significant shift in political power at the federal and state levels. Where ranchers have traditionally enjoyed relatively unfettered access to the public domain, federal livestock management policies are now under attack. Indeed, the western livestock industry is feeling quite beleaguered today.\(^3\) It faces the prospect of increased grazing fees, further restrictions on grazing practices to protect riparian areas and other environmentally sensitive lands, limitations on federal predator control efforts, and the likelihood of wolf reintroduction. Some are even calling for the end of all public range grazing,\(^4\) or the establishment of a ""buffalo commons."\(^5\) The brucellosis controversy is one more instance where the traditional ranching dominance on the public domain is being questioned.

In the Yellowstone region, few people question the priority given to bison and other wildlife inside the national parks and wildlife refuges. On the public lands outside the parks, though, the question of priority is still subject to debate. Ranchers have historically enjoyed considerable influence over multiple-use policies, enjoying ready access to the national forest lands for livestock grazing purposes. But wildlife is now recognized as an important resource across the public domain, and it is clear that Greater Yellowstone's wildlife populations cannot exist solely inside the parks. As a national political matter as well as a regional socio-economic matter, the fact is that wildlife—particularly large charismatic species like the bison and elk—have greater value on the Greater Yellowstone public domain than cattle. None of the bison-brucellosis court cases have suggested otherwise.\(^6\)

In short, political, legal, and ecological realities are such that cattle must make room for bison on the Greater Yellowstone public domain. This same answer is increasingly emerging elsewhere, too.

B. The Natural Regulation Debate: Nature versus People?

Since its inception, the Park Service's natural regulation policy has been controversial. In Yellowstone, the focal point of the con-

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396. While the Ninth Circuit Court of Appeals sustained the Park Service's lethal bison control policy by acknowledging Montana's interest in its livestock industry, the court carefully noted that the bison herd's biological integrity was not threatened. The Fund for Animals, Inc. v. Lujan, 962 F.2d 1391, 1401-02 (9th Cir. 1992). In the Wyoming litigation, by ruling against the compensation claims, both courts effectively acknowledged that wildlife and cattle can coexist on the public lands, though there is some remote liability exposure. See supra text and accompanying notes, at notes 321-337.
trovery has been the northern range. Some observers believe that the natural regulation policy has resulted in too many ungulates and that the range is overgrazed and in serious ecological decline. They contend that Yellowstone's elk and bison are now making their way out of the park because the degraded range can no longer support them. Range scientists, accustomed to managing livestock intensively, also see nothing wrong with applying intensive management techniques—including quarantine, vaccination, and test and slaughter strategies—to bison to address the brucellosis problem. But most wildlife biologists are not convinced that Yellowstone's northern range is overgrazed or that population numbers have exceeded its carrying capacity. They note that wildlife population numbers have always fluctuated widely in response to natural factors and that the northern range is still sustaining wildlife numbers consistent with historical patterns. And unlike their range counterparts, wildlife managers generally do not use intensive management techniques, even in cases of disease, preferring instead to let nature take its course.

Underlying these different perspectives on the validity of the natural regulation policy is a basic philosophical disagreement on the relationship between people and nature. Just how far are we willing to trust nature without human intervention? For range scientists and livestock producers, managers applying scientific principles can and should improve on nature by determining appropriate carrying capacities, manipulating populations, utilizing technology, and the like. Others are profoundly skeptical about the Park Service's ability to recreate a primitive scene in the ecologically fragmented national park environment. Wildlife biologists, though, are leery of carrying capacity concepts, believing instead that nature's sometimes unpredictable methods are to be preferred at least in park and wilderness settings. They note that these undisturbed landscapes provide valuable baseline scientific information and afford an unparalleled opportunity to learn from nature's ways. Supporters also explain that the natural regulation policy does not involve recreating a static primitive landscape, but contemplates that ecological processes, driven by nature's dynamic forces, should be allowed to unfold with minimal human intervention. Moreover, they note that the Yellowstone setting is one of the few remaining places where Americans can still experience their wilderness heritage.

397. See, e.g., Chase, supra note 63, at 52-70; Chadde and Kay, supra note 63, at 231-233. They also assert that the 1988 fires, another product of the natural regulation policy, further reduced available habitat, contributing to the large winter wildlife die-off following the fires.

398. See, e.g., Boyce, supra note 361, at 191-195; Houston, supra note 63, at 198-199.


400. See Chase, supra note 63, at 48.

401. See R. Keiter & M. Boyce, supra note 350, at 406; M. Boyce, supra note 361, at 202-203.
These fundamentally conflicting views have shaped the bison-brucellosis debate. Livestock interests tend to see the bison, which are also raised domestically on ranches throughout the West, as another domestic animal and support active intervention to eradicate the brucellosis disease. Adherents to the natural regulation policy, however, view the bison as wildlife and oppose intervention, at least inside the parks. But acknowledging the present ecological fragmentation of park environments, many bison supporters concede that some intervention may be necessary to control population numbers and to protect adjacent private interests. The issue, therefore, becomes a question of how to manage bison outside the national parks—which means formulating and defining a workable ecosystem-based bison management policy.

C. Ecosystem Management: A Viable Solution?

Both the Park Service and the Forest Service now explicitly endorse the principle of ecosystem management as a fundamental precept of natural resources management. In Greater Yellowstone, however, the concept of ecosystem management is still ill-defined, despite recent interagency coordination efforts. Nonetheless, the concept at least implies that the boundary line is not sacrosanct, and that resources like wildlife must be managed at the appropriate ecological scale. The concept also implies that missing ecological components should be restored to insure the region’s long term ecological health. In short, the principle of ecosystem management provides the basis for developing and implementing natural resources policy at the appropriate spatial and temporal scale.

The ecosystem management concept has not been uniformly well received in the Yellowstone region or elsewhere. Extractive industries

402. In Greater Yellowstone, the emerging concept of ecosystem management has been characterized in the following terms:

First, ecosystem management is built upon cooperative interagency institutional structures, as well as public involvement and support. Second, ecosystem management draws heavily upon scientific principles and research; it requires an improved understanding of ecological systems so that management proposals can be designed to minimize disruption of ecosystem processes. Third, ecosystem management is committed to preserving and restoring biological diversity within regional fauna and flora. Finally, ecosystem management policies must manifest broadly shared public values.

In Greater Yellowstone, where public lands have been set aside as national parks and wilderness areas, this means that ecosystem management policies must take account of aesthetic concerns and amenity values, and thus preserve the natural integrity and appearance of the area.

and commodity user-groups have been quite wary of any policy that might place wildlife or environmental protection above economic interests. They have vigorously resisted recent Park Service and Forest Service coordination efforts, which are seen as a plot to expand park boundaries onto the multiple-use forest lands and to limit traditional access rights. Similarly, efforts to restore extirpated species and ecological processes are viewed with skepticism, or even outright hostility in the case of wolf restoration. Ecosystem management opponents also criticized the federal interagency coordination initiatives for not including the states in the effort. But although opponents successfully undermined the recent Greater Yellowstone coordination efforts, the momentum plainly is toward ecosystem management on the public domain in Greater Yellowstone and beyond.

Clearly, the bison-brucellosis controversy must be addressed on a regional scale, and it must take account of ecological realities. With overlapping federal-state wildlife management responsibilities, it also must involve explicit federal and state coordination. Any bison management plan that sanctions bison outside national park boundaries can—and should—be viewed as a manifestation of ecosystem-based management. Moreover, any wildlife brucellosis control policy that provides for elimination of elk feedgrounds in western Wyoming and for restoration of historic elk migration patterns can—and should—be seen as an ecosystem restoration effort. Although each of these policies will adversely impact traditional economic interests—ranchers, hunters, outfitters and guides—and will be resisted for that reason, neither bison nor other migratory species can survive within the ecologically fragmented national parks. In other words, wildlife management policy must be defined in ecological terms and wildlife must be given equal status with traditional uses on the public domain.

Nonetheless, the principle of ecosystem management does not obviate the need for some boundary agreements to define management priorities. These agreements should be based upon ecological principles to insure the integrity of the resource base, but they also must take account of private property interests as well as regional


economic concerns. As we have seen, a wildlife brucellosis control policy based on a risk reduction principle derived from ecological considerations can accomplish these twin objectives. In the final analysis, ecosystem management—whether or not it is used openly to resolve the Greater Yellowstone bison-brucellosis controversy—provides a means for acknowledging and integrating new values and scientific knowledge into natural resources policy on the public domain while still accommodating legitimate existing interests.

D. The Anti-Hunting Debate: Morality versus Utility?

Are there viable means to control burgeoning bison populations other than shooting the animals? Many animal rights activists have vigorously opposed bison hunting as well as any plans to kill surplus bison. Believing that individual animals have rights just like people, they oppose hunting or killing any wildlife regardless of the purpose. But federal and state officials, supported by wildlife biologists and many environmentalists, have thus far not identified an alternate solution. They are reluctant, however, to continue a public bison hunt that provides animal rights activists with an easy political target. Instead, they hope that having state or federal officials do the shooting will reduce the political furor. Yet hunters, also an important wildlife constituency who have supported the bison hunt, are critical of plans to have government employees shoot the surplus bison.

Hunting has become a highly emotional issue with significant political and legal overtones. Even though hunters and hunting generally have been a positive force for wildlife, western legislatures and sportsmen are well-advised to take the anti-hunting movement seriously. Indeed, animal rights activists have become a serious presence to be reckoned with on the western public domain. In the bison controversy, they scored an important local victory when the Montana legislature, fearing an even stronger anti-hunting backlash, dropped its controversial bison hunt in the face of adverse national publicity. They have temporarily enjoined several bison killing proposals, and they have actively confronted hunters and others shooting bison, garnering additional publicity. In addition, they have stopped grizzly

406. See supra text accompanying notes 349-391.
407. See, e.g., L. Mighetto, supra note 47, at 108; R. Nash, supra note 399, at 136-144. See also Douglas Linder, "Are All Species Created Equal" and Other Questions Shaping Wildlife Law, 12 HARV. ENVIR. L. REV. 157 (1988).
408. Hunters have been an important political force for wildlife protection and habitat acquisition, and their efforts are largely responsible for the national wildlife refuge system. See Coggin & Ward, supra note 9, at 63-67. See generally Peter Matthiessen, supra note 1.
409. See supra text accompanying notes 91-92, 300.
410. See S. Durrant, supra note 300, at 505-507 for a description of recent hunt interference activities by animal rights activists.
bear hunting in Montana, and they are mounting concerted campaigns against hunting elsewhere in the West. Their aggressive tactics have spurred state legislatures to enact hunter harassment statutes, and prompted sober-minded sportmen to call for cleaning up hunting practices. Knowledgeable observers are understandably fearful of broader restrictions on hunting.

The philosophical issue is whether it is right to kill animals, either for the sake of sport or to achieve other natural resource goals. Many animal rights activists, attributing animals with human-like qualities and rights, take the high moral ground that any killing is wrong as a matter of principle. In opposition, hunting advocates and wildlife managers generally justify hunting on utilitarian grounds. Wildlife managers, who have historically managed game populations for hunters, rely upon annual hunter harvests to stabilize population numbers within available habitat limits and to achieve other resource management goals. Although hunting once may have been a means of life support, it is now widely regarded as a sporting activity, hardly essential to an individual's well-being. Indeed, public values about wildlife and hunting have evolved considerably over the past few decades. The general public's interest in wildlife, reflecting increased urbanization and other socio-economic trends, has shifted to non-consumptive uses, as exemplified by the current interest in wildlife viewing and support for preserving biological diversity. And an important lesson from Montana's recent experience with its bison hunt is that the less sporting the hunting activity, the less likely the public is to care whether it achieves other, desirable resource management goals. In short, the anti-hunting view is powerfully appealing to a public increasingly removed from the daily realities of wildlife management on a shrinking habitat base.

The challenge for hunters and wildlife managers is to provide a compelling justification for the use of lethal force on bison and other wildlife. Once a species occupies available habitat, one wonders how proliferating wildlife populations are to be controlled in the absence of hunting or other human harvest strategies. Would it be preferable

414. Some animal rights activists, however, also advocate more aggressive habitat acquisition programs to decrease the reliance on hunting to regulate wildlife populations. For animal rights advocates, this could have the salutary effect of reducing the influence hunting organizations exert over state game and fish policies. For a thoughtful discussion of the overlapping interests shared by animal rights advocates and the hunting community, see THOMAS A. LUND, AMERICAN WILDLIFE LAW 107-110 (1980).
to vaccinate or sterilize bison, elk, and other game to control populations or diseases? Are fences the answer? Would that really be less intrusive and less biologically damaging? Thus far, wildlife managers, environmentalists, and others—sensitive to local political constituencies as well as biological considerations—have taken the position that none of these techniques can replace hunting as a viable management tool. In the case of Greater Yellowstone’s bison, they must now put that message across in convincing ecological terms to an emotionally vulnerable public fearful of a modern day version of yesteryear’s buffalo slaughter.

E. Property Rights and Governmental Compensation: An Ecosystem Protection Tool?

The bison-brucellosis controversy has been triggered by the view that private property—either privately owned cattle or private rangeland—should be protected from the infectious bison. Traditionally, the law has sanctified the boundary line and given legal protection to ownership interests behind it. But as we have seen, property owners are not legally entitled to compensation for wildlife-related damages to livestock or crops. And as the Wyoming compensation cases suggest, livestock owners will have a difficult time establishing a wildlife-related brucellosis compensation claim under existing statutory schemes. Thus, private property rights do not present a serious obstacle to an ecosystem-based wildlife brucellosis control policy based on the principle of risk reduction.

Indeed, implementation of ecosystem management principles to resolve the brucellosis controversy will undoubtedly impact traditional private property interests. Any policy entitling wildlife to roam beyond defined legal boundaries means that private property owners will be at some risk from these same animals. According to one prominent authority, this diminution of traditional private property rights simply represents the legal system seeking to cope with “the

415. See supra text accompanying notes 225-227.

416. One knowledgeable commentator, noting that property law now embraces the public’s commitment to environmental values, has observed that a recurring theme in modern property law “is an increase in the social responsibilities of the landowner and a corresponding decrease in the owner’s rights.” J. Cribbet, Concepts in Transition: The Search for a New Definition of Property, 1986 U. Ill. L. Rev. 1, 6. The author also observes: “All landowners hold their interest for the benefit of posterity as well as for their own use. Landowners are thus trustees for the future, and society, as a whole, has a stake in whether the landowner wastes land or uses it wisely.” Id. at 40. In urban settings, therefore, the law regularly mandates restraint by property owners to accommodate neighbor’s interests. See, e.g., Penn Central Transportation Co. v. New York City, 438 U.S. 104 (1978); Agins v. Tiburon, 447 U.S. 255 (1980). Even in the rural American West, the law has reduced traditional private property rights and expectations to accommodate emerging environmental values and important wildlife resources linked to the public domain.
risks and changes generated by new laws and policies aimed toward restoring natural systems." For a property owner, predators, fires, and even contagious wild animals all fit within the expectations that attach to land ownership in a region like Greater Yellowstone, where the public is committed to maintaining and restoring ecological processes on a large scale and where nature's dangers are well-known to the local populace. In rejecting a constitutionally-based compensation principle, the law is merely recognizing that Greater Yellowstone private landowners cannot reasonably expect to be insured against wildlife that are part of the larger ecosystem.

Nonetheless, even if the law does not constitutionally require compensation for wildlife-related brucellosis losses, compensation might be appropriate as a matter of policy. Under a wildlife brucellosis control policy based on the principle of risk reduction, individual ranchers are required to bear the risk that wildlife will not transmit the disease to domestic livestock. But when the policy fails and brucellosis is contracted by a cattle herd, the consequences can be devastating financially for the affected rancher who stands to lose the entire herd. If the public values bison sufficiently to mandate that they be allowed outside the national parks, then perhaps it should consider compensating for proven losses in individual cases when the underlying risk reduction policy fails. Besides, the consequences of a brucellosis outbreak—usually loss of the entire herd—are qualita-

417. Joseph L. Sax, supra note 6, at 79. See also J. Sax, Some Thoughts on the Decline of Private Property, 58 WASH. L. REV. 481 (1983). Recent proposed congressional legislation highlights the point. Under the proposed Old Faithful Protection Act, which passed the House of Representatives but died in the Senate during the 102nd Congress, private property owners in Greater Yellowstone would be prohibited from undertaking geothermal development within 15 miles of Yellowstone National Park. Despite vigorous objections, the bill contained no provision for compensation, though takings claims might still be brought against the government. H.R. 3359, 102nd Cong., 1st Sess. (1991). See David Hackett, Wallop delays Yellowstone geothermal protection bill, CASPER STAR TRIBUNE, June 25, 1992, at A1. Should the bill pass next session, Congress would effectively be acknowledging that a private landowner has no reasonable expectation—and therefore no legal right—to develop or destroy natural resources or resource systems that would damage publicly-shared ecosystems.

418. Cf. Lucas v. South Carolina Coastal Council, ___U.S. ___, 112 S.Ct. 2886 (1992) (holding that a state's interest in ecosystem protection and restoration can justify reasonable regulatory restraints on private property owners without constituting a taking, so long as the owner could reasonably expect such restraints under prevailing state law).

419. Compensation should be limited to the affected rancher, and then only if it is established that brucellosis was contracted from wildlife, either on private lands or on a grazing allotment. But the question of federal or state "ownership" of the responsible animals should perhaps not be a factor, which would ameliorate the impact of the Wyoming federal court's Parker ruling. In this case, compensation would shield the individual rancher from a potentially crippling personal loss incurred to provide bison or other wildlife sufficient room on the public domain. It also would recognize that fencing often will not stop bison or other wildlife, and that fencing is not always desirable as a matter of wildlife management policy. This limited compensation approach, however, differs markedly from the western senators proposal which would have compensated all ranchers who faced brucellosis-related expenses, those incurred for testing purposes as well as those related to wildlife on either public or private lands. See supra text accompanying notes 242-244.
tively different from the sporadic and rarely devastating losses that occur from predation and most other natural hazards of public land grazing. As a matter of individual fairness, therefore, compensation might be appropriate for the rancher who incurs a devastating personal loss under a regional, risk-based disease control policy.

Moreover, a compensation policy might be justified by other ecosystem-based resource management goals. Specifically, compensation might be used to protect ranchland from development, which could accomplish the regional land use goals of protecting open space and wildlife habitat. In the event of a brucellosis outbreak, compensation would help ensure that a rancher was not forced out of business and compelled to sell his or her property, perhaps to real estate speculators for subdivision. In addition, compensation could help preserve the cultural aspects and diversity of local ranch-based communities—another important dimension of the Yellowstone experience. In short, a compensation policy may be an expeditious means of promoting ecosystem-based wildlife management policies as well as other important regional land use policies.

CONCLUSION

The Greater Yellowstone bison-brucellosis controversy abounds in paradox. Yellowstone's bison originally contracted the brucellosis disease from cattle, but the bison have now been cast as the culprit in this controversy. In the Montana litigation, the United States government has argued—successfully—that bison are feared transmitters of brucellosis and should be shot on sight; then, in the Wyoming litigation, it has argued—also successfully—that federally managed bison and elk are not responsible for transmitting the disease to cattle. The Park Service, which is charged with preserving wildlife as part of our natural heritage, has proposed killing its bison to protect cattle located outside the parks. The livestock industry, conveniently ignoring its own lengthy, expensive, and yet incomplete livestock brucellosis eradication effort, is pressing for an immediate solution—even proposing quarantine and depopulation measures—to the wildlife brucellosis problem. Animal rights activists, expressing deep concern over the bison’s welfare, have suggested fencing the parks and sterilizing the animals—approaches that threaten the entire region's ecological integrity and ignore genetic considerations. And nearly everyone, well aware of local political realities but ignoring scientific fact, chooses to overlook the elk brucellosis problem.

The unfortunate truth is that no one quite knows what to do with Greater Yellowstone’s proliferating bison. While many wildlife advocates fear a return to the last century’s bison slaughter policies, others fear the consequences of restoring the bison to its original ecosystem, virtually the entire Northern Plains. Yet others see the
imminent demise of the cattle industry if bison are ever permitted outside national park boundaries. Each of these scenarios, however, masks a false choice between bison and cattle. Rather than eliminating bison to eradicate brucellosis, the wildlife brucellosis problem can be addressed by reducing the risk of disease transmission, which is already quite low. In the absence of any congressional statutory direction on the issue of wildlife brucellosis, the courts have avoided making a clear-cut choice between Yellowstone's wildlife populations and the region's cattle industry. Federal and state officials, therefore, have the legal authority to implement a coordinated wildlife brucellosis control policy that acknowledges the ecological realities of the Greater Yellowstone setting, as well as the practical realities of managing wildlife and cattle. In short, the wildlife brucellosis problem must be addressed with the use of ecosystem management techniques.

It is unlikely that brucellosis will soon be eliminated from Greater Yellowstone's wildlife populations. Some small risk of transmission to cattle will continue. Property owners adjacent to the national parks and forest lands where wildlife roam without regard to legal boundaries will have to live with the threat of brucellosis. Under the current law, they have only limited recourse. But should existing federal or state law become an impediment to a regional wildlife brucellosis control policy, Congress will have to address squarely whether bison or cattle should be accorded priority in the Greater Yellowstone region. If bison do not prevail over cattle here, then are wildlife ecosystems secure anywhere on the public domain? Having once successfully rescued the bison from near extinction, surely we can protect the biological integrity of a few free roaming bison populations in and around the world's first national park. At least the law should not be an insurmountable obstacle for the bison.

**Postscript**

On October 21, 1992, the U.S. General Accounting Office issued a report on the Yellowstone brucellosis controversy, which concluded that "[s]everal factors indicate that the risk of [brucellosis] transmission in the northwest area of Yellowstone Park may be low." In the event of a brucellosis outbreak, the report estimated that Montana's statewide cattle export testing costs would total slightly less than one half million dollars annually. It also estimated that 800-1,300 cattle in Montana are directly at risk of contact with brucellosis-exposed bison from Yellowstone park. During December, 1992, citing inadequate time to prepare necessary environmental documents, Yellowstone officials denied Texas A&M University researchers permission to trap and remove sixty bison to study how brucellosis affected them. By mid January, 1993, neither Yellowstone nor Grand Teton park officials had yet issued bison management plans.
Listed below are the names, titles, and affiliations of the individuals we interviewed, either personally or by telephone, in the preparation of this article.

Bob Brooks, Assistant U.S. Attorney, Butte, Montana.
Bob Budd, Executive Director, Wyoming Stockgrowers Association, Cheyenne, Wyoming.
Steve Cain, Biologist, Grand Teton National Park.
Barry Davis, Supervisor, Shoshone National Forest.
Don Ferlicka, D.V.M., Montana State Veterinarian, Helena, Montana.
Bill Gentle, Deputy Commissioner, Wyoming Department of Agriculture, Cheyenne, Wyoming.
Mike Hedrick, Manager, National Elk Refuge.
Noel Larrivee, Attorney, Missoula, Montana.
Bob Martinka, Area Supervisor, Montana Fish, Wildlife and Parks Department, Bozeman, Montana.
Mary Meagher, Biologist, Yellowstone National Park.
Rod Miller, Public Lands Coordinator, State Planning Office, Cheyenne, Wyoming.
Jack Neckles, Superintendent, Grand Teton National Park.
Lloyd Oldenberg, Idaho Fish and Game Department, Boise, Idaho.
David Price, Resources Management Division, Yellowstone National Park.
Don Rolston, Commissioner, Wyoming Department of Agriculture, Cheyenne, Wyoming.
Bruce Smith, Biologist, National Elk Refuge.
Jeanne-Marie Souvigney, Program Assistant, Greater Yellowstone Coalition, Bozeman, Montana.
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