**BEFORE THE SECRETARY OF THE INTERIOR**

# A PETITION TO PROTECT YELLOWSTONE'S WILD BISON FROM EXTINCTON

**DOOR TO EXTINCTION for America's last wild bison: the North Gateway of Yellowstone National Park. At its top is inscribed "For the benefit and enjoyment of the people."** ***This photo is released by the copyright holder James Horsley to the public domain.***

PETITION UNDER THE ENDANGERED SPECIES ACT FOR THE LISTING OF THE WILD HERDS OF BISON IN YELLOWSTONE NATIONAL PARK AS ENDANGERED OR THREATENED WITH EXTINCTION IN A SIGNIFICANT PORTION OF THEIR RANGE

> *"When people describe what's happening here as a national tragedy, I don't disagree with them . . . We are participating in something that is totally unpalatable to the American people, and it's something we are not convinced that science justifies."* [Yellowstone National Park Superintendent Mike Finley following the winter of 1996-97 when over 1000 bison, attempting to leave the park to escape its harsh winter, were either executed or sent to slaughter by Montana Department of Livestock officials.]

*“We have our own mandate just like the park has theirs, and ours is to eliminate brucellosis . . . If we drop our guard and let the diseased bison roam freely out in the countryside, we’re inviting trouble.”* [Animal and Plant Health Inspection Service (APHIS) Veterinarian Mike Gifford. (Brunner, 2011, p. 2).]

*“Greater Yellowstone is absolutely irreplaceable. If we, as a society, cannot protect this spectacular, iconic place that inspires people worldwide with its breathtaking beauty, incredible wildlife, vast landscapes and vision for the best that this country can be in protecting our natural heritage—if we cannot leave this place wild and intact as a legacy for the future—where can we?”* [Sierra Club: Resilient Habitats, 2014]

*“The buffalo is more than an animal. It is the sun's shadow.*
*Our lives are bound to it. If it lives, we live.*
*If it dies, we die. It is our life and our living shield.”*
[Words spoken to N. Scott Momaday by an old Kiowa man at Medicine Park, Oklahoma (Momaday, 2014).]

*Who's afraid of the big bad wolf,*
*The big bad wolf, the big bad wolf;*
*Who's afraid of the big bad wolf,*
*Tra la la la la*
[Popular song written by Frank Churchill]

**Notice of Petition**

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**Submitted this 2nd day of March, 2015**

**Declaration**
Pursuant to the Endangered Species Act, James Horsley, hereafter referred to as the petitioner, hereby petitions the Secretary of the Interior, through the United States Fish and Wildlife Service, to protect the wild bison of the Greater Yellowstone Ecosystem as an endangered or threatened species or distinct population segment of a species. According to the act, the FWS must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." FWS must make this initial finding to "the maximum extent practicable, within 90 days after receiving the petition." Petitioner also requests that critical habitat be designated for the Yellowstone bison concurrently with the species being listed. The designation of this requested critical habitat as exclusively for wildlife only should be granted because it represents the most scientifically realistic solution to the protection of cattle from the threat of interspecies transmission of *B. abortus* by park wildlife, as well as the protection of the genetic diversity of wild bison in the GYE.

The petitioner supports the petition filed Sept. 15, 2014, by the Friends of Animals and the Buffalo Field Campaign asking the National Park Service (NPS) and the U.S. Forest Service (USFS) to undertake a population study of the Yellowstone bison herd, revise the Interagency Bison Management Plan (IBMP) to correct scientific deficiencies, and make the plan consistent with the best available science. The petitioner supports the groups' request that the capture, removal or killing of bison at the Stephens Creek area of Yellowstone National Park and the Horse Butte area of the Gallatin National Forest be prohibited, as well as any other area in the GYE, until a study is completed.

The position that it is cattle that should be managed, not bison—as argued recently by the Western Watersheds Project and the Buffalo Field Campaign in a recently submitted petition to list the park's wild bison—is also supported by this petitioner. That petition states:

> Current Yellowstone bison management outside the Park is governed by the IBMP. However, the IBMP was not designed to protect bison and their habitat but rather to keep bison out of their habitat outside of the Park. Although the threat of brucellosis transmission

could be more easily pacified through management of domesticated cattle rather than bison, the agencies have chosen the wrong ungulate to manage (Connor, 2014).

**Injunction sought**

The petitioner requests that the slaughter of 900 bison this year and 900 next year—scheduled to begin January 15, 2015 and ongoing at the date of the submission of this petition—be barred by means of an injunction. Further, to remove the perceived necessity of this slaughter, as part of the injunction, the petitioner requests the removal of all cattle from grazing lands adjacent to the borders of Yellowstone National Park as a national biosecurity measure. The petitioner asks Dan Wenk, Yellowstone National Park Superintendent, or Sally Jewell, Secretary U.S. Department of the Interior, who are responsible for the protection of wildlife in the park, to so seek injunctive relief based on the information contained in this petition. The injunction is necessary to protect wild bison from possible extinction of this species and its wild phenotype and behavior, while a 90-day finding is being conducted on the merits of this petition as well as the petition for listing wild Yellowstone bison recently filed by the Buffalo Field Campaign and the Western Watersheds Project. The authority for such an injunction is given by the Yellowstone Act of 1872 which states that the Secretary of the Interior "shall provide against the wanton destruction of the fish and game found within said park, and against their capture or destruction for the purposes of merchandise or profit." Clearly, the destruction of the wild bison herd now being carried out on park property is being conducted to benefit the commercial interests of cattle operations contiguous to the park.

**Petitioner**

I, James Horsley, am a resident of Fargo, North Dakota, and am the author of a petition (see Appendix) submitted February 11, 1999, to list the Yellowstone National Park (YNP) bison herd as threatened or endangered under the Endangered Species Act (ESA). The petition was submitted following the slaughter of over 1,000 bison by the Montana Department of Livestock as they crossed the border of the park seeking forage during the severe winter of 1996-97. I sought to have the herd listed as a distinct population segment because the bison "herd is the only wild, unfenced buffalo herd in the nation.'' I argued that killing only bison that cross the borders of the park is genetically removing bison with the ability to migrate, thus contributing to the elimination of that instinct in wild bison, compromising their ability to survive harsh winters.

I have been publisher of the *Prairie Journal*, a regional newspaper, as well as an instructor in English composition at College of the Desert, Palm Desert, California; a speech writer for the California Medical Association and the State Bar of California, and an account executive with the public relations firm Daniel J. Edelman, San Francisco, California.

**Overview of 90-day finding of 2007**

The U.S. Fish and Wildlife Service concluded August 15, 2007 that the YNP bison herd satisfied the two essential requirements to be listed as either endangered or threatened, that it was both "discrete" and "significant." The FWS found that while there are 500,000 bison in North America, including 50 herds (containing approximately 19,200 head) managed with conservation objectives, "YNP is the only area in the United States where bison have existed in the wild state since prehistoric times." "Conservation herds" refer to those herds managed by federal, state, municipal or private entities without commercial intent.

The FWS found that the YNP bison may be discrete from other members of the taxon Bison bison because of physical distance and barriers. The herd was considered significant because it is the only wild herd that has remained in an unfenced setting since prehistoric times and because it was uniquely genetically pure and diverse, one of two populations "which at this time do not have any evidence of domestic cattle introgression and also have high levels of unique genetic variation in relation to other federal populations," noting that "All other bison in the United States are reconstituted herds and are confined with fencing, or otherwise range restricted."

However, it also concluded that the petition did not provide substantial information to indicate listing may be warranted. It held that the YNP bison herd is not in danger of going extinct because there are sufficient numbers and because the current government management practice of lethal control of bison crossing the park borders has not reduced the population of the herd to a point of being in danger of extinction. Further, it found that the herd's ability and instinct to migrate were not being compromised by killing only migratory bison (those attempting to leave the park) because so far some bison were still migrating, that is, attempting to leave the park, nevertheless. (Endangered and threatened wildlife and plants; 90-day finding on a petition to list the Yellowstone National Park bison herd as endangered, 2007).

In a press release August 17, 2007 following the listing denial, headed "Yellowstone National Park Bison Do Not Meet Criteria for Listing Under the ESA: Management Plan Now Provides Substantial Protection for Herd," the FWS stated:

> The Service finds that the YNP bison herd is not in danger of going extinct. Since the petition was filed, a multi-agency Joint Bison Management Plan was finalized in 2000. The plan provides substantial protection for the YNP bison herd and therefore there is not a current credible threat to the herd's existence, which would be necessary to list the herd under the ESA (Davis, 2007).

However, the petitioner contends that it is now the Joint Bison Management Plan, now called the Interagency Bison Management Plan (IBMP), itself that is posing a credible threat to the herd's existence.

**New information**

The petitioner claims that substantially new information is contained in this present petition beyond information contained in his petition submitted in 1999, warranting its consideration. New information will show the 2007 finding was in error and that the Yellowstone bison herds should be listed under the ESA because there is a current credible threat to the herds' existence.

**Figure 1. WILD BISON GRAZING FREELY near hot pools in Yellowstone National Park (Yellowstone Park bison herd, 2014).** ***Photo by Daniel Mayer.***

**Figure 2. RANGERS HERDING BISON into the Stephens Creek bison pen January 1997. Government agents on horseback and in vehicles pushed 1,100 bison into the capture facility that severe winter. The bison were then loaded onto livestock trailers and shipped to a slaughter house (Yellowstone's Photo Collection, 2015).** ***Photo by Jim Peaco.***

## SUMMARY

James Horsley, a private citizen, is petitioning the US Fish and Wildlife Service to list the Yellowstone bison as an endangered Distinct Population Segment (DPS) of plains bison, *Bison bison bison* and as an endangered species of mountain bison or buffalo, also called wood bison, *Bison bison athabascae.* This latter bison is currently not recognized by park authorities and is thought to be extinct in the United States, but most likely still inhabits the remote regions of the park, as discussed in this petition.

The petition seeks the restoration of the original and historical habitat of the Yellowstone bison and the creation of a cattle-free zone around the Greater Yellowstone Ecosystem in the interest of national security and to mitigate the spread of wildlife brucellosis to livestock.

The Yellowstone bison are the last remaining, non-extirpated bison in the United States and are unique in that they have inhabited continuously the Yellowstone region since prehistoric times. The present Interagency Bison Management Plan that manages this herd is in practice a government bison extermination program operating primarily in behalf of the Montana Department of Livestock. Listing is necessary to promote the necessary protection for this unique wild bison remnant that presently is being driven into extinction by the governmental agencies comprising the IBMP.

Listing would benefit the nation economically by providing enhanced protection from the spread of brucellosis as well as a less costly method for such protection, which is now costing the taxpayer $3 million annually.

If these large-scale lethal removals are allowed to continue, valuable genetics related to the migratory trait of wild bison may be lost forever, significantly damaging the genetic diversity of Yellowstone's wild bison and their ability to survive as a wild species. Large-scale removals are contrary to the scientific findings that oppose such massive herd reductions.

Eyewitness views of what is going on in the park with regard to lethal removals and hazing of Yellowstone's wild bison can be seen on YouTube at:

- Shame on Yellowstone, 2015 (https://www.youtube.com/watch?v=hwVwvK7dK3c),

- Bison Helicopter Haze, 2013 (https://www.youtube.com/watch?v=68VfwlDnVL8).

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## NEWS RELEASE FOR PETITION

For Immediate Release, March 2, 2015

Contact: Jim Horsley, (701) 212-0353, jahorsley@yahoo.com, www.buffalopeople.org

### Petition Filed to Save Wild Herd of Yellowstone Bison from Extinction

FARGO, NORTH DAKOTA—A petition to list the wild herds of bison in Yellowstone National Park as endangered was filed today by a private citizen in an attempt to save this iconic species from extinction. It is one of two such petitions recently filed.

James Horsley, a resident of Fargo, North Dakota, filed the petition under the provisions of the Endangered Species Act, which was created, as the act states, to protect critically imperiled species from extinction as “a consequence of economic growth and development untempered by adequate concern and conservation.”

Horsley claims that the wild herd of about 4,900 animals is being driven to extinction by a coalition of government agencies formed specifically to prevent wild bison from migrating out of the park into the state of Montana. The coalition is called the Interagency Bison Management Plan (IBMP).

The Yellowstone bison are recognized as the only wild, unfenced bison in the nation that have continuously inhabited their present habitat since prehistoric times.

The bison are not allowed to leave the park because the state of Montana contends that these animals have the potential to infect cattle that are grazing on public and private land immediately adjacent to the park with brucellosis, a disease that can cause cattle, bison and elk to abort. At present there are about 1,000 cattle grazing near the park, all within the Greater Yellowstone Ecosystem.

To carry out this government posse action—which involves rangers and other government officials on horseback, as well as in squad cars, ATVs, pickups, snowmobiles and helicopters—a total of $3 million is spent annually, as documented by the Government Accountability Office (GAO), which was critical of the operation.

This winter the IBMP plans to kill 900 animals, with the posse beginning its “lethal removal” actions, as the IBMP calls the culling, January 15, 2015. At the date of this submission, according to reports by Buffalo Field Campaign patrols, over 700 Yellowstone bison have been killed either by hunting or by being trapped in a capture facility and sent to a slaughter house.

Millions once inhabited the Great Plains. Following the herds’ destruction in the 1870s, only a few bison were left huddled in the park. Most probably, they survived in Yellowstone because of the thermal pools, which provided a refuge from hunters and forage free of snow in the winter.

“And now we are still working toward the annihilation of this animal, which early man encountered 10,000 years ago in travelling from the Old World to the New World over the Bering Land Bridge.

The ancestors of the American Indian tribes called the Clovis people migrated through a corridor in the retreating glaciers. As the ice melted, the ocean waters rose and cut off that passage between the two continents. When this wild species is lost, so will be that connection between early man and ourselves," Horsley said.

Under Montana state law, if a wild bison crosses the boundary of the park in an attempt to find forage in the lower regions just outside the park during severe winter conditions, a posse of government agents has the authority to drive them into the Stephens Creek capture facility located on park property or into other similar traps. From there they are loaded onto livestock trucks and shipped to a slaughter house.

"Epidemiologically, it makes no sense and is a total waste of tax-payers' money," Horsley said. "The idea is to keep cattle separate from disease-carrying wildlife in the park. While there is no documented case of bison spreading brucellosis to cattle under open range conditions such as exist just outside the park, elk have infected cattle. They have been identified as a much greater risk factor for transmitting the disease to cattle. However, elk are allowed to comingle with cattle in these regions and elk are allowed to migrate. But not bison. Go figure."

No benefit in disease control is realized if one species with brucellosis is allowed to come in contact with cattle, while the other is not, Horsley pointed out.

"The park is recognized internationally as a wildlife treasure, yet it is being managed like a stockyard," Horsley said. "Part of the problem is that the Montana Department of Livestock is basically in charge of the IBMP. The Montana DOL views bison as livestock and so does Montana law."

Horsley originally filed a similar petition in 1999 to list the wild herd as a "distinct population segment," a special designation for a species that may be abundant elsewhere, but are unique, significant, and genetically and behaviorally distinct at another location. The US Fish and Wildlife Service determined eight years later in 2007, following a review of his petition, that the Yellowstone bison were indeed significant and distinct, but not in danger of extinction because they were being managed by the IBMP.

However, since that determination, Horsley claims in his petition that the IBMP itself has become the greatest threat to the Yellowstone bison's continued existence as a wild species.

"By not allowing the wild bison to migrate, they are in effect domesticating Yellowstone bison, for the only bison that survive the government posse are those that do not migrate. The trait of migration has associated with it such traits as aggressiveness, a sense of fear and leadership. Those left behind in the park to breed are the non-migratory and possibly the more docile. Contrary to the evolutionary forces of natural selection and survival of the fittest, the IBMP has turned Mother Nature on her head. What survives now is potentially the less wild and the less fit bison, those that don't migrate," Horsley said.

Horsley also contends in his petition that in addition to the plains bison species *Bison bison bison*, the park also contains a species unrecognized by current park officials, namely, mountain bison, also called wood bison, *Bison bison athabascae.*

Historically, early park visitors and scientists identified a species separate from the more common plains bison as existing in the park, an animal described as being smaller, more fearful and more fleet. There have also been such sightings recently, Horsley said.

"Several years ago I talked with a former park ranger who said such a herd exists in the most remote regions of the park," Horsley said. "But the Fish and Wildlife Service denies this. In response to my original petition, the FWS in 2007 stated that "This controversy has since been resolved, and YNP staff now considers the remnant population, as well as the introduced bison, as being of plains bison origin."

However, neither park officials nor other biologists have conducted studies concerning the species' existence in the park, Horsley said.

"If they are not there, where did they go?" Horsley asked. "Maybe members of that unique herd tried to migrate and were shipped to slaughter by the IBMP. What is going on at the borders of Yellowstone National Park, which was founded to help protect wild bison from poachers, is ecologically tragic."

A simple, disease preventive, economical solution exists, according to Horsley.

"Withdraw grazing permits on these public lands and prohibit cattle from grazing in those relatively small regions near the park," Horsley said. "This would not only save millions of dollars and assure that wildlife does not transmit brucellosis to cattle, but also help secure the future of the park's bison."

In his petition Horsley has appealed to Dan Wenk, Yellowstone National Park Superintendent, and Sally Jewell, Secretary U.S. Department of the Interior, to file an injunction prohibiting the ongoing slaughter of these animals by the IBMP until the FWS can complete a 90-day finding on his petition, as well as a similar petition filed to protect wild bison by the Western Watersheds Project and Buffalo Field Campaign.

The agencies originally composing the IBMP beginning in 2000 are National Park Service (NPS), U.S. Forest Service (USFS), Montana Department of Fish, Wildlife, and Parks (FWP), Montana Department of Livestock (DOL), and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS). Added to those agencies in 2009 were the Confederated Salish & Kootenai Tribes (CSKT), Inter Tribal Buffalo Council (ITBC), and Nez Perce Tribe (NPT).

Horsley has worked in the fields of publishing, public relations and education.

# # #

## OVERVIEW

It is the winter of 2015, the 13 day of February. Yellowstone National Park is in the process of capturing and slaughtering its iconic wild bison in an attempt to reach its goal of eliminating 900 this year and 900 next year, 100 percent of which are from the migratory herd. It is an artificially selective process. Many of the animals are pregnant. Many of the mothers are followed by their calves. The non-migratory do not try to leave the park and thus do not get into the trap prepared for them, a funnel of fencing that leads into the Stephens Creek capture facility.

The bison escorts—our very own protectors of the park, the Yellowstone rangers—and agents of the Montana Department of Livestock, are mounted on horses to drive them into this funnel. They yell "hey, hey, hey, yo, yo, yo" as though they were herding cattle. Outside the facility, which is built on park land not too far from the north entrance, is parked an array of pickups and livestock trailers. This is the staff's busiest time of year.

Once the bison enter the funnel they are processed through the various chutes that squeeze them single file onto the loading ramp, where they will enter the open doors of a livestock trailer. The doors will be shut and from here they go on a long ride to the slaughter house. The area around the facility is closed to the public while it is in operation.

Hunting is still going on. Montana Fish, Wildlife and Park's buffalo hunt "hotline" informs hunters about the location of bison that have come down from the higher altitudes and have left the park, entering the killing zone. Hunters then rush to the designated spot.

Out of the goal of culling 900 this year, between those killed by hunting and those captured and sent to slaughter, they have already reached the 525 mark (Update from the field, February 12, 2015).

We are led to believe a number of falsehoods. For instance, the National Park Service website titled "Frequently Asked Questions: Bison Management," announcing the present culling activities, leads us to believe that the culling will be done randomly. NPS states:

> The plan is to capture and ship at least 50 to 100 bison per week from mid-January through mid-February without regard for age, sex, or disease status.

We are led to believe that the culling is necessary because of issues related to disease. The NPS states:

> Yellowstone bison have been chronically exposed to the non-native disease brucellosis that can be transmitted to cattle and cause them to abort calves. As a result, bison are not allowed to move unimpeded into cattle-occupied areas in Montana.

We are led to believe that the culling is also necessary because of the threat of a bison mass migration into Montana. The NPS states:

> Biologists from the National Park Service (NPS) have proposed removing 900 bison near the northern boundary this winter to reduce population growth and the potential for a mass migration of bison into Montana (Frequently Asked Questions: Bison Management, 2014).

However, what we are *not* told by the NPS in its announcement of the culling is the truth: that only migratory bison are being selected for culling, that actually elk are the greatest threat of brucellosis transmission to cattle (yet elk are not being culled), that those bison migrating north out of the park would be restricted from going any further by barriers at Yankee Jim Canyon, a few miles distant, and that recommendations have been made against large-scale herd reductions of bison by the NPS itself due to the potential of increasing the rate of genetic loss.

All this so cattle can graze in a wildlife sanctuary.

Nearing the completion of this petition, in a last-minute attempt to get a straight answer from the National Park Service, I wrote the following email to Rick Wallen, Wildlife Biologist, Bison Ecology and Management Team, Yellowstone National Park, with whom I had previously corresponded. Here is the email, dated Tuesday February 3, 2015:

> Mr. Wallen,
>
> Thanks for your reply. I will soon be submitting a petition to list the wild bison in Yellowstone National Park. On the NPS's "Frequently Asked Questions: Bison Management" website under the question "What is the current bison population?" it says this:
>
> "Biologists from the National Park Service (NPS) have proposed removing 900 bison near the northern boundary this winter to reduce population growth and the potential for a mass migration of bison into Montana."
>
> I would be interested in knowing who these biologists are and what studies they are relying on for that statement. I would also be interesting in knowing if this ongoing culling is selecting only migratory bison.
>
> My best,
>
> Jim Horsley

Here was his reply, dated Wednesday, February 4, 2015:

> Mr. Horsley,
>
> The report we produced to evaluate the annual abundance and distribution of the population was presented to the managers in August of 2014. Much debate ensued and the final operations plan by the agencies was completed in December. To help inform that debate we provided a prediction of what to expect for migration of Yellowstone bison this winter based

on our previous work studying the relationship between population abundance, distribution and winter severity. That report was provided to the managers in September.

All three of these reports are provided to interested constituents to review as well and can be found at a world wide web site called IBMP.INFO. I encourage you to take a look at our reports and the interagency operations plan that the agencies produced. Follow the link on ibmp.info titled Library and there you will find a second link titled Winter Operations and Surveillance/Harvest Plans. You can see that we post these documents each year for interested folks like yourself to study the details of our recommendations . . .

Rick Wallen

I was being directed to get the answers I wanted from the IBMP, the group that is in charge of the wild bison culling. I went to the sites as directed and learned that the authors of the documents were all biologists with Yellowstone National Park, which, through its affiliation with the National Park Service, is a partner with the IBMP. The supporting studies cited in these documents were predominately park staff also.

The documents were revealing. Three categories were listed for the year 2015 under Winter Operations and Surveillance/Harvest Plans. Under each category was a document. Categories and document titles plus authors follow:

- Winter Populations Disease Model:

  "Population Dynamics and Adaptive Management of Yellowstone Bison," August 5, 2014, by Chris Geremia, Rick Wallen, and P.J. White, Yellowstone National Park.

- Winter Operations Plan:

  "Operating Procedures for the Interagency Bison Management Plan," signed approval by the following organizations (names of individual signers omitted as some were not legible):

  Animal and Plant Health Inspection Service, District Director, Veterinary Services;
  Confederated Salish Kootenai Tribe, Chairman;
  Intertribal Buffalo Council, President;
  Montana Board of Livestock, Executive Officer;
  Montana Fish, Wildlife, and Parks, Region 3 Supervisor;
  Montana State Veterinarian;
  National Park Service, Superintendent, Yellowstone National Park;
  Nez Perce Tribe, Chairman;
  U.S. Forest Service, Forest Supervisor, Custer Gallatin National Forest.

- Winter Bison Spatial Distributions:

> "Spatial Distribution of Yellowstone Bison—Winter 2015," September 5, 2014 by Chris Geremia, Rick Wallen, P. J. White, Yellowstone National Park, and Fred Watson, California State University, Monterey Bay.

**First document**

On reading "Population Dynamics and Adaptive Management of Yellowstone Bison," it appears that biologists, at least in this document, are not concerned about a massive migration into Montana. They are instead hopeful that *enough* bison come toward the park's borders so they can kill 900 of them, the recommended culling level for this year (2015). The authors state:

> We recommend removing 900 bison during the forthcoming winter, including 180 calves, 70 yearling females, 410 adult females, 60 yearling males, and 180 adult males. To reduce abundance and productivity, it is most important to meet the removal objectives for females and calves.

They believe this is achievable because:

> Predicted migrations suggest sufficient numbers of bison will move beyond park boundaries to facilitate the recommended removals.

Further, because "large removals (e.g., >1,000 animals)" could "threaten long-term preservation of Yellowstone bison" IBMP managers decided on "moderated culls." The authors noted:

> In 2008, IBMP managers decided to implement moderated culls in an attempt to avoid large annual fluctuations in the bison population, which occurred during the early IBMP period and could threaten long-term preservation of Yellowstone bison, cause societal conflict, and reduce hunting opportunities outside the park. The removal of 900 bison (as recommended above) during each of the next two winters through hunting and culling should reduce abundance to approximately 3,500 before calving.

"Moderated culls" is 900 bison this year and 900 bison next year. Like beauty, "moderated" is in the eyes of the beholder. And what is the reason for reducing the bison herd to 3,500? Under "Need and Purpose," we have an answer:

> Yellowstone bison are managed under an Interagency Bison Management Plan that is primarily designed to reduce the risk of brucellosis transmission from bison to livestock. Pursuant to this plan, bison are supposed to be managed towards an end-of-the-winter guideline of 3,000 animals.

Apparently, the IBMP actually wants to reduce the populations to 3,000 and is working its way down toward that number. But why? As we shall find out, when the bison population in the park goes beyond 3,000 head, the IBMP believes that such a bison density will trigger migration out of the park. When bison migrate out of the park the concern is that they will come in contact with cattle grazing on the perimeters. And when that happens, they might transmit the disease brucellosis to their cattle.

The only trouble with that line of thinking is that elk are not put through a similar gauntlet, yet they pose a greater threat of transmitting the disease to cattle. Elk used to be culled by the park to prevent overgrazing. On average 2,000 elk were lethally removed each year. But that practice was stopped in 1968 due to public outrage. With the subsequent introduction of wolves into the park the overgrazing ceased.

**Figure 3. HAZING ELK BY HELICOPTER into a capture facility at Crystal Creek in January 1968. Ted Scott (Yellowstone's Photo Collection, 2015).**

**Figure 4. ELK HERDED INTO A TRAP at a capture facility in February 1965. Ted Scott. (Yellowstone's Photo Collection, 2015).**

**Figure 5. LOADING ELK ONTO A TRUCK for shipment to a slaughter house in February 1965. Ted Scott. (Yellowstone's Photo Collection, 2015).**

This differential in actions to separate species, where one brucellosis reservoir (bison) is removed from the presence of cattle, while the other (elk) is not, is not only rotten epidemiology, it accomplishes no disease control whatsoever. In light of this one fact alone, the IBMP is providing a useless, make-work service that serves only one purpose: increasing yearly the probability of the extinction of the Yellowstone bison as a wild species.

But then, again, maybe it is not all about separation and stopping migration after all. Just about the time one thinks one understands the perspective of the documents referenced by Wallen, such as the one he helped write, "Population Dynamics and Adaptive Management of Yellowstone Bison," one reads this on the next-to-the-last page:

> Furthermore, building evidence (3) suggests that end of winter herd sizes of >2,500 northern and >1,500 central may be more appropriate for maintaining annual migrations where sufficient numbers of animals move beyond the northern park boundary to support state and tribal hunting outside of Yellowstone and removals that are large enough to offset growth. IBMP partners agreed to implement moderated culls in an attempt to avoid large annual fluctuations in the bison population, which occurred during the early IBMP period (Figure [6]) and could threaten long-term preservation of Yellowstone bison (4).

The document provided four citations (reference No. 1 same as No. 3). They are given below:


1. Geremia, C., P. White, J. Hoeting, R. Wallen, F. Watson, D. Blanton, and T. Hobbs. 2014. Integrating individual- and population-level information in a movement model of Yellowstone bison. Ecological Applications 24:346-362.

2. Geremia C., P. White, R. Wallen, F. Watson, J. Treanor, J. Borkowski, C. Potter, and R. Crabtree. 2011. Predicting bison migration out of Yellowstone using Bayesian models. DOI 10.1371/journal.pone.0016848

4. White, P, R. Wallen, C. Geremia, J. Treanor, and D. W. Blanton. 2011. Management of Yellowstone bison and brucellosis transmission risk—Implications for conservation and restoration. Biological Conservation 144:1322-1334.

Now it appears that migration is being encouraged, large reductions discouraged and a population of 4,000-plus targeted. The studies cited include Wallen himself and his long-time co-authors. Some of the relevant quotes from each citation given in support of the above quote will be provided below, followed by the petitioner's comment:

*Reference No. 1.* "Migration pathways were increasingly used over time, suggesting that experience or learning influenced movements. To support adaptive management of Yellowstone bison, we forecast future movements to evaluate alternatives. Our approach of developing models capable of making explicit probabilistic forecasts of large herbivore movements and seasonal distributions is applicable to managing the migratory movements of large herbivores worldwide. These forecasts allow managers to develop and refine strategies in advance, and promote sound decision-making that reduces conflict as migratory animals come into contact with people."

- If this is so, then why are IBMP decision-makers increasing conflict between migratory animals and people? Why are they culling the very animals that have acquired experience or learned behavior? How long can this selective culling last without harming that behavior?

*Reference No. 2.* "Simulations of migrations over the next decade suggest that allowing increased numbers of bison beyond park boundaries during severe climate conditions may be the only means of avoiding episodic, large-scale reductions to the Yellowstone bison population in the foreseeable future."

- If this is so, then why is IBMP recommending large scale culls?

*Reference No. 4.* "Frequent large-scale, non-random culls could have unintended effects on the long-term conservation of bison, similar to demographic side effects detected in other ungulate populations around the world."

- The study, however, never spells out at what level a reduction my be termed "large-scale," but recommends against large-scale fluctuations and reductions. It also recommended against "non-random culls," yet selects only migrating animals to cull.

So, in reality, are the reduction quotas large or moderate-scale reductions? Wallen provides a graph of the fluctuations over the years. Recall that the intent is to avoid large-scale reductions as has been the case in the past. If one projects the scheduled level of culling into the next two years, one comes up with a troubling picture, indeed: a 30 percent reduction of the herd.

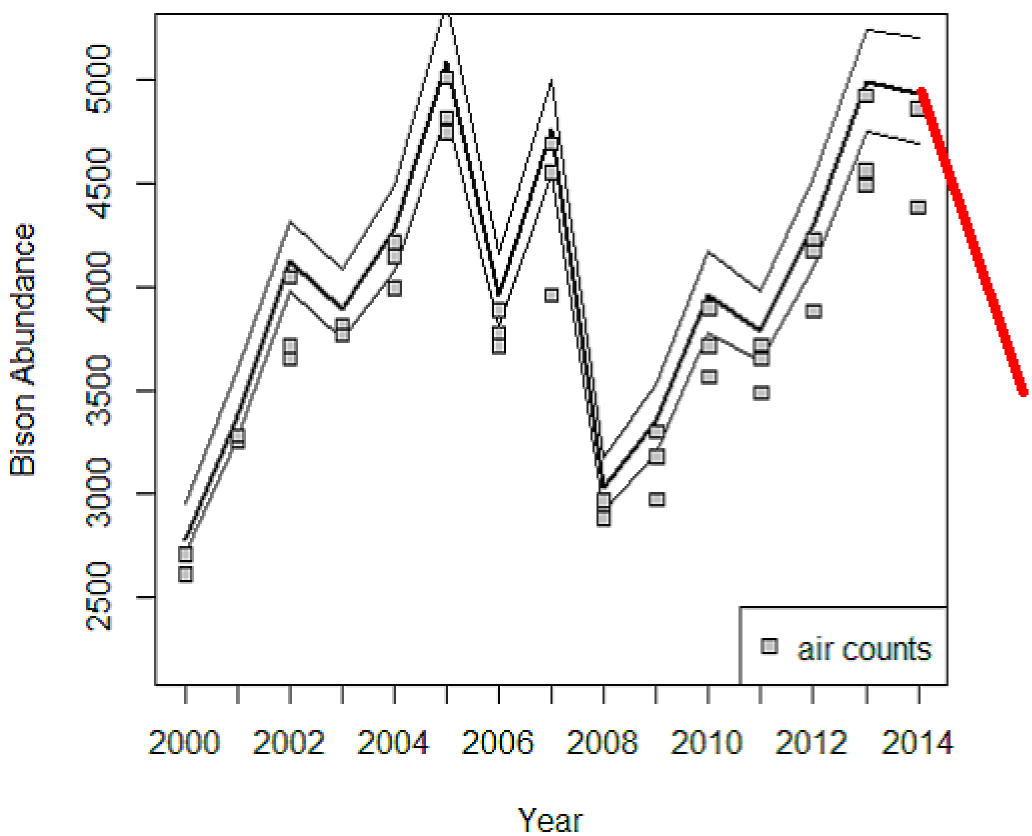


**Figure 6. PLANNED REDUCTIONS AMOUNT TO 30 PERCENT of the herd in two years. Figure based on estimated Yellowstone bison abundance from aerial counts conducted during the Interagency Bison Management Plan. Bold lines indicate mean abundance and thin lines show 95% credible intervals (Geremia, 2014). Red line drawn by petitioner as a projection.**

Note: the red line in Figure 6, drawn by the petitioner as an addition to the existing graph provided in the study, represents a projection of the predicted result of carrying out the planned reductions for the next two years of 900 plus another 900, including the additions of births, for a total two-year population goal of 3,500 head. Total reduction is 28.57 percent or approximately 30 percent. One can tell merely by looking at that projection that the planned magnitude of culling is large both in terms of fluctuation and the level of reductions.

The troubling aspect of all this is the irrationality and inconsistency. On one hand, we are told by an NPS website that 900 bison must be culled to stop a mass migration into Montana. On the other hand we are told that they can expect enough animals will migrate to “facilitate the recommended removals.” Then we are told the IBMP wants to reach a level of 3,000 in population. Then we are told later that in two years the level should be 3,500, but that maybe at some point 4,000-plus (>2,500 + >1,500) would be better, that is, a number that “may be more appropriate for maintaining annual migrations where sufficient numbers of animals move beyond the northern park boundary to support state and tribal hunting outside of Yellowstone and removals that are large enough to offset growth.”

That is, we need more bison to migrate so we can kill more so they won't migrate. Interesting reasoning.

At any rate, 900 x 2, or 1,800 bison, must be killed over a course of two years so as to "avoid large annual fluctuations in the bison population" because such large-scale reductions "could threaten long-term preservation of Yellowstone bison." But as noted, when one projects the plan, one comes up with a great fluctuation.

**Second document**

The second documents referenced by Wallen, "Memorandum December 19, 2014. Operating Procedures for the Interagency Bison Management Plan," essentially is an operations manual outlining the logistics of hazing and removing bison. A few samples follow. On page 8 we read:

> Hazing may be accomplished by personnel using ATVs, snowmobiles, on foot, horseback, and/or helicopters, and may include the use of cracker shells or rubber bullets.

Culling activities include hunting. Bison hunters have an added advantage—government-paid spotters and flushers. On page 9 we read:

> Hazing operations will be coordinated with the administration of the hunt. The NPS and MDOL will make efforts to integrate management of hazing actions with treaty and state-regulated hunting in Montana.

Apparently they have a little heart in their hazing. On page 8 we read:

> Furthermore, NPS rangers may at times ask the MDOL [Montana Department of Livestock] to cease helicopter hazing operations within Yellowstone National Park to allow bison to rest.

In the spring during bison calving season, to make way for the more important arrivals on the public grasslands just outside the park, our government will make sure everything is just right to accommodate their bovine guests. On page 9 we read:

> The IBMP members will coordinate in April to compile and update knowledge on bison movements and distribution, snow conditions, vegetation green-up, stream flow in the Madison River, logistical issues (e.g., staff, horse, and helicopter availability; traffic control; visitation and road closures), and cattle turn-on dates and locations.

Once this is done, the bison will be evicted. On page 9 and 10 we read:

> The IBMP members will assess this information and discuss a step-wise, integrated plan for hazing bison from the Gardiner and Hebgen basins back into Yellowstone National Park. The current target dates for bison to be back into the park are May 1 from the Gardiner Basin and May 15 from the Hebgen basin.

Now, if hunting does not kill enough bison then they will be captured: On page 10 we read:

> Bison may be captured . . . to reduce abundance if hunting will not achieve annual removal objectives . . . (Memorandum, 2014).

Once they are captured, they are shipped to a slaughter house.

This document contains a map of the Northern Management Area, describing various removal zones, with the intensity of hazing and lethal removal increasing as bison progress from one to the other. As one can see in Figure 7 below, Zone 1 begins in the park. The red dotted boundary denotes an area providing more tolerance of bison movements all year, part of proposed adjustments to the Interagency Bison Management Plan, with lethal removal beginning beyond that boundary, which is the crest of mountains.

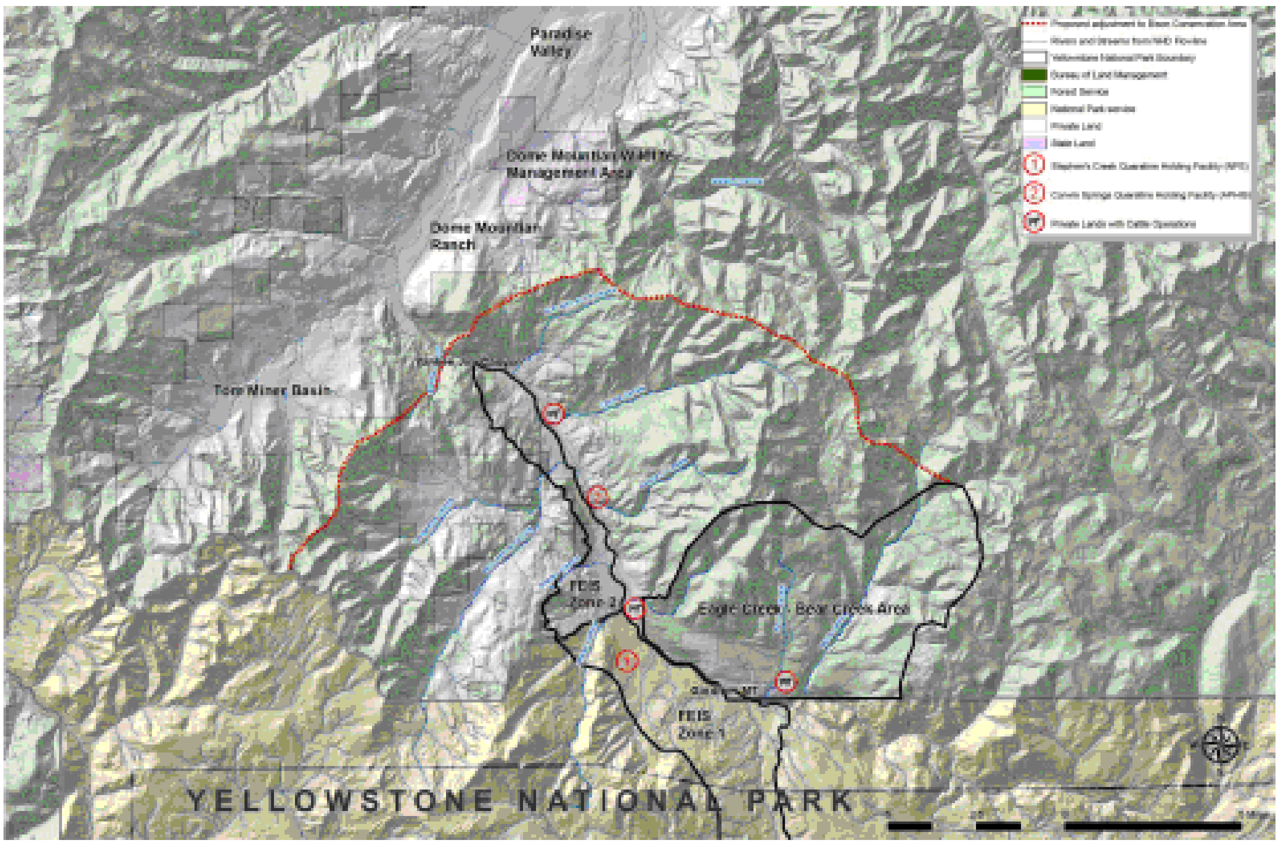


**Figure 7. IBMP NORTHERN MANAGEMENT AREA. Black lines demarcate management boundaries and zones. Dotted red line demarcates proposed adjustment to Bison Conservation Area (tolerance zone) within which some bison would be free to move (Memorandum, 2014).**

One of the alternatives, Alternative B, as proposed in the "Draft Joint Environmental Assessment Year-round Habitat for Yellowstone Bison" developed by Montana Fish, Wildlife and Parks along with the Montana Department of Livestock, would allow bull bison only to occupy Gardiner Basin all year. However, even though agreement was achieved, as will be described later, the proposal was shot down (tabled) by the Montana Board of Livestock. This cattle icon  denotes the location of private land with cattle operations. A closer look at grazing allotments will be given below.

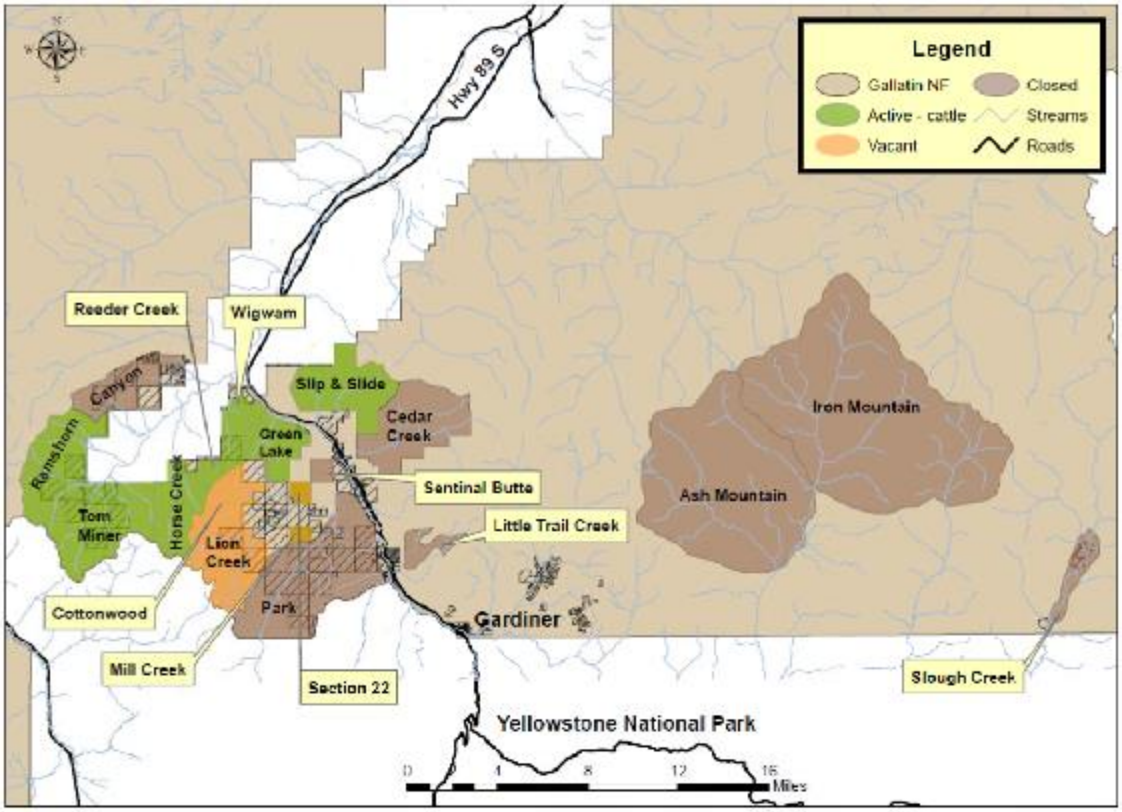


**Figure 8. GRAZING ALLOTMENT STATUS for 2012, Gallatin National Forest, Gardiner Ranger District (Year-Round Habitat Ap F, 2015).**

**Table 1. Summary of Livestock Use and Time of Use per Allotment Along the Northern Boundary (C. Rock GNF, pers. comm. 2013)**

| Allotment Name | Livestock Type | Period of Use |
|---|---|---|
| Green Lake | 46 cow/calf pairs | mid-June – mid-Oct. |
| Horse Creek | 125 cow/calf pairs, 3 bulls, & 31 horses | early July – end of Sept. |
| Slip & Slide | 30 cow/calf pairs | mid-June – mid Oct. |
| Tom Miner/Ramshorn | 260 cow/calf pairs | early July – mid-Oct.. |
| Wigwam | 56 cow/calf pairs | mid-June – end of Sept. |

According to the *Draft Joint Environmental Assessment:Year-round Habitat for Yellowstone Bison* by Montana FWP and the Montana DOL, the latest population assessments of the presence of cattle along the northern border state:

> . . . there are two year-round and six seasonal livestock producers in and near the Gardiner Basin. The two year-round operators winter their cattle in the Gardiner Basin and move the cattle to the Cinnabar Basin to graze in the summer. The seasonal producers manage herds ranging in size of 100-600 cow/calf pairs on private lands. The seasonal arrival date of cattle

on private lands is mid-May, and all are moved out of the northern management area by the end of December.

Some of the livestock operators have improved their existing fencing or installed new fencing with the DOL's assistance in order to maintain spatial separation between cattle and bison. Three active grazing allotments are within the existing bison-tolerant zone within the GNF. Use of the allotments range from mid-June until mid-October, and the allotments are only used by cattle. In additional to those allotments, there are three more allotments just north of the hydrological divide boundary of the bison-tolerant zone.

The table above summarizes the allotments along the northern border and Figure 8 shows their location. Total cow-calf pairs there are between 617 and 1,117, plus three bulls.

Along the western boundary area:

> . . . there are two private landowners that lease out their pastures for cattle grazing and one livestock owner that leases one of the USFS allotments. There are ten active grazing allotments within the GNF in the proposed year-round bison-tolerant zone. Use of the allotments range from mid-June until mid-October, and the allotments are used by either cattle or horses depending upon the location.

In Hebgen Lake region there are 10 active allotments in the Gallatin National Forest, the majority used for grazing horses. Total number of cattle are 89 cattle plus 70 cow-calf pairs.The table below summarizes the details of each allotment's use and their locations are shown in Figure 9 below.

**Table 2. Summary of Livestock Use and Time of Use per Allotment Along the Western Boundary (S. Lamont GNF, pers. comm. 2013)**

| Allotment Name | Livestock Type | Period of Use |
|---|---|---|
| Basin | 4 horses | July – mid-Oct. |
| Grayling | 24 horses | July – mid-Sept. |
| Moose | 4 horses | July – mid-Oct. |
| North Cinnamon | 40 horses | late June – mid-Oct. |
| Sage Creek | 129 horses | late June – mid-Oct. |
| Sheep/Mile | 89 cattle | June – mid-Oct. |
| South Cinnamon | 35 horses | late June – mid-Oct. |
| South Fork | 15 cow/calf pairs | July – early Oct. |
| Taylor Fork | 90 horses | June – late Sept. |
| Watkins Creek | 55 cow/calf pairs | July – early Oct |

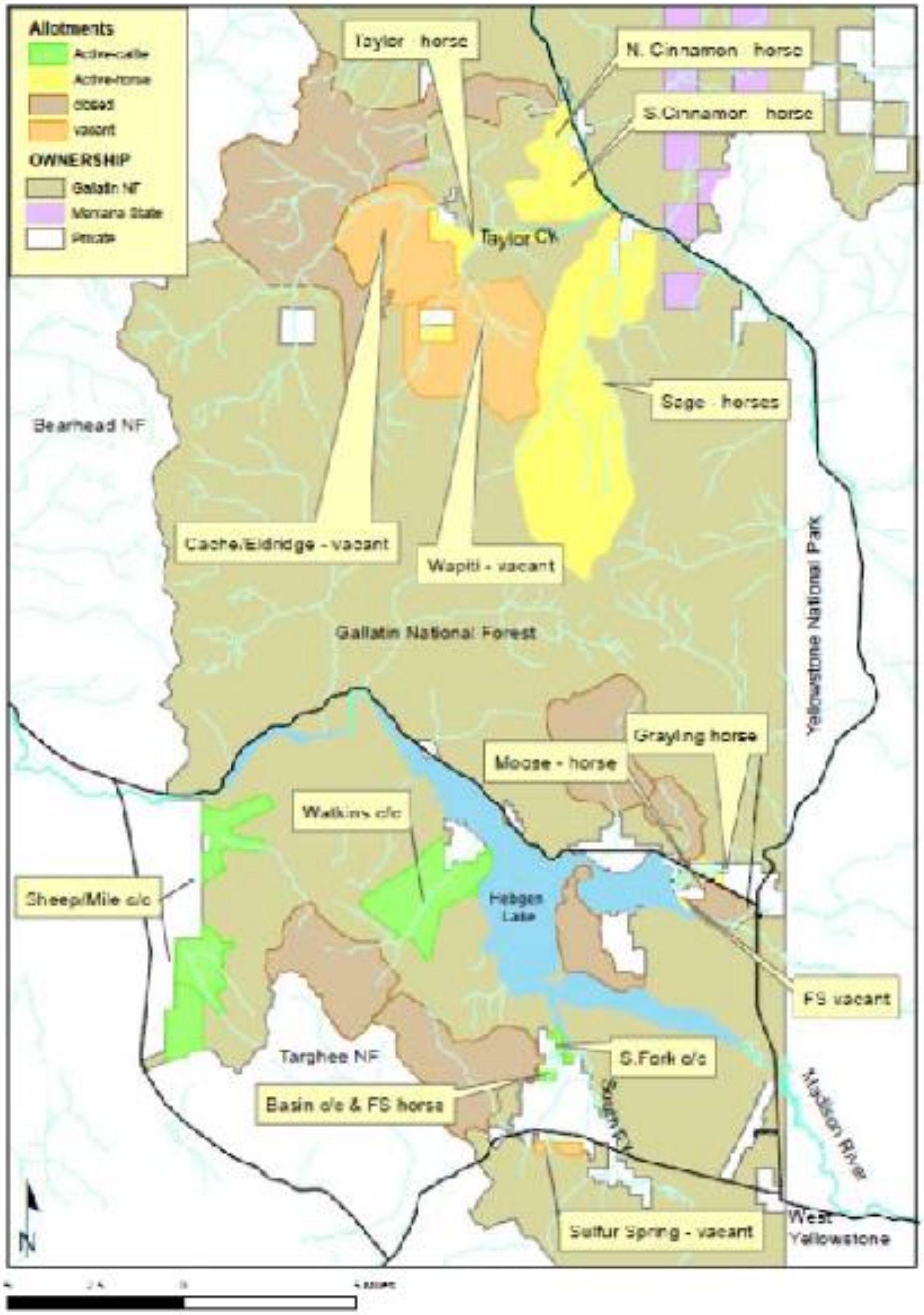


**Figure 9. RANGE ALLOTMENTS for 2012, Hebgen Ranger District (Year-Round Habitat Ap F, 2015).**

One can readily understand why IBMP does not focus its lethal removals on the west side of the park. There are only a few cattle grazing there. On the other hand, there are about 1,000 cow/calf pairs grazing on the northern perimeters of the park. To protect these cattle herds from the transmission of brucellosis from cattle, yet doing only half the job by skipping protecting these herds from a similar threat of transmission of the disease from elk, which is the greatest threat, the government is spending on this half-baked job about $3,000 per cow. Is there any epidemiological justification for this? Is there any fiscal justification? Is there any ecological justification? One purpose of this petition is to show there is not.

**Third document**

The third document referenced by Wallen, “Spatial Distribution of Yellowstone Bison—Winter 2015,” a document of which Wallen was a co-author, provides the following information in the Executive Summary:

> During July 2014, 4,865 bison were counted in Yellowstone National Park following calving, including 3,421 in northern Yellowstone and 1,444 in central Yellowstone. National Park Service biologists recommended removing 900 bison from the population during the forthcoming winter through hunter harvests (~300-400) in Montana and the capture and shipment of animals (~500-600) from northern Yellowstone to meat processing facilities. To assist with planning for these removals, current information about bison movements was used to predict the timing and extent of migrations to management areas near the Park boundary. Under average snow conditions, numbers of bison in the Northern Management Area (Mammoth to Yankee Jim Canyon; see Figure [12] ) should increase substantially during January through March 2015, with approximately 2,000 bison present by the end of winter. Smaller migrations of fewer than 1,000 bison are expected if snow conditions are well-below normal. In the Western Management Area (Madison Junction to the Hebgen basin), approximately 100 bison should be present throughout autumn and winter, with numbers increasing during March to about 350 bison during April and May. Natural migrations by bison back into the interior of Yellowstone National Park should begin in April in the Northern Management Area and early June in the Western Management Area.
>
> If weather conditions are approximately average, then sufficient numbers of bison should move to the Park boundary and into Montana to enable the recommended removal of 900 animals, primarily from the Northern Management Area. To limit impacts to hunting in the Northern Management Area, captures and shipments of bison should be implemented throughout the winter with small numbers (e.g., 25-100) of animals removed weekly through March. Captures and shipments of bison to meat processing facilities will likely need to be significantly biased towards adult females, calves, and juveniles to meet removal recommendations. It is important to begin these efforts early in winter to avoid sending females late in pregnancy to processing facilities.

Based on snow conditions, this document predicts the feasibility of providing enough bison to meet the goals for shipment of these animals “to meat processing facilities.” If weather conditions are average, “sufficient numbers of bison should move to the Park boundary and into Montana to enable the recommended removal of 900 animals.”

Again, to prevent a “mass migration,” the Yellowstone biologists are hopeful enough bison will migrate. Interesting reasoning.

In the end, one wonders what is being recommended to achieve their goals, that is, whether it is non-random “shipments of bison to meat processing facilities” “significantly biased towards adult females, calves, and juveniles to meet removal recommendations," or random removals "without regard for age, sex, or disease status," as stated by the NPS for the present culling?

Regardless, to meet the culling goal, most bison will not be allowed to migrate out of the park, but will be killed within the park as they congregate inside the borders to access forage there, forced out of the higher altitudes by snow conditions. Our own park is not safe for bison.

The *Record of Decision for Final Environmental Impact Statement and Bison Management Plan for the State of Montana and Yellowstone National Park,* which in 2000 established legally what management actions can be carried out toward wild bison, states the following:

> The agencies, therefore, would allow untested bison up to a tolerance level of 100 in both the northern and western boundary areas to freely range in both the western and northern boundary areas, and manage them as described above.
>
> In the spring, the agencies would haze all bison remaining in the Reese Creek or western boundary areas back into the park. The agencies would use capture facilities in Stephens Creek and the West Yellowstone area to maintain the bison population at 3,000, to enforce tolerance levels of bison in either the Reese Creek and West Yellowstone boundary areas, and to ensure no bison remain outside the park after the respective haze-back dates (Record of Decision, 2000, p. 13).

A total of 3,000 bison are allowed in the park year-round and a total of 100 bison are allowed in the Gardiner Basin until check-out time, which is May 1, and in the Hebgen Lake region, where check-out time is May 15. According to the NPS, a total of 900 bison will be removed "near the northern boundary this winter." Reportedly, about 525 bison have already been killed this year (2015) by Montana and tribal hunters standing along the borders of the park, as well as those driven into the Stephens Creek capture facility. With the capture facility on park property near the northern boundary, this means that the great majority of bison killed will be within the park and within Zone 1 of the park.

It is commonly acknowledged that the bison being removed are in mid-migration. However, most bison that are killed have not crossed the border. As one can see from the distribution map below, few bison are recorded as crossing the northern park boundary. The reason for this demographic is that all bison above 100 at the northern border are killed on park property before they leave the park. Would there be migration into Gardiner Basin during the winter if allowed to roam? Possibly, but no data has been generated to demonstrate a pattern of migration into Montana because the data needed is being eliminated by IBMP members killing migratory bison. If there were migration, it would be limited to the Gardiner Basin.

To say that the NPS must kill 900 bison to prevent a "mass migration of bison into Montana" and then produce an operations manual that advocates using hazing, including buzzing bison with helicopters, to force bison to migrate across the borders of the park so they can be killed by hunters, so their quota of 900 head can be reached, is dissimulation. To kill bison on park property before they migrate off the property to prevent migration into the relatively small area of Gardiner Basin and do so in the name of stopping a "mass migration of bison into Montana" is also dissimulation.

For Yellowstone rangers to be involved in this wanton destruction on park property when it is their task to protect wildlife there is hypocrisy. I support the Buffalo Field Campaign in saying “Shame on Yellowstone.”

The third document provides the following demographic maps showing areas used by bison:

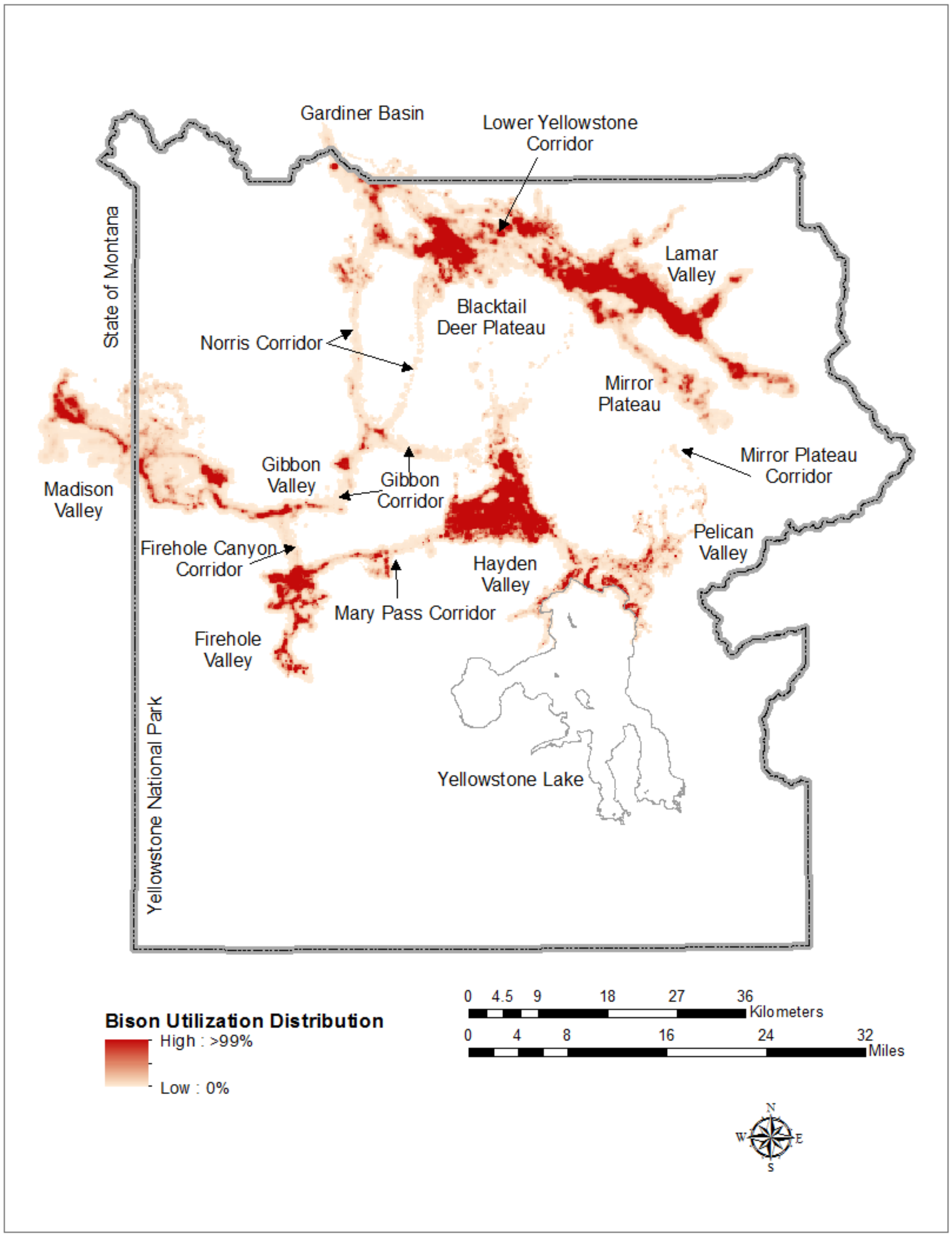


**Figure 10. BISON USE AREAS. Names of various places and areas used by bison in and near Yellowstone National Park. Darker shading indicates areas used more frequently by about 66 adult female bison fit with GPS radio collars during 2004 through 2012 (Geremia, 2014).**

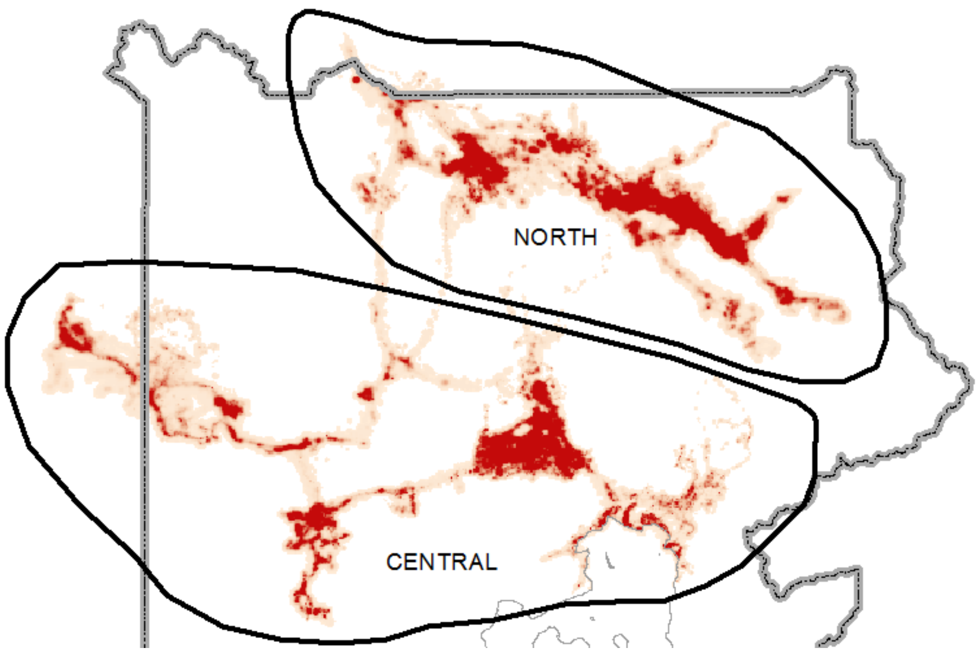


**Figure 11. HERD LOCATIONS (Geremia, 2014). As one can see, outside of the park there is much more tolerance for bison occupying the Hebgen Lake region west of the park (red splotches) in the Western Management Area where there are few cattle, as opposed to north of the park, Gardiner Basin, the Northern Management Area, where there are more cattle.**

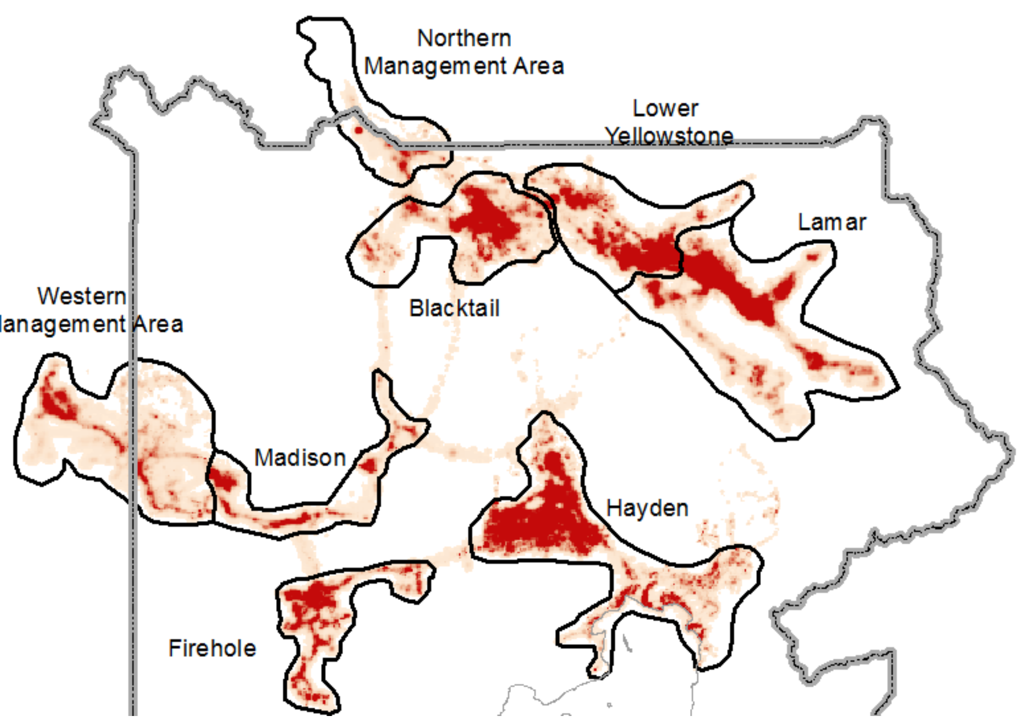


**Figure 12. MANAGEMENT AREAS (Geremia, 2014).**


**Figure 12a. NORTHERN MANAGEMENT AREA UP CLOSE. (Geremia, 2014). Arrow drawn by petitioner points to Gardiner Basin (the pink splotch extending from the northern tip of the boundary of the park).**

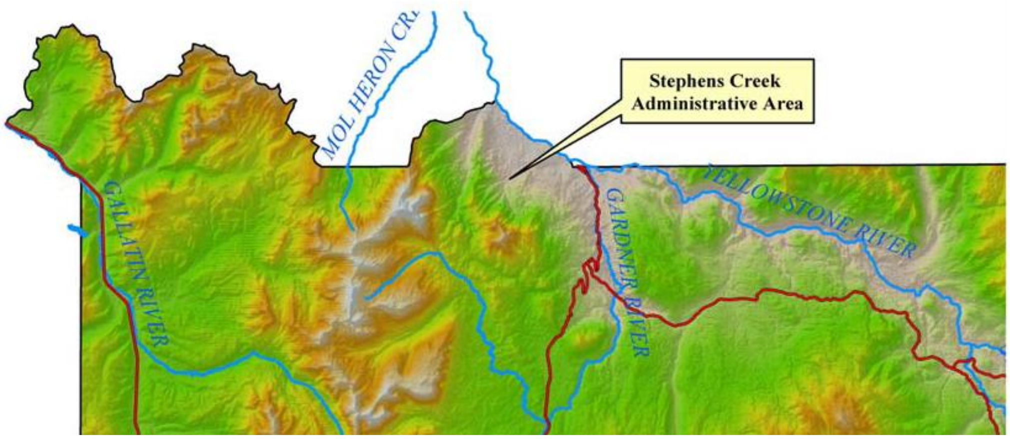


**Figure 12b. LOCATION OF STEPHENS CREEK ADMINISTRATIVE AREA. The bison capture facility lies within the SCAA (Stephens Creek Administrative Area, Yellowstone, 2006).**

If one looks closely at the blow-up of the map seen in Figure 12a, one can see a pink splotch at the top of the most northern portion of the park. That is the location of Gardiner Basin. It is just above the red dot, which incidentally most likely is the location of the Stephens Creek capture facility. Red indicates a higher concentration of the herd (see Figure 10 for bison use scale) and the herd is, indeed, concentrated there via hazing into the trap. The members of the herds, represented by the red and pink splotches, that roam into the Management Area will roam no more. They are hazed into the capture facility in the park, shipped out of the park and slaughtered. Except for the 100 bison that are allowed sometimes in Gardiner Basin or the Hebgen Lake region, the only bison that migrate out of the park are those that migrate in a livestock trailer.

This entire issue boils down to a controversy essentially concerning that pink splotch on the map, for that is where a scattering of bison, according to this distribution map, slip by and congregate outside the park's border in the forbidden basin, that is, Gardiner Basin.

Apparently, the prevailing thinking is that cattlemen have preemptive claims to the public land here, even in an ecosystem and even if it takes $3 million in government funds every year to clear wild bison from wildlife habitat so 1,000 domestic cattle can graze here in their place. Three million dollars is being spent per year to keep the splotch (Gardiner Basin) shown in Figure 12a, which indicates the degree of use by bison, from possibly turning from pink to red.

Of paramount concern in the management of bison herds and brucellosis is that all this expenditure of effort and funds is targeting only one species of ungulate, bison, while the disease is spread by two species, both bison and elk, with elk being the primary vector.

This is all done methodically, calculatedly, year in and year out and it makes no sense. And presently, under the parameters established by the IBMP, there is no way out, either for bison or for those who favor more tolerance for bison movement: both inside the park in Zone 1, where lethal action can commence, and outside the park. As long as cattle graze in Gardiner Basin, all the increased habitat that has been explored for bison occupancy will mean nothing, even if obtained, since under present law any bison that roams toward the border from a herd totaling more than 3,000 is a candidate for lethal removal regardless of how much habitat is available.

Bowing down to cattle in the Greater Yellowstone Ecosystem has apparently reached the level of a religious cult, for nothing else could explain the suppression of reason at this magnitude. And the public is being forced to pay tribute for the continuation of this practice at the rate of $3 million a year. The annual slaughter from which the public is barred has elements that remind one of a sacrificial rite.

The objective of this petition is to tell the truth, to stop the government slaughter of wild bison, to close the Stephens Creek capture facility and other such units and thereby save wild bison from extinction.

Throughout the remainder of this petition the total population used for cattle will be 2,000, with approximately 1,000 in Hebgen Lake region and 1,000 in Gardiner Basin, as these figures are the original ones used in past studies and reports. Over the years, there has been a decrease in cattle in the Hebgen Lake region. Total population of bison is often referred to as 4,900, however, as of this writing, due to ongoing culling activities through hunting and slaughter operations the bison population has been reduced by a factor of 525 animals (Update from the Field, 2015, Feb. 13).

**Scope of petition**

This is a petition to list the last wild herd of bison in Yellowstone National Park as a species or distinct population segment endangered or threatened in a significant portion of its range, that range being both its historical winter and spring habitats, including the Gardiner Basin north of the park and Hebgen Lake basin to the west, as well as portions historically occupied by bison beyond those regions extending along both the Yellowstone River into Paradise Valley and along the Madison River extending into Madison Valley. The petitioner claims that the park contains remnants of the only bison herd in the United States that has not been extirpated. It is also the only bison herd in the United States that has remained in its wild, unfenced state since prehistoric times.

These characteristics make the herd both distinct and significant. Further, the petition claims that because of the genetic traits of the herd and because it is being managed by scientifically unsound principles—namely, herd reductions via lethal control and experimental birth control—the herd is being subjected to selective breeding practices that have the potential to reduce the herd to population compositions and levels that will put it in danger of extinction.

The petition claims that the YNP contains a species of plains bison, namely *Bison bison bison*, as well as a separate species, namely, mountain bison or buffalo. This species may be wood bison, specifically *Bison bison athabascae*. The petition is based on new genetic, morphological and phenological information relevant to granting an endangerment of extinction designation to the herds, either as a species or as a distinct population segment (DPS).

Listing is especially urgent because the government policy of mass bison herd reductions that led to the destruction of the vast herds in the late 1800s is presently being mirrored in Yellowstone National Park against this nation's last remnant wild bison population, descendants of the very same herd that escaped the great buffalo slaughter at the end of the 19th century.

Relative to the size of the herd, large numbers are being destroyed by the government year after year against recommendations of the National Park Service itself, which administers Yellowstone National Park. If lethal removal is necessary, only a few bison at a time should be killed, instead of large reductions, according to guidelines developed for genetic management of federal bison herds reported in *Bison conservation genetics workshop*: *Report and recommendations* by Peter A. Dratch, National Park Service Natural Resource Program Center and Peter J. P. Gogan, U.S. Geological Survey Northern Rocky Mountain Science Center.

With regard to the need to maintain stable population sizes, the authors state:

> Based on well-established genetic population theory, fluctuations in population size increase the rate of genetic loss. Any necessary population reductions should be small and frequent to create minor adjustments as opposed to large and infrequent adjustments (Dratch, 2010, p. 11).

Contrary to such recommendations, large herd reductions have been ongoing. The bison population in YNP was reduced from 3,500 head in 1996-1997 to 1,700 head as a result of the destruction of 1,100 head via lethal control at park borders. Another 1,000 head died of starvation inside the park during that winter (NASDA Policy Statements, 2011).

In 2008, 1,087 bison were captured and shipped to slaughter from the Stephens Creek and Horse Butte capture facilities. Another 166 bison were lethally removed by state-licensed and tribal hunters. Total herd population went from 4,700 to 3,000, winter die-off accounting for the mortality of another 500 animals (National Park Service, 2008). As mentioned, another 900 are scheduled for lethal removal this year, plus another 900 next year. These large-scale culling practices are setting up the present Yellowstone bison herd for a potential catastrophe. The *Record of Decision* states:

> If the additional information suggests the management practices of the Joint Management Plan adversely affect genetic diversity, the NPS will review management actions and recommend adjustments. Considering the information currently available, the agencies believe they are providing for the conservation of Yellowstone bison genetics by balancing a spring bison population limit of about 3,000 animals with other management objectives*(p. 51).*

That "the agencies believe they are providing for the conservation of Yellowstone bison genetics" is a belief only. No relevant scientific study demonstrates that the genetics of Yellowstone's wild bison are being conserved by the lethal removal actions of the IBMP.

**Figure 13. ON THE ROAD TO EXTINCTION. A convoy loaded with bison from the Stephens Creek capture facility heading to a slaughter house.** ***Courtesy Buffalo Field Campaign.***

In order for the wild bison of Yellowstone National Park to be listed as endangered or threatened under the Endangered Species Act, a number of requirements must be met. What follows is an analysis in light of those requirements, as well as findings by the FWS relevant to this petition.

**Arguments in support of listing**
The petitioner makes the following claims:

- The genetic diversity of wild bison is not being maintained by the IBMP's actions of lethally removing migratory bison, but instead the herds' genetic composition is being altered by the artificial selection of bison with non-migratory and domestic animal traits.

- To prevent bison form migrating out of the park, but not elk, which pose a greater risk of brucellosis transmission to cattle, is ineffective disease control. Instead, cattle should be removed from the ecosystem, especially those habitats adjacent to the park.

- Geographically, Gardiner Basin and the Hebgen Lake region, as well as portions down the Yellowstone River and Madison River are together a part of the range of the Yellowstone wild bison population.

- Restoration of habitat includes restoration and preservation of historically present animals in that habitat, such as the grey wolf.

- Contrary to the 2007 finding based on the petitioner's original petition filed in 1999 (see Appendix), the migratory behavior of Yellowstone wild bison is significant and unique.

- The 2007 finding was correct in its conclusion that the wild bison herd in Yellowstone National Park is discrete and significant within the meaning of the term "distinct population segment" (DPS) and therefore constitutes a DPS.

- The 2007 finding concluded correctly that the Yellowstone herd may be discrete from other plains bison, because it is considered the only herd that has "remained in a wild state since prehistoric times" and because of physical distance and barriers.

- The 2009 finding on the petition submitted by James A. Bailey and his wife Natalie A. Bailey that the "best available information now indicates that the basis for our 2007 DPS determination was erroneous" is itself in error.

- The 2009 finding is in error when the FWS stated: "we no longer consider the Yellowstone herd to have remained in more of a 'wild' state than any other conservation herd."

- The bison herds in Yellowstone National Park may constitute not only plains bison, but also mountain bison. The statement in the 2007 finding that "This controversy has since been resolved, and YNP staff now considers the remnant population, as well as the introduced bison, as being of plains bison origin" has in fact not been resolved and has no adequate scientific support.

- Man has had a unique relationship ecologically with megafauna, possibly driving many to extinction beginning 10,000 years ago on this continent. The last and largest remaining species representing that megafauna in the United States are scientifically recognized to be *Bison bison bison* and *Bison bison athabascae.* The last remaining unextirpated remnant of either of those species are members of the wild bison herd of Yellowstone National Park. Under the leadership of the IBMP, the historical legacy of the park's bison is being disregarded and, instead, imprinting the reputation of the park as a site of ecological despoliation.

- "Wild" in reference to animals means free to roam. While commercial use can domesticate an animal, non-commercial use of an animal does not necessarily result in it remaining wild.

Wildness is not merely determined genetically. The qualities of being wild include behavior and history (that is, legacy), as well as ecology.

- Genetics is only one potential criteria to determine if a species is a DPS.

- Predatory species should be allowed to operate freely in Yellowstone National Park. This includes both mammals and bacteria, such as wolves and *B. abortus.* This will promote the restoration of the balance of nature, whereby dispersal of bison through the actions of wolves will help reduce the level of brucellosis, since crowding is a factor in the prevalence of this disease.

- The lethal control policy of the Interagency Bison Management Plan is introducing stressors promoting artificial selection to the point that extinction of the Yellowstone herds as a wild species is a high probability. Killing wildlife at the industrial level, especially migrating animals, has no business in wildlife management. It kills a high number of calves and pregnant bison. Such a policy treats wildlife as pests. Further, it promotes domestication of this wild species.

- Yellowstone bison should be allowed to migrate freely without governmental lethal control, allowing range size, forage availability, climate, predation and hunting to govern the herd size and dispersal. To do otherwise converts the park into a zoo and a stockyard, with bison being managed for the commercial gain of the cattle industry.

- Bison traps, holding paddocks and capture facilities should be eliminated from the YNP, as they are in violation of the law that established the park and because such capture facilities encourage the spread of disease, such as brucellosis.

- Park management of buffalo has failed in the hands of government agents and scientists in part because they consider bison in terms of numbers only, to be without emotional response to stimuli, as objects influenced only by such factors as "density" and as physical forces governed by the "domino effect." Because of this failure, the majority of the management related to park bison should be in the hands of conservations as well as restored to the hands of Native American tribes, who have a tradition for their successful management that spans millennia.

- The Yellowstone herds have not been managed in accordance with the best interests of their composition, especially with regard to genetics, disease status, proportional effects of culling on the northern versus the central herds, sex and age ratios, habitat and range needs, behaviors, migratory instinct and species designation.

- The YNP herds contain members that are either a separate species or a distinct and significant segment of a species that are endangered or threatened with extinction throughout their range.

Support for these claims follows.

## INTRODUCTION

America's last herds of wild buffalo are being driven toward extinction by a range war over the private use of primarily public wildlife habitat located in the Gallatin National Forest just outside the boundary of Yellowstone National Park and within the Greater Yellowstone Ecosystem (GYE).

These threatened bison are the only unfenced wild buffalo in America that have not been extirpated, having continuously populated their original range since prehistoric times, descendants of bison that migrated from the Old World to this continent across the Bering Land Bridge millennia ago. Today over 99 percent of America's bison are kept like cattle behind fences, either on private ranges for meat production or on government conservancies for public viewing. They are not wild. Only 1 percent are wild, that is, the 5,000 bison inhabiting the YNP out of a total of 500,000 bison in the United States.

In rejecting my original petition to list these bison under the Endangered Species Act, the government makes the claim that such wild bison are abundant. Wild bison are not only not abundant, they are rare. What makes them particularly unique is that they possess and express the trait of migration, which exists in no other bison population.

Moreover, these wild bison comprise the only herds managed by the U.S. Department of the Interior that are genetically pure, having no cattle genes (Dratch, 2010). They congregate in Yellowstone National Park, the centerpiece of the GYE, the largest remaining nearly-intact ecosystem in the earth's northern temperate zone.

The major reason for the need of a federally mandated listing is that the various governmental agencies now managing the existence of these wild bison have failed to exercise their responsibility to preserve wildlife in a wilderness setting and instead have bowed to the interests of the cattle industry. The collaborating agencies, initially established in 2000, as listed in the *Record of Decision for Final Environmental Impact Statement and Bison Management Plan for the State of Montana and Yellowstone National Park*, are the:

- National Park Service (NPS),
- U.S. Forest Service (USFS),
- Montana Department of Fish, Wildlife, and Parks (FWP),
- Montana Department of Livestock (DOL), and the
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS),

and added in 2009 the

- Confederated Salish & Kootenai Tribes (CSKT),
- Inter Tribal Buffalo Council (ITBC), and
- Nez Perce Tribe (NPT).

These governmental and tribal agencies, operating under the rubric of the Interagency Bison Management Plan (IBMP), have been collectively given the court-approved authority to truncate all migratory movement of wild bison attempting to leave the park and enter the state of Montana. Such agencies, largely under the direction of the Montana Department of Livestock, may haze, capture and lethally remove bison from national forest area public grazing allotments adjacent to the park, as well as private property there, because:

- cattle interests want cattle to graze there instead and
- such interests do not want cattle to comingle with bison in those habitats because 50 percent of the bison herd in the park have contracted brucellosis, which can be transmitted interspecies to cattle.

Brucellosis can cause a diseased animal to abort its calf. It is a zoonotic disease. According to a fact sheet prepared by APHIS, brucellosis:

- is a contagious, costly disease of ruminant animals such as cattle, bison and elk that also affects humans. It is also called contagious abortion or Bang's disease. In humans it is known as undulant fever because of the severe intermittent fever accompanying infection.
- in animals causes decreased milk production, weight loss, loss of young, infertility and lameness.
- is commonly transmitted to animals by direct contact with infected animals or with an environment that has been contaminated with discharges from infected animals. Aborted fetuses, placental membranes or fluids may be contaminated with the disease. It is transmitted by cows licking those materials or the genital area of other cows or ingesting feed or water contaminated with the disease-causing organisms. Brucellosis is carried from one herd to another when a herd owner buys replacement cattle that have been infected with the disease. The disease may also be spread when wild animals or animals from an affected herd mingle with brucellosis-free herds.
- may be avoided by using proper sanitation methods. Proper herd management strategies, such as maintaining closed herds, can aid in the avoidance of the disease.
- can be eradicated. In 1954 congressional funds were approved for a cooperative state-federal brucellosis eradication program to eliminate the disease from the country. The basic approach is to vaccinate calves, test cattle and domestic bison for infection and send infected animals to slaughter. Depopulation of herds, if funds are available, may be used if herds are severely affected. States are designated brucellosis-free when none of their cattle or bison is found to be infected for 12 consecutive months under an active surveillance program (Facts About Brucellosis, 2015).

Of particular interest is the method APHIS recommends to control the spread of brucellosis, namely, closed herds. Closed herd management restricts the introduction of animals and vehicles from livestock sources as well as contact with other herds and animals, according to the *Merck Veterinary Manual.* Open herds have a higher risk of introducing pathogens through such practices as introduction of purchased replacements, mingling of animals of different backgrounds or poor herd biosecurity (Hilton, 2014). Maintaining a closed beef herd includes eliminating fence line contact with other herds (Dahlen, 2015).

By insisting on grazing cattle, whether open range or fenced, adjacent to a biohazardous area such as the GYE where wildlife is infected with brucellosis, is not practicing the protocols recommended by APHIS, which include closed herd management.

No transmission of brucellosis from wild bison to cattle has been recorded in the wild. Nevertheless, because the IBMP has determined the risk of transmission is "not zero," as stated in the *Record of Decision*, and because cattle are allowed to graze adjacent to the park within the GYE in violation of the very brucellosis-control methods APHIS recommends, the IBMP has the authority to kill any bison coming out of the park when the population of bison within the park exceeds 3,000 head.

At the end of 2014 there were 4,900 bison in the park. Some bison are hunted, but if not enough can be killed via hunting, government agents may herd a predetermined number of migrating bison into capture facilities and ship them to a slaughter house. Since 1985, over 7,000 bison have been slaughtered by government agents involved in this process.

This winter (2014/2015) 900 wild bison are scheduled for lethal removal by the IBMP. Next winter, another reduction of 900 animals is planned.

**Sanitizing a wilderness**

The scheduled lethal removal of large segments of the park's herds is nothing new. It has become a family tradition with members of the IBMP. In an attempt to sanitize wilderness, each spring a posse of government agents on horseback; in all-terrain-vehicles, squad cars, pickups and sometimes in helicopters, descend on bison mothers as they are giving birth and nursing their young outside the park. Their mission is to drive them back into the park before the cattle come. Some of the stampeding animals get entangled in fences and others, especially the calves, break their legs in holes.

Some of the animals are driven into capture facilities. The captured animals are then coerced through a series of progressively smaller pens into a series of narrowing chutes until a single animal is contained in tight quarters. At this site age, sex and morphology information along with a blood sample is collected (Cross, 2010). Following serological testing, some females are fitted with vaginal monitors to track birthing locations. Some are vaccinated. Some are slaughtered if tested positive for the disease brucellosis, while others if they are pregnant.

The government is studying the possibility of injecting female bison with a birth control substance to prevent them from multiplying. It is called GonaCon, a contraceptive vaccine for wildlife. Originally developed by the USDA as a non-lethal form of pest control, it works by lowering the concentration of sex hormones in the bloodstream to weaken fertility and the urge to mate (Yager, 2011). Providing "multiple years of infertility following a single injection," it works well to control populations of white-tailed deer, prairie dogs and tree squirrels (Wildlife Contraceptives, 2012).

In the winter another posse is waiting for the bison. As snow levels deepen, bison descend to find forage. As noted previously, while still on park land and contrary to the park's founding act prohibiting the "capture or destruction" of animals there, government agents direct the migrating bison into capture facilities such as at Stephens Creek. At the entrance a funnel of fencing fans out from the specially fortified pens into which they are herded or stampeded. The trapped bison are then loaded onto livestock trailers that have been backed up to ramps connected to the facility and trucked to slaughter houses. (Unsurprisingly, this park facility is closed to the public.)

Wild bison are harassed and killed coming and going, breaking up family units, traumatizing entire herds, killing the aggressive leaders and their followers, leaving the genetics necessary for survival and migratory behavior rotting in the waste bins of the slaughter houses.

What has this achieved? Outrage by a large sector of the public, especially conservationists, and the death of multiple thousands of bison. It has not decreased the chance of brucellosis transmission to cattle.

The price we as a nation are paying for keeping up this ritual is the mathematical certainty that eventually the Yellowstone bison will be made extinct as a wild animal. Someday they might still look the same, but they won't be the same due to practices that promote domestication by means of artificial selection instead of survival of the fittest. Now only the non-migratory survive. It is a case of wildlife management out of control.

Beyond the problem of brucellosis, due to their physical characteristics bison have a potential of coming into conflict with humans. But this very potential makes the last remaining wild bison important. The National Park Service makes the following observations:

> Bison are massive animals that compete directly with humans and livestock for use of the landscape. Their preferred habitats include nutrient-rich valley bottoms where agriculture and development occupy most of the land, while public lands are more likely to be situated in mountainous areas above these valleys. Given existing habitat loss and the constraints modern society has placed on the distribution of wild bison, it is unlikely that many additional populations will be established and allowed to range across the landscape. Thus, the few remaining wild and free-ranging bison populations in North America are very important.

As noted by the NPS, of particular importance is its wildness, genetics and ecological function:

> Yellowstone bison comprise the largest (2,400 to 5,000) wild population of plains bison and are one of only a few populations to continuously occupy portions of their current distribution. They are managed as wildlife in multiple large herds that move across an extensive landscape (more than 150,000 hectares or 372,000 acres) they share with a full suite of native ungulates and predators, while being exposed to natural selection factors such as competition for food and mates, predation, and survival under substantial environmental variability. As a result, these bison likely have important adaptive capabilities compared to most bison populations that are managed like livestock with forced seasonal movements among fenced pastures, few predators, and selective culling for age and sex classifications that facilitate easier management (e.g., fewer adult bulls). These bison also provide meat for predators, scavengers, and decomposers; contribute to nutrient recycling that enhances plant

> production and diversity; and allow visitors to observe this keystone species and symbol of the American frontier (National Park Service's Decision, 2014).

It is troubling and logically inconsistent that this agency, while extolling the importance of the wild bison's "adaptive capabilities compared to most bison populations that are managed like livestock with forced seasonal movements" is, itself, managing the wild herd like livestock by prohibiting its seasonal movements via slaughter at capture facilities, targeting those animals exhibiting the adaptive capabilities of migratory behavior, the very trait the NPS finds valuable.

**Elk get a free pass**

On the other hand, elk—as well as other wild ungulates such as bighorn sheep, deer and moose that spend summers in the park—are allowed to migrate out of the park in the autumn and winter to the lower level habitats forbidden to wild bison. Here some are harvested through hunting.

Elk are the most abundant large mammal found in Yellowstone. Brucellosis incidence studies indicate elk are also reservoirs for this disease. According to the Wildlife Management Institute:

> The prevalence of brucellosis is increasing in many Greater Yellowstone elk herds and available evidence indicates that all recent cases of brucellosis transmission from wildlife to livestock have come from elk (Stemler, 2015).

"Seventeen instances of brucellosis transmission from elk to livestock were reported during the last decade," according to the Center for Disease Control. Writing in CDC's journal *Emerging Infectious Diseases*, Jack C. Rhyan summarizes the problem of brucellosis in the Yellowstone area:

> During the 1930s, a state-federal cooperative effort was begun to eliminate the disease from livestock in the United States. From an initial estimated prevalence in 1934 of ˜15%, with nearly 50% of cattle herds having evidence of infection, the United States now has no known infected livestock herds outside of portions of Idaho, Wyoming, and Montana, adjacent to Grand Teton and Yellowstone National Parks. This area, referred to as the Greater Yellowstone Area (GYA), also encompasses state and federal feeding grounds in Wyoming where elk are fed during the winter. Considered a spillover disease from cattle to elk and bison, brucellosis now regularly spills back from elk to cattle. Although bison-to-cattle transmission has been demonstrated experimentally and in nature, it has not been reported in the GYA, probably because of ongoing rigorous management actions to keep cattle and bison spatially and temporally separated (Rhyan, 2013).

Most likely, brucellosis was brought to the park years ago following the introduction of cattle into the park's valleys by the original park managers.

Epidemiologically, separating bison but not elk from areas outside and adjacent to Yellowstone National Park where cattle graze is irrational and ineffective disease management. Such a policy puts the national security vis-à-vis brucellosis containment in jeopardy. If the "ongoing rigorous management actions to keep cattle and bison spatially and temporally separated" is responsible for the lack of transmission of brucellosis by bison to cattle near the park, then the same "rigorous management actions" should be applied to Yellowstone area elk as well, that is, also prohibiting them from leaving the park by means of hazing or lethal removal to achieve effective separation.

**A better alternative**

If this is not possible for economical and ecological reasons, then the only alternative to such actions would be to separate cattle from the area by means of banning the presence of cattle in regions within the Greater Yellowstone Ecosystem.

Further, the gray wolf should be incorporated into this protected habitat region, since this species is critical to restoring the balance of nature in this ecosystem and will contribute to a more economical control of bison populations, as well as a means of preserving the genetic diversity of wild bison. For the same reason, bison hunting should be continued, as wild bison have coexisted with human populations hunting them for millennia, but it should be done on the basis of sustainability, not the despoliation of a wild species.

While listing wild bison under the act would make it is unlawful for any person to take such species, the act provides that exceptions may be granted to enhance the propagation or survival of the affected species. Survival would be enhanced by hunting. Under the act, an applicant can request a permit to hunt wild bison, but must first submit a conservation plan that specifies such things as the impact likely to result from such taking and the funding available to implement such conservation steps (Endangered Species Act, 1972).

It would seem probable that an applicant such as a member or group from an American Indian tribe, as well as other hunters, could demonstrate that historically over the course of 10,000 years during pre-settlement times, wild bison evolved here in the presence of human hunters and were at the height of their population numbers and genetic diversity in such a hunting environment.

It should be obvious, however, that what is going on at this writing (January 8, 2015) at Beattie Gulch, a few miles north of Gardiner, is not acceptable. The Buffalo Field Campaign reports:

> Snow has been accumulating in Yellowstone country, and buffalo are beginning to seek lower elevation habitat. Nine buffalo have been gunned down at the north boundary of Yellowstone National Park since our last writing, bringing this year's death toll to at least fifteen.
>
> Over the weekend, a group of thirteen buffalo approached Beattie Gulch, the boundary between Yellowstone National Park and Gallatin National Forest. We thought for sure that this whole family group would be wiped out. Hunters were literally lined up on the Forest Service side of the line, just waiting for them to cross. The hunters ended up waiting all day and the buffalo bedded down on the Park side of the Gulch. As the light waned, the hunters went away empty handed. The buffalo, sensing temporary safety, crossed in the middle of the night and were found on private property the next morning, where they could not be hunted.
>
> Over the course of the next few days, some buffalo eventually left the relative safety of private property, and one by one, they are being picked off. On Wednesday, treaty hunters

hastily shot into a group of buffalo that had crossed into Montana at Beattie Gulch, killing a couple and wounding at least one. The buffalo that didn't die turned around and ran into Yellowstone National Park, where they cannot be pursued. BFC patrols have been monitoring one wounded adult female. If the Park Service spots her, they may "dispatch" her, and the hunter who shot her will still get to fill his "unused" tag.

Hunters are swarming into the Gardiner Basin, just waiting for buffalo to step over the boundary. Tens of thousands of acres of habitat have recently, though temporarily, been opened to buffalo, but they never get a chance to access these new lands as they are gunned down before they make it very far. This firing line style of killing is another stark illustration that this so-called hunt is nothing more than a livestock industry-driven extermination program aimed to prevent wild, migratory bison from re-inhabiting even fractions of their native Montana landscape (Update from the field, 2015).

As Laura Lundquist reported recently for the Bozeman Daily Chronicle:

Since hunters have to wait for the bison to leave the park, they wait for their chance in the open Forest Service land near Beattie Gulch, and the bison don't get much farther.

She wrote on Christmas Day, 2014 a story on the issues concerning wild bison migration out of the park. She said:

Four tribes—the Confederated Salish and Kootenai Tribes in Montana, and the Nez Perce, Umatilla and Shoshone-Bannock in Idaho—have treaty rights to hunt Yellowstone bison. Montana hunters also get a limited number of tags.

With only two places to hunt—near Gardiner and West Yellowstone—hunters would like to stalk bison on a broader landscape.

"Coming from a ranching family, I can see it from both sides. I can understand some of the concerns that ranchers have," said Kootenai wildlife manager Tom McDonald. "But what we really need to do is just allow bison to get out and express themselves on the landscape, and over time through our diligence, people can become accustomed to them on the landscape."

But so far, ranchers' concerns have constrained wandering bison to bulges of land near the park, creating problems with gut piles, overgrazing and, ultimately, population control.

As of this summer, about 4,900 bison lived inside the park. The northern herd, which migrates out near Gardiner during the winter, has 3,500, and the rest belong to the central herd, which trundles out near West Yellowstone.

That's more than ranchers and the Montana Department of Livestock want.

So during recent Interagency Bison Management Plan meetings, DOL representatives pushed for the removal of as many as 1,000 bison through hunting or capture-and-slaughter this winter.

> Last winter, about 650 animals were removed, half by hunters.
>
> The IBMP partners reached a tentative compromise of 900 for this year.
>
> But as of three weeks ago, the tribes were still trying to work that number down, worried that the cull would select against animals with migratory tendencies. Plus, a larger herd means more animals leave the park, providing more hunting opportunity.

Lundquist noted that steps are being made for increased tolerance of wild bison outside the park:

> After a year's delay, more area around Hebgen Lake may open up to bison year-round.
>
> The DOL and FWP conducted an environmental study of a policy of allowing bison onto almost 422,000 acres of national forest land with no cattle in the upper Gallatin Basin.
>
> The majority of almost 120,000 public comments submitted in September 2013 supported the proposal.
>
> It stalled in May after the Board of Livestock refused to vote on the study, saying it would wait for a new Yellowstone bison management plan, which is only in initial development (Lundquist, 2014).

The bottom line is this: while elk are managed as wildlife and are allowed to move in and out of Yellowstone National Park, wild bison are managed as livestock and their movements outside the park are subject to prohibition. While both species carry the disease brucellosis and while cattle may contract the disease from both elk and bison, only bison are controlled.

**Double standard for migratory bison and elk**
This double standard—one for migratory bison and one for migratory elk—can be seen by the two diagrammatic maps that follow.

Shown below is the historical and present range of wild bison. Note that the movements are back and forth and limited. The red lines represent both the historical and present migratory path of Yellowstone's wild bison. The solid portion of the red line represents their present path and the dashed red line their extended historical path. The dashed black line represents the extent of the range of wild bison in pre-settlement times. The black areas are the present range, which overlaps portions of the park boundary, with the hatch-marks representing the IBMP's bison management areas. The blue line is the Madison River and the orange line is the Yellowstone River. The Yellowstone River runs from Yellowstone Lake through Yankee Jim Canyon and thence through Paradise Valley, of which Yankee Jim Canyon is the gateway, presently barring bison progression into the valley via a cattle guard, fencing and the white waters of the Yellowstone River, which runs through the steep canyon below.

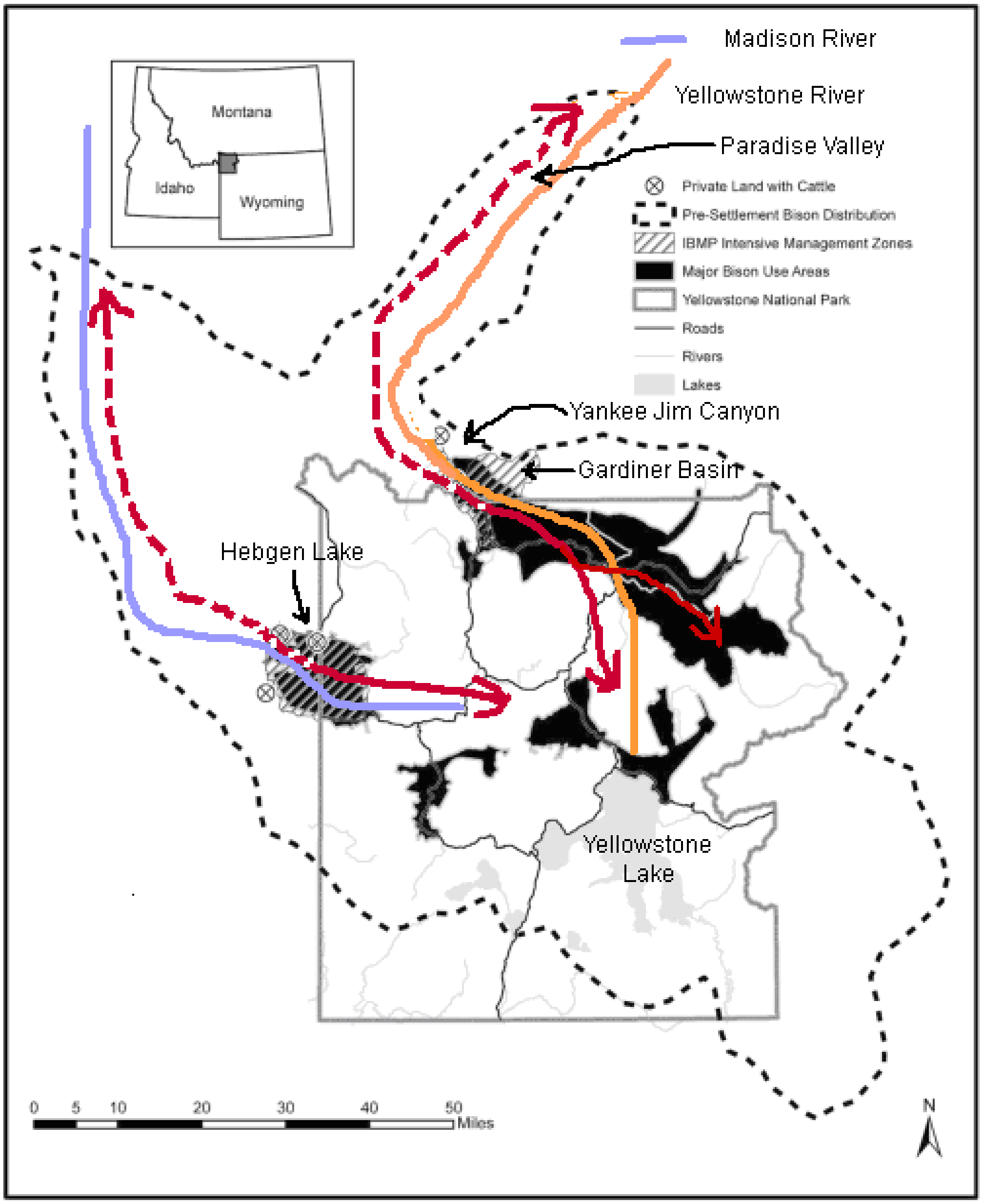


**Figure 14. PRESENT AND HISTORICAL RANGE OF WILD BISON. Black areas are the present range of the park's bison and the dotted line their historical range limit. Migratory movements are back and forth on a seasonal basis from the high plateaus to the lower valleys.** ***Image from White, 2011. Color-coded rivers, migratory paths and site names added by James Horsley.***

Shown below are the migratory movements of elk in the GYE, which converge toward the interior of the park in the spring, then disburse toward lower elevations in the autumn and winter months. The migratory paths of both bison and elk involve comingling with public grazing ranges just outside the park, yet only bison are routinely restricted by the IBMP.

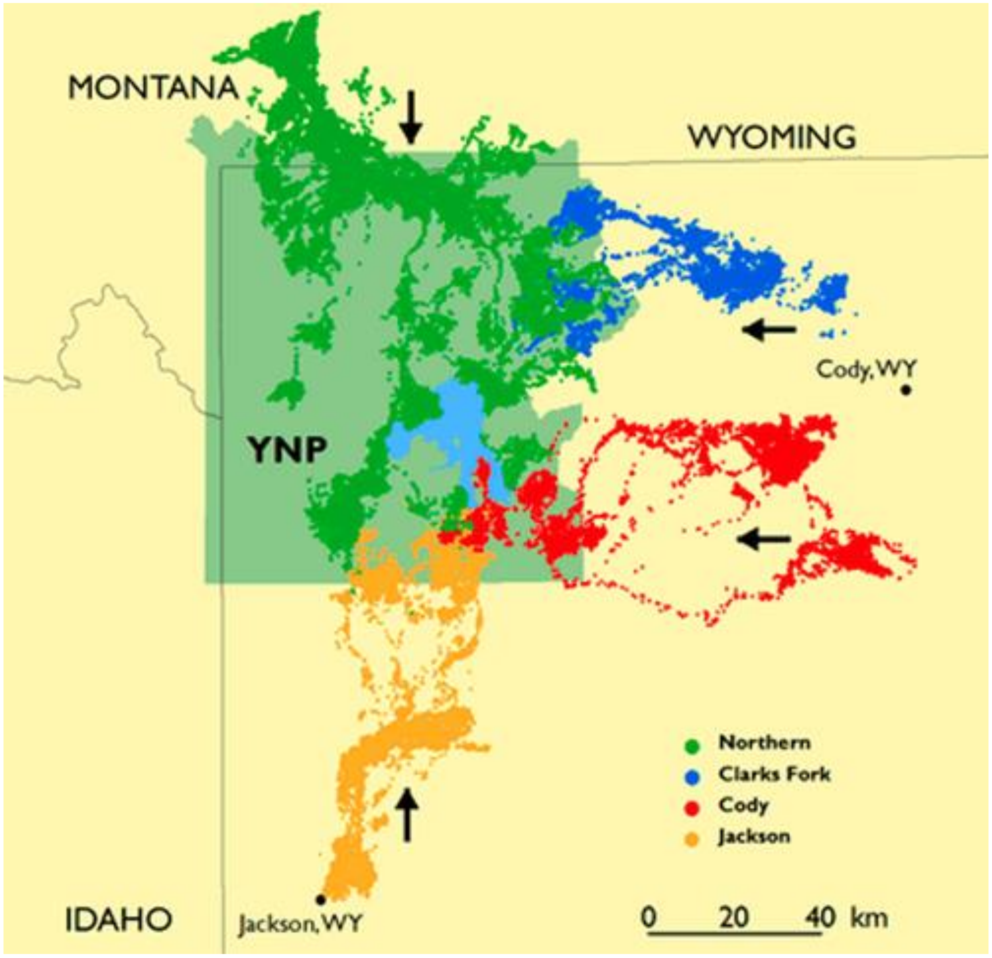


**Figure 15. ELK MIGRATION IS SIMILAR TO BISON seasonal movements. Shown are converging elk herds, such as the Northern, Clarks Fork, Cody and Jackson herds. Moving in the direction of the arrows toward the interior of the park, the herds travel from their lower winter grounds to the high-altitude meadows of the park during the spring (Map from *Elk Migrations of the Greater Yellowstone: Project Overview,* 2014).**

**Figure 16. ELK ARE ALLOWED TO MIGRATE OUT OF YELLOWSTONE. Here elk travel across the winter range in the northwestern Greater Yellowstone Ecosystem near the Gardiner River in Yellowstone National Park in 2008. Many proceed out of the park into Gardiner Basin (Conservation: Story, 2013).** ***U.S. Geological Survey/photo by Jonny Armstrong*****.**

**Figure 17. BUT WILD BISON ARE NOT ALLOWED TO MIGRATE. Here a Montana Department of Livestock agent on horseback herds migrating wild bison into the Stephens Creek capture facility within Yellowstone National Park, where they are shipped to slaughter. These bison were headed to the Gardiner Basin.** ***Photo courtesy of Buffalo Field Campaign.***

**Figure 18. BISON ARE RESTRICTED FROM PARADISE VALLEY so cattle can graze here, as well as from Gardiner Basin on the other side of the mountains to the south just outside the park in the heart of the Greater Yellowstone Ecosystem. This is being done at a cost of $3 million annually in the name of preventing the spread of brucellosis by wildlife to cattle. Beef from cattle raised on grasslands north of the park, as well as west of it, is marketed as free-range, Yellowstone grass-fed beef and sold at premium prices. These are truly "cash cows."** ***Yellowstone's Photo Collection, 1999. Photo by Jim Peaco.***

Effective disease control is not achieved by managing the chance of transmission by one species, but not the other. Although brucellosis has been essentially eradicated in the United States, the disease persists in the GYE because this region is one of the last places on the North American continent to remain wild and unfenced. For animals in close proximity, *B. abortus* can only be completely controlled by means of fencing so that separation can be maintained between infected and uninfected animals.

If the IBMP means what it says in its *Record of Decision* that "Cooperative management of Yellowstone bison requires an ecosystem approach" (p. 8), then management should not include the destruction of that ecosystem. But that is what is happening now with the decimation of the wild bison migratory herds and the now legalized destruction of their natural predators, the gray wolf, just outside the park boundary. IBMP presently functions as a predatory pack itself, with the Montana Department of Livestock its alpha male.

In the end, the only solution to the problem of the transmission of brucellosis here is either to fence in the park, which would fence out wildlife from moving across the ecosystem, or to keep cattle out of the ecosystem. Yellowstone National Park is 3,470 square miles. The Greater Yellowstone

Ecosystem is 28,000 square miles. Fencing in either of these two regions would not make sense fiscally or ecologically.

**Figure 19. FENCING A PARK. In an effort to control overgrazing by elk in the Wind Cave National Park, South Dakota, fencing has been strung around portions of the 53-square-mile park. Adjustable gates have been installed to allow elk to leave the park in the spring and prevent their reentry for protection until after the fall hunting season. While wildlife fencing may be feasible there, one cannot fence an entire ecosystem (Farrell, 2010).** ***NPS Photo.***

**Conservation is predominant**

According to the *Record of Decision*:

> Congress has provided that when there is a conflict between conserving park resources and values and providing for the enjoyment of them, conservation is predominant. Additionally, although Congress has provided the secretary with limited discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The NPS, thus, must manage park resources and values to allow them to continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them (p. 10).

Concerning the importance of the Yellowstone bison, according to the National Park Service,

> . . . several scientists recently concluded that plains bison are ecologically extinct across North America because less than 4 percent (%) are in herds managed primarily for conservation and less than 2% have no evidence of genes from inter-breeding with cattle. Instead, most bison are raised for meat production, mixed with cattle genes, protected from predators, confined in fenced pastures, and their mating structures are inhibited by low ratios

> of adult males in order to maximize offspring production. As a result, bison no longer influence the landscape as they once did by roaming across large areas while enhancing nutrient cycling, competing with other ungulates (hoofed animals), creating wallows (i.e., depressions in soil) when they roll on their backs to give themselves dust baths, and serving as a major converter of grass to animal matter (Remote Vaccination of Bison, 2014).

Despite these self-declaratory statements by the government partners of the IBMP concerning the resolution of conflict between enjoyment of the park and conservation of its resources, as well as the importance of wild bison to the ecosystem, the interagency has provided for the removal of bison from the ecosystem in favor of the cattle interests' enjoyment of profit, whereby those interests predominate over conservation.

The *Record of Decision* states, "The Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise." The NPS can impair the resources of the park because the actions granted by law to the IBMP specifically provide the right to do so.

To counter these ecologically abusive decisions at the state and federal levels, the wild bison of the Greater Yellowstone Ecosystem should be protected under the Endangered Species Act by their listing as a species or distinct population segment threatened or endangered with extinction and their migratory range just outside the park preserved as a critical habitat, specifically regions such as Gardiner Basin to the north and the Hebgen Lake region to the west of the park. Eventually, habitat should also comprise the entire historic range of wild Yellowstone bison, which extended along the Yellowstone River into Paradise Valley as well as regions along the Madison River. The distribution of this population involves altitudinal migration. Herds move (or attempt to move) seasonally from the high grassy plateaus where they graze in the spring and summer months down to the lower valley regions during the winter for forage along the rivers mentioned. Historically, their migration was limited, consisting of back and forth movements involving distances of about 100 miles. Today, due to government actions favoring commercial interests, their migration has been stopped, which will lead to their extinction as a wild species.

## DISCUSSION

### Objectives of the petition

The Endangered Species Act specifies that:

> The Secretary shall designate critical habitat, and make revisions thereto . . . on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impact, of specifying any particular area as critical habitat (Endangered Species Act, 1973, p. 5).

This petition will show that the best scientific data available supports the removal of all cattle from the proposed protected habitat, that national security will be served best by such a designation and that the elimination of lethal control and hazing of bison as well as the protection of gray wolves in these habitats will be the most economical and cost-effective alternative.

Targeting migratory bison but not elk coming out of the park has no useful purpose in eliminating the possibility of the transmission of brucellosis from wildlife to cattle in the area. All significant *B. abortus* wildlife vectors, not just one, must be separated from cattle to reduce the chance of transmission. Without destroying the wildlife in the park, such separation cannot be achieved other than by the removal of cattle from the GYE.

Moreover, the petition will show that the artificial limitation of the park bison population to 3,000 is not based on scientific findings concerning the preservation of genetic diversity among the herd but instead is a formula employed only to justify lethal control measures of migratory bison based on density pressures.

Lastly, the petition will demonstrate that the root cause of the problems arising in the Greater Yellowstone Ecosystem relative to bison is the failure to let nature alone, interrupting the natural control mechanisms such as the predator-prey relationship and the reliance on hunting.

In the absence of an immediate listing, the petitioner recommends a moratorium on all lethal control, hazing or capture of wild bison within the Greater Yellowstone Ecosystem by government agencies so that scientific studies can be made regarding the outcome of such non-intervention strategies. This would allow the inter-relationship among bison, elk and wolves to play out. A particularly valuable focus would be to study whether wolves show signs of “prey switching” from elk to bison as a response to fewer elk and/or larger wolf pack sizes. This would provide valuable data for holistic research studies that do not now exist.

Controlling the population size of wild bison should be limited to such factors as wolf predation, the natural toll of disease, range capacity, climate, age, accidents (such as vehicular) and hunting outside the park.

Concurrent with a listing or moratorium should be the launching of a study concerning the possibility of a species of bison called mountain buffalo that may still exist in remote regions of the park. This study has never been done, and claims by park officials that they have determined there are no such species remaining are not based on any scientific study, but rather opinion. Historically, this species has been documented to exist in the Yellowstone area. If its present existence can be established (and there have been claimed recent sightings—one by a former park ranger in the Pelican Valley region) it is in need of special protection via listing and habitat protection.

**Reasons for listing as threatened**

Reasons for listing wild bison as threatened or endangered with extinction are several. First, on August 15, 2007 the FWS concluded that the YNP bison herd satisfied the two essential requirements to be listed as either endangered or threatened, that it was both “discrete” and “significant.” The present petition contends that this finding is still valid.

Secondly, the petitioner asserts that the finding of the multi-agency Joint Bison Management Plan finalized in 2000, that purportedly “provides substantial protection for the YNP bison herd and therefore there is not a current credible threat to the herd’s existence,” is in fact in error. Instead of providing protection, the petitioner contends that it is the very actions of the members of that interagency plan that are now causing the threat to the herd’s continued existence as discrete and significant.

Section 4 of the Endangered Species Act states that the Secretary may determine whether any species is an endangered species or a threatened species because of any of the following factors:

- the present or threatened destruction, modification, or curtailment of its habitat or range;
- overutilization for commercial, recreational, scientific, or educational purposes;
- disease or predation;
- the inadequacy of existing regulatory mechanisms; or
- other natural or manmade factors affecting its continued existence.

The determination of wild bison as an endangered or threatened species is warranted because:

- the wild bison’s utilization of their historic migration and calving grounds within the Gardiner Basin and Hebgen Lake region is being curtailed by the actions of the IBMP since its inception;
- the migratory habitat of the wild bison is being over-utilized by commercial cattle interests, creating an environment lethal to wild bison;
- scientific tests for disease status of wild bison often result in their lethal removal;
- the diseased status of wild bison make them a target for their lethal removal from their migratory habitat;

- predation by governmental agents when wild bison enter their migratory habitat decimate the number of wild bison (ironically, members of the IBMP have become the wild bison's greatest predator);

- existing regulatory mechanisms are not merely inadequate but through the exercise of such regulatory mechanisms by the IBMP promote the lethal removal of wild bison;

- the current exercise of lethal control and other management practices by IBMP affects the continued existence of Yellowstone's wild bison.

Under Section 4 of the ESA, the Secretary shall designate critical habitat on the basis of the best scientific data available, taking into consideration relevant impacts such as economic and national security. The petitioner contends that the failure to designate the migratory regions immediately outside the park historically used by wild Yellowstone bison as critical habitat will result in their extinction as a distinct, undomesticated, unfenced and wild species.

The IBMP is overseeing what amounts to a pest extermination program mounted against the Yellowstone bison, favoring the economic interests of the cattle industry in direct violation of the act founding the park, which states that the Secretary of the Interior "shall provide against the wanton destruction of the fish and game found within said park, and against their capture or destruction for the purposes of merchandise or profit" (Yellowstone Act, 1872; 2014).

The rationale for designating the migratory regions in Gardiner Basin and Hebgen Lake area as critical habitat is manifold, namely:

- the regions have been historically used by bison,

- they provide bison with a safe haven for escape from harsh winter conditions at higher altitudes in the park and for calving purposes in the spring,

- their continued use enables wild bison to retain their migratory instincts critical for survival as wild animals and

- it would protect wild bison from lethal removal for the purpose of profit by the cattle industry,

- allowing bison to migrate to these regions potentially is the most economical alternative.

It would stand to reason that the alternative recommended here, doing nothing other than allowing bison to migrate into their traditional migratory grounds, would save the money now being spent on separating wild bison from cattle bi-annually, that is, about $3 million annually in combined state and federal funds.

The money saved could be used to purchase wild bison migratory habitat as a reserve. Further, funds generated by the license fees currently being collected for their hunting could be used to compensate any displaced cattle operations now in the region.

Thus, listing the wild bison as endangered or threatened and designating its migratory regions and calving grounds immediately outside the park as critical habitat has a good probability of saving money in comparison to the plan now in operation, further warranting their listing as endangered or threatened.

Moreover, because it has the most potential in comparison to all other alternatives to promote the national security—that is, safety from an outbreak of brucellosis among cattle in the contiguous states—the listing concurrent with habitat designation should be granted.

If simply allowing wild bison to migrate to these regions proves unworkable due to property damage and safety reasons, then funds from hunting permits and from the tax dollars currently going to lethal management and hazing activities by the IBMP, could be diverted to building fences around communities such as Gardiner and around vulnerable private properties.

However, such actions require compromise on the part of both those in favor of allowing bison to roam and those against it. With a philosophy of valuing the Yellowstone bison, its heritage and its wildness as a priority, then humans and wild bison can co-exist, avoiding the tragedy of the extirpated European bison, the wisent. Further, the war against the wolf should also stop, for it should be viewed as an ally in controlling the bison population.

But it does not stop there. Combined actions, instead of targeting the destruction of wild bison, could result in the restoration of the ecosystem and a cascade of ecological benefits. To accomplish this, we need to listen to the experts, the American Indian people, those who were able to not only co-exist with wildlife, but to prosper in doing do. If you view wildlife merely scientifically, you end up relating to it in a heartless way, and that is what is happening now. Heartlessness eventually ends up in exploitation and conflict.

Such a viewpoint—namely, working with nature instead of against it—leads to greater prosperity for all concerned. But this means changing the ethos, and that ain't no easy task.

**Brief history of the bison in Yellowstone**

The present-day American bison is a descendent of *Bison antiquus*, sometimes called the "ancient bison," once the most common large herbivore of the North American continent. It was taller and had larger bones and horns than modern bison. It stood about 7.5 feet tall and had a span of 3 feet from point to point. Bison today stand at 5 to 6.5 feet.

During the later Pleistocene epoch, between 240,000 and 220,000 years ago, steppe wisent (*Bison priscus*) migrated from Siberia into Alaska. This species inhabited parts of North America throughout the remainder of the Pleistocene. In midcontinent North America, however, *Bison priscus* was replaced by the long-horned bison, *Bison latifrons*, and somewhat later by *Bison antiquus*. The larger *Bison latifrons* appears to have died out by about 20,000 years ago. In contrast, *Bison antiquus* became increasingly abundant in parts of midcontinent North America from 18,000 years ago until about 10,000 years ago, after which the species appears to have given rise to the living species, *Bison bison*. Bison *antiquus* is the most commonly recovered large mammalian herbivore from the La Brea tar pits (Bison antiquus, 2015).

These animals, as well as other megafauna, evolved in North America without the presence of humans. About 13,000 years ago the ice sheets that had covered the Bering Land Bridge located between Asia and North America began to melt, creating an ice-free corridor between glaciers. The terminus of the corridor emptied into the plains and Rocky Mountain region. Travelling through this corridor came tribes of ancient people.

Excavators in the 1920s at a site near Folsom, New Mexico, discovered a stone projectile point along with the bones of the extinct B. antiquus, indicating that bison were trapped and killed there. In the 1930s excavations near Clovis, New Mexico uncovered projectile points at what appeared to be an ancient campsite. Fluted points, spearheads and other stone and bone weapons, as well as tools and processing implements were found. These artifacts were in association with the remains of extinct Late Pleistocene megafauna, including Columbian mammoths, camels, horses, bison, saber-tooth cats, sloths and dire wolves. Radiocarbon dating indicated the sites were over 10,000 years old, with the earliest sites being those containing the Clovis points. (Folsom Site, 2015; Clovis culture, 2015; Blackwater Draw, 2015).

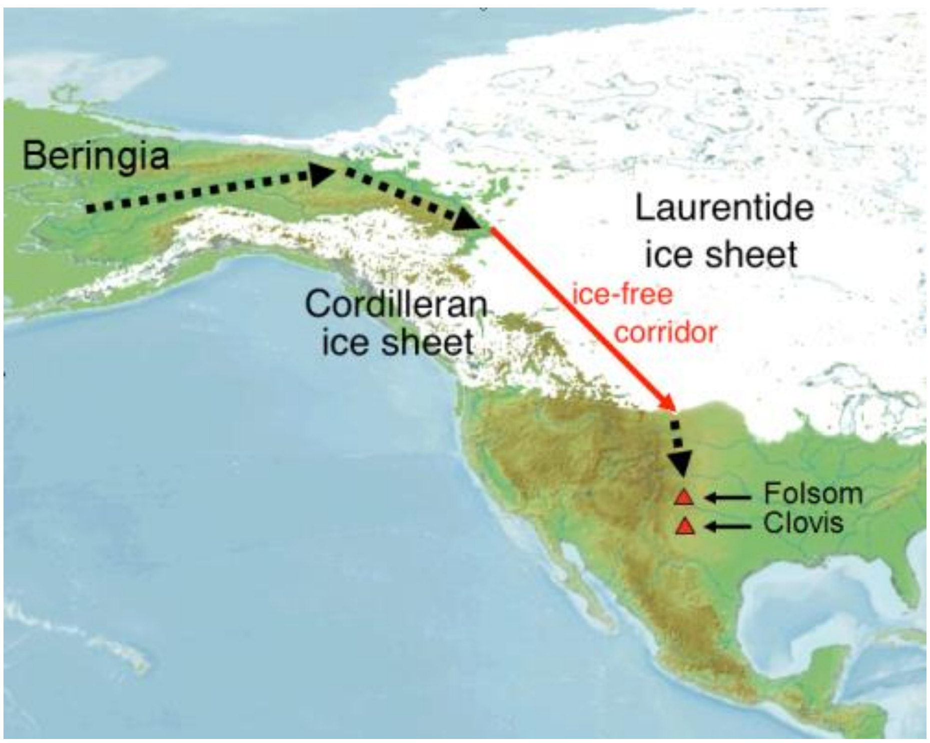


**Figure 20. FROM THE OLD WORLD TO THE NEW. Map showing the location of the ice-free corridor and specific Paleoindian sites, such as Clovis and Folsom, New Mexico. Early man migrated over the Bering Land Bridge when the ice sheet began to melt, encountering such megafauna as bison and mammoths. About this time, a mass extinction of megafauna species began.** ***Map used under the Creative Commons attribution license. Author: Roblespepe***

As the ice age ended, fresh water from the glaciers melted and the level of the ocean began to rise, eventually cutting off further passage between the two continents. At about the same time, numerous large animal species went extinct. No one knows exactly why these large beasts became extinct. Some think it was due to indigenous hunters. Others believe predators, climate change or disease were the cause. The largest megafaunal species to survive that extinction was bison, from which the present species evolved. (Elias, 2014; Anderson, 2014). }

On Osprey Beach on the shore of Lake Yellowstone in Yellowstone National Park is another archaeological site, a campsite occupied about 10,000 years ago. Hunters and gatherers of the region were once thought to inhabit only the plains and foothills as bison hunters. However, following excavation of the site, analysis revealed that they were also present in this mountainous lake area on a seasonal basis. Chert or obsidian knives found in the excavation had various types of blood residue on their blades, such as bison, deer, rabbit and Rocky Mountain bighorn sheep. Some of the artifacts came from Obsidian Cliff, a major source of obsidian throughout prehistory, located about 20 miles to the northwest of Yellowstone Lake. Some believe that the Yellowstone region may have served for early man as a kind of summer resort and as a place to procure flint and process hides (Shortt, 2003).

Paleo-Indians were efficient hunters. Before the introduction of horses by the Spanish conquistadors in the 16th century, they hunted on foot using spears. Analysis of archaeological excavations of kill sites across the United States reveal that such hunters often stampeded bison into gulches or over cliffs, killing hundreds in a few minutes. They were butchered on the spot and the various cuts taken back to camp (Shortt, 2003).

Clovis people hunted mammoths, but the mammoth may have been hunted out by 8,000 BC. It was replaced as a big game animal by the now extinct Bison antiquus,. A millennium later this species was supplanted by the somewhat smaller Bison occidentalis, also now extinct (Wheat, 1972).

There are two recognized subspecies of bison extant today, wood (Bison bison athabascae) and plains (Bison bison bison) bison.

As reported by William T. Hornaday in *The Extermination of the American Bison*, the first sighting of the American bison by Europeans in the Americas was in the menagerie of Montezuma in 1521. According to historian Antonio de Solís:

> In the second Square of the same House were the Wild Beasts, which were either presents to Montezuma, or taken by his Hunters, in strong Cages of Timber, rang'd in good Order, and under Cover: Lions, Tygers, Bears, and all others of the savage Kind which New-Spain produces; among which the great Rarity was the Mexican Bull; a wonderful composition of divers Animals. It has crooked Shoulders, with a Bunch on its Back like a Camel; its Flanks dry, its tail large, and its Neck cover'd with Hair like a Lion. It is cloven footed, its Head armed like that of a Bull, which it resembles in Fierceness, with no less strength and Agility (Hornaday, 1887).

Indians coexisted with bison on the Great Plains for millennia. Massive herds of buffalo roamed the Great Plains. Bison were the most numerous single species of large wild mammals on earth, numbering in the multiple millions.

With the settlement of the United States by European immigrants, the killing of bison increased exponentially. During the “great slaughter” of bison during the years 1872 to 1874, according to records provided by Col. Richard Irving Dodge, based on statistics furnished by the Atchison, Topeka and Santa Fé railroad, 3.2 million buffalo were killed “by whites” (Hornaday, 1887).

This was done in part as a military strategy to clear the Great Plains of Indians to make way for settlement by European immigrants, to ensure safe passage of the transcontinental railroad—as well as encourage investment in this enterprise—and to enable the introduction of domestic cattle.

The December 12, 1874 issue of *Harper's Magazine* recounted the slaughter:

> The vast plains west of the Missouri River are covered with the decaying bones of thousands of slain buffaloes. Most of them have been slaughtered for the hide by professional hunters, while many have fallen victims to the sportsmen's rage for killing merely for the sake of killing. These people take neither hide nor flesh, but leave the whole carcass to decay and furnish food for the natural scavengers of the plains.
>
> Our front-page illustration represents a party of professional hunters, numbering six or eight, who have come upon a large herd of buffaloes. The first shot brings down a splendid animal, wounded purposely in a manner not to kill but to make him "pump blood," that is to say, to bleed profusely. Others of the herd gather around their wounded comrade, and appear to be too much stupefied to avoid danger by flight. The hunters kill as many as they can, until the survivors at last take fright and gallop off.
>
> Then the “stripping” begins. The hides are taken off with great skill and wonderful quickness, loaded on a wagon, as shown in the background of the picture, and carried to the hunters’ camp. Our artists spoke with the hunters on the plains who boasted of having killed two thousand head of buffalo apiece in one season. At this rate of slaughter, the buffalo must soon become extinct. Already there is a sensible diminution of the great herds on the plains, and from many places where they were once numerous they have disappeared altogether. Some of the railroads running far out into the prairies have regular trains for parties of amateur hunters, who fire upon their victims from the car windows. Thousands of buffalo were killed in this manner, besides other kinds of wild game, and their carcasses left to decay on the ground along the line of the railroad.

Such killing had massive consequences to the ecological stability of the region, for with the bison’s extirpation, the extirpation of Indian tribes also followed, resulting in war on the plains. As the *Harper's Magazine* article continues:

> The indiscriminate slaughter of the buffalo has brought many evils in its train. Among other bad consequences it has been the direct occasion of many Indian wars. Deprived of one of their chief means of subsistence through the agency of white men, the tribes naturally take revenge by making raids on white settlements and carrying off stock, if they do not murder the settlers.

The end result was the re-location of Indian tribes to reservations where they were forced to live sedentary lives, deprived of the bison stock on which they had subsisted. Bison were reduced to a few hundred animals on the verge of extinction.

"Extinction is irreversible. Species that die out will never come back," observed Michael Novacek in *Terra: our 100-million-year-old ecosystem—and the threats that now put it at risk.* "As we have seen, much of the devastation that humans have wrought over the past forty thousand years has been unusually focused on big animals. The survivors of this onslaught now hang on in confined, degraded habitats, with small, isolated populations that maintain only a meager portion of their once enriched gene variation."

Following the decimation of the American bison, a few were found huddled in Yellowstone National Park.

> South of the Northern Pacific Railway, a band of about three hundred settled permanently in and around the Yellowstone National Park, but in a very short time every animal outside of the protected limits of the park was killed, and whenever any of the park buffaloes strayed beyond the boundary they too were promptly killed for their heads and hides. At present the number remaining in the park is believed by Captain Harris, the superintendent, to be about two hundred; about one-third of which is due to breeding in the protected territory (Hornaday, 1887).}

Yellowstone National Park was founded in 1872 in part for the protection of bison and other wildlife. Ongoing poaching continued there until the U.S. Army arrived at Mammoth Hot Springs in 1886 and built Camp Sheridan. By 1902 a total of 23 bison were counted in Pelican Valley, located at the east and of Yellowstone Lake outlet.

The bison most likely survived here because of the thermal pools, which provided a year around refuge. Because of the warm thermal ground, forage was available even during the winter because of less snow cover. Some of these bison stayed within the park all winter, thereby not exposing themselves to buffalo hunters and poachers.

In 1905, 21 bison were reintroduced into the park to improve genetics. Beginning in 1940, bison that reproduced beyond what was considered the carrying capacity of the range either starved or were killed by park rangers. By 1954 there were 1,477 bison in the park. In 1966, park managers adopted a policy of "natural management," ceasing to kill bison within park boundaries. Hunting licenses were sold by Montana for bison that migrated across park boundaries. In 1984, in response to ranchers' complaints in the Gardiner Basin, Montana game wardens slaughtered 88 buffalo that wandered outside the park.

In 1985 the Montana state legislature passed a law "reaffirming buffalo as a legitimate game animal." By 1988, due to a number of preceding mild winters, the bison numbered 3,500.

In the winter of 1988-89, snow depth and cold temperatures forced the bison to lower elevations, resulting in a large migration (Gutkoski, 2006). During that winter cattlemen complained that if migrating bison got near their cattle grazing adjacent to the park they could be infected with brucellosis. To address that problem, the Montana FWP announced a special hunt.

Reporters from the national news media travelled to the Gardiner Basin and the West Yellowstone area to film the event. They described how park rangers led hunters directly to bison they had located. Animals either standing or lying down were shot at point-blank range. A total of 569 buffalo were killed. One reporter noted ironically that the rangers' badges were inscribed with the Interior Department's symbol, the American bison. The resulting footage caused a national uproar and criticism of "unfair chase" and "slaughter."

In 1990 the National Park Service, the U.S. Forest Service, and the Montana Department of Fish, Wildlife, and Parks collaborated to prepare an environmental impact statement examining options for a "long-range bison management plan." In 1992, those agencies joined with the Montana Department of Livestock and U.S. Department of Agriculture, Animal and Plant Health Inspection Service and signed a "Memorandum of Understanding" to develop such a plan.

Between 1990 and 1995, various plans provided for agency personnel from Montana and the National Park Service to shoot bison moving from Yellowstone National Park into Montana in order to "achieve the objectives of protecting private property, providing for human safety, and maintaining Montana's brucellosis class-free status."

In 1995 the State of Montana sued the National Park Service and APHIS, complaining of both NPS management of bison and the possibility that APHIS would change the state's brucellosis class-free status. In 1996, shooting was suspended and instead, migrating wild bison were herded into the Stephens Creek capture facility within the park and near its north boundary, loaded onto livestock trailers and shipped to a slaughtering facility. The plan also provided for the capture of bison outside Yellowstone in the West Yellowstone area and the shipment to slaughter of all pregnant bison as well as any others that tested positive for brucellosis.

Two lawsuits challenged the legal basis for the agency implementation of this plan because it included the capture and testing of bison in capture facilities within the park and in the Gallatin National Forest, and subsequent slaughter of seropositive and pregnant bison. The U.S. District Court for the District of Montana held that the actions of the National Park Service were within the authority and discretion of the agency. The Ninth Circuit Court of Appeals affirmed that decision (*Record of Decision*, 2000, pp. 3-4).

During the severe winter of 1996-1997, nearly 1,100 bison were sent to slaughter, reducing the population to about 2,200 in 1997-1998. The carcasses were sold at public auction or given to Native Americans (Bison, 2015).

While the various plans provided the legal authority to lethally remove bison attempting to leave the park for forage, no management plan was in place limiting the mortality or providing guidelines to maintain a genetically viable population. The need for such a bison management plan was summarized in the *Jackson Hole News & Guide*. The story, headed "Feds deny petition for bison ESA listing," concerned the FWS's 2007 denial of my petition to list the Yellowstone bison as an endangered species. Reporter Cory Hatch wrote:

> The U.S. Fish and Wildlife Service has denied a private citizen's request to list the Yellowstone bison as an endangered species after eight years of deliberation.
>
> Minnesota resident James Horsley filed the petition in 1999, concerned that there were no limitations on killing bison that left the park. Horsley's petition came after the winter of 1996-97 when severe weather led to the deaths of over 1,000 bison as they tried to move into winter range outside the park.
>
> According to Chuck Davis, endangered species litigation coordinator for the Fish and Wildlife Service, Yellowstone and other management agencies that oversee bison populations in Montana have since formulated a management plan that provides guidelines for killing bison meant to keep numbers high enough to maintain a viable population.
>
> Davis said that, though the petition was unsuccessful, Horsley's concerns raised some key issues. "His main concern was there was no control over mortality," said Davis. "Because we didn't have a plan, his petition had some merit."
>
> Also, Horsley suggested that the Yellowstone bison be considered a distinct population segment, a position that the agency ultimately agreed with.
>
> "If you look at the Yellowstone bison herd, it is both discreet and important," said Davis. "It doesn't interbreed with other populations and it's significant because it's the only bison herd that has always been there. It never disappeared and it is not reconstituted from other herds."
>
> Davis acknowledged that there are still some problems with Yellowstone bison, most notably a disease called brucellosis that bison might be able to transmit to cattle. "Clearly there were some issues here with management of the park's herd," he said. "Quite frankly our herd continues to grow and it doesn't show any problems with breeding and things like that. In fact, the herd is doing pretty darn well."
>
> Horsley and representatives of the Buffalo Field Campaign could not be reached for comment (Hatch, 2007).

**Beginning of the Interagency Bison Management Plan (IBMP)**
Trying to achieve the various goals of the agencies created conflicts between them and resulted in the filing of the suit mentioned above. Following an environmental impact statement, the parties signed a settlement agreement that provided for a bison management plan. That plan eventually resulted in a court-approved agreement that entailed the shipment to slaughter of bison captured in the park near the north boundary in the Stephens Creek as well as Hebgen Lake regions near the West Yellowstone area.

This agreement established the Interagency Bison Management Plan (IBMP). In essence, the plan gives legal authority to haze or lethally remove wild bison coming into these wildlife habitats where cattle, a domestic and invasive species, graze. The plan was made law in 2000 and since November

2009 includes three tribal entities: the Confederated Salish & Kootenai Tribes, the Inter Tribal Buffalo Council, and the Nez Perce Tribe.

According to the Preamble of the *Record of Decision for Final Environmental Impact Statement and Bison Management Plan for the State of Montana and Yellowstone National Park*:

> Bison are an essential component of Yellowstone National Park because they contribute to the biological, ecological, cultural, and aesthetic purposes of the Park. However, Yellowstone National Park is not a self-contained ecosystem for bison, and periodic migrations into Montana are natural events. Some bison have brucellosis and may transmit it to cattle outside the Park boundaries in Montana if bison migrating from the Park are allowed outside the Park without appropriate management measures. Transmission of brucellosis from Yellowstone bison to cattle in Montana could have not only direct effects on local livestock operators, but also on the cattle industry statewide. Because bison that leave YNP are under the management jurisdiction of the State of Montana, the cooperation of several agencies is required to fully manage the herd and the risk of transmission of brucellosis from bison to Montana domestic cattle.
>
> The parties recognize that the cooperation to address the existence of brucellosis in the bison herd involves the management of wild bison on both private and public lands, which requires different approaches to risk and disease management than standard situations involving brucellosis in domestic cattle or bison . . .
>
> The management of bison under this plan will include actions to protect private property; actions to reduce the risk of transmission of brucellosis from bison to cattle; and, actions to maintain a viable, free-ranging population of Yellowstone bison (*Record of Decision,* p. 21, 22).

This is an amazing collection of double talk. On the one hand, it outlines the importance of wild bison and that the park is not large enough to provide all the habitat essential for their survival, necessitating their migration out of the park. In recognition of this, the IBMP states it intends to "maintain a viable, free-ranging population of Yellowstone bison." These statements are contradictory when one considers that the IBMP was specifically formed to stop the free-ranging behavior of bison, that is, their migration.

In order to proceed when mission statements contain opposing goals, one has to choose one or the other goal. The IBMP chose to target bison instead of cattle to achieve separation of the two species. The simplest, most effective and most economical choice would have been to remove cattle from the park boundary areas such as Gardiner Basin and Hebgen Lake region near West Yellowstone. Instead, the IBMP chose to allow cattle in these park perimeter habitats and disallow bison, favoring less than 2,000 head of cattle that annually graze these regions over almost 5,000 bison that historically have used these habitats for winter migration.

This is an ecological travesty.

**Wild bison managed by law like livestock**

Giving legal cover for this range war is statute 81-2-120 of the Montana Code Annotated as passed by the state legislature. The 2014 code states under "Management of wild buffalo or wild bison for disease control" the following:

> (1) Whenever a publicly owned wild buffalo or wild bison from a herd that is infected with a dangerous disease enters the state of Montana on public or private land and the disease may spread to persons or livestock or whenever the presence of wild buffalo or wild bison may jeopardize Montana's compliance with other state-administered or federally administered livestock disease control programs, the department may, under a plan approved by the governor, use any feasible method in taking one or more of the following actions:
>
> (a) The live wild buffalo or wild bison may be physically removed by the safest and most expeditious means from within the state boundaries, including but not limited to hazing and aversion tactics or capture, transportation, quarantine, or delivery to a department-approved slaughterhouse.
>
> (b) The live wild buffalo or wild bison may be destroyed by the use of firearms. If a firearm cannot be used for reasons of public safety or regard for public or private property, the animal may be relocated to a place that is free from public or private hazards and destroyed by firearms or by a humane means of euthanasia.
>
> (c) The live wild buffalo or wild bison may be taken through limited public hunts pursuant to 87-2-730 when authorized by the state veterinarian and the department.
>
> (d) The live wild buffalo or wild bison may be captured, tested, quarantined, and vaccinated. Wild buffalo or wild bison that are certified by the state veterinarian as brucellosis-free may be:
>
> (i) sold to help defray the costs that the department incurs in building, maintaining, and operating necessary facilities related to the capture, testing, quarantine, or vaccination of the wild buffalo or wild bison; or
>
> (ii) transferred to qualified tribal entities that participate in the disease control program provided for in this subsection (1)(d). Acquisition of wild buffalo or wild bison by a qualified tribal entity must be done in a manner that does not jeopardize compliance with a state-administered or federally administered livestock disease control program. The department may adopt rules consistent with this section governing tribal participation in the program or enter into cooperative agreements with tribal organizations for the purposes of carrying out the disease control program.
>
> (e) Proceeds from the sale of live, brucellosis-free, vaccinated wild buffalo or wild bison must be deposited in the state special revenue fund to the credit of the department (Montana Code Annotated, 2014).

In sum, this states that whenever wild bison from Yellowstone National Park (which are recognized by law as being publically owned) come on public or private property within Montana, the Department of Livestock may either haze them back into the park, capture and ship them to a slaughter house, shoot them or have them taken by public hunting.

While hazing involves less lethal management of bison, it still can kill them, especially when calves are stampeded or when bison are driven out onto thin ice. A case in point is shown below:

**Figure 21. RANGERS HAZED THESE WILD BISON out onto the thin ice of a lake, drowning many.** ***Photo courtesy of Buffalo Field Campaign.***

**Figure 22. RANGERS PULLING OUT CARCASSES of drowned bison that fell through the ice during hazing operations.** ***Photo courtesy of Buffalo Field Campaign.***

Brucellosis-free bison may be sold or transferred to those tribes that have taken part in the "disease control program," thereby providing bison as a handout to these tribes. This is an insult when you consider that bison were originally destroyed by the millions during the great buffalo slaughter following the Civil War as a means to subdue the Plains Indian nations' ability to be self-reliant.

It is relevant to note that this statute is under the heading of "Title 81: Livestock, Chapter 2: Disease Control." Bison are being managed as livestock for disease control in the state of Montana by the Department of Livestock.

Possibly Native Americans and conservationists can offer to manage Montana cows for disease control. It would be an instance of "tit for tat," a logical strategy used in the game Prisoner's Dilemma. This strategy, which has been applied successfully in many real life situations, recommends a like-for-like retaliation as the most rewarding response to duplicity by one's opponent (Tit for tat, 2015). Possibly, in the name of disease control, they could go onto cattle ranches near the park and slaughter 900 cattle that have come in contact with elk from brucellosis-infected herds, give the slain animals to the cattlemen and charge them $3 million for their service.

**Basis of the IBMP**

The most sweeping authority over wild bison given to the IBMP is the stipulation that allows the Interagency to kill all wild bison over the population target of 3,000 head. This number was chosen because it was determined that when the bison population reached this level it triggered migration out of the park during severe winters (*Record of Decision*, 2000, pp. 26, 30). Regrettably, this population level has no correlation to the number needed to protect the wild bison's genetic diversity. The fallout of this provision is that any bison that approaches the boundary of the park is a candidate for lethal removal when the herd reaches that magic number of 3,000, regardless of available habitat.

But cattlemen want cheap federal grazing land. And tragically, they are getting it at the cost of a $3 million annual expenditure in public funds to keep bison out of their favorite Yellowstone grazing plots.

According to the *Record of Decision* itself, the statutory basis for the joint management by the various governmental agencies of Yellowstone bison is as follows:

> The major federal laws that apply to federal agency actions in the Joint Management Plan are the National Park Service Organic Act and General Authorities Act, the Yellowstone Enabling Act, the National Forest Management Act, the Forest Service Organic Act, the Multiple-Use Sustained-Yield Act, the Federal Land Policy and Management Act, the Department of Agriculture Organic Act, the Animal Industry Act, the Animal Disease Control Cooperative Act, the Cattle Contagious Diseases Act, the Act of July 2, 1962, the Endangered Species Act, and the National Environmental Policy Act.

The statutes give the governmental agencies:

> . . . broad discretion to exercise our expertise to manage the lands, programs, and wildlife, as applicable, under our administrative authority in a manner deemed best to meet the purposes Congress has delineated.

In implementing its management plan for Yellowstone bison, the actions of the IBMP must comply with the various laws, which the IBMP claims are based on the "best available scientific information" and are "ecologically sound." Further:

> They will provide for the conservation of bison in Yellowstone National Park and provide protection for the economic interests and viability of the livestock industry in the State of Montana.

The *Record of Decision* states that the Forest Service has the responsibility of "providing habitat for wildlife and grazing allotments for cattle." However:

> The Forest Service recognizes that the State of Montana has primary management responsibilities for livestock disease and wildlife on national forest as well as private lands surrounding Yellowstone National Park.

The *Record of Decision* notes the following:

> When Congress created Yellowstone National Park in 1872, it set apart the area as a "public park or pleasureing ground for the benefit and enjoyment of the people." (16 USC 21) Congress also declared that the park would be under the "exclusive control" of the Secretary of the Interior. Congress charged the secretary with "providing for the preservation, from injury or spoliation…the natural curiosities, or wonders, within the park, and their retention in their natural condition." The secretary also must provide against the "wanton destruction of the fish and game found within the park." In 1894 Congress provided additional protection to wildlife within the park, largely in response to continued poaching of bison. In what is often referred to as the original Lacey Act, Congress prohibited within the boundaries of the park "all hunting, or the killing, wounding, or capturing at any time of any bird or wild animal, except dangerous animals, when it is necessary to prevent them from destroying human life or inflicting an injury."

**The "various actions" now permitted**
With those high sounding objectives stated, the *Record of Decision* launches into "various actions" the IBMP can carry out "in Yellowstone National Park, the Gallatin National Forest, and private lands on the north and west boundaries of Yellowstone National Park . . . particularly with regard to managing bison on winter range outside Yellowstone National Park."

The primary objective of these various actions is "to address the risk of transmission of brucellosis," with the major tool to achieve this being "the spatial and temporal separation of bison from an affected herd and cattle."

What follows is a total capitulation to the cattle industry by the agencies responsible for the protection of wildlife. Instead of not allowing less than 2,000 cattle on private property adjacent to the park and instead of withdrawing permits for public grazing allotments for which the government charges only $1.35 per cow per month for usually a four-month period of time each year, to accomplish the objectives stated above, at the cost of $3 million annually, these actions are taken:

> The agencies will not allow bison to intermingle with cattle. Additionally, in the spring the agencies will haze bison back into the park, at or near the time when bison historically can return to the park based on snow and weather conditions, or capture or shoot them if hazing is unsuccessful. The Joint Management Plan includes capture, test, and slaughter of seropositive bison at both the Reese Creek and West Yellowstone areas in steps one and two, and the use of hazing, capture, test and slaughter operations, or quarantine, if available, of all bison that might remain outside the park in these areas after specified haze-back dates.
>
> The agencies will control the risk of transmission to cattle outside the boundary areas by limiting the number of bison in the boundary areas through intensive monitoring and zone management. The agencies will increase the intensity of management as bison move toward the edges of management Zone 2 . . . [See Figure 23].

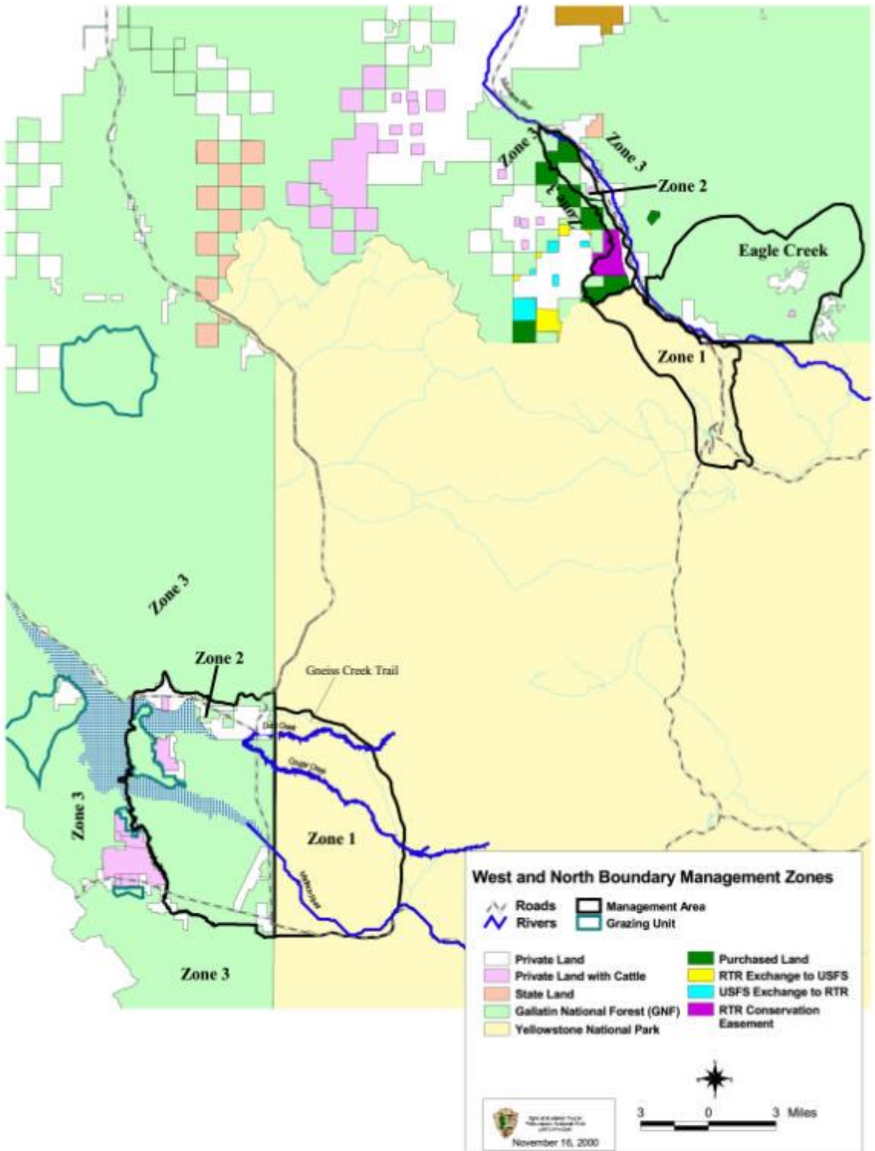


**Figure 23. WEST AND NORTH BOUNDARY MANAGEMENT ZONES map in the *Record of Decision*, 2000, p. 7. Notice Zone 1 is on park property where lethal management can commence.**

Notice the stipulation that such management action is triggered by movement of wild bison into Zone 1 which is *within the boundaries of the park.* Zone 1 is where "agencies will increase the intensity of management as bison move toward the edges of management Zone 2." Here in Zone 1 "bison attempting to exit the Park may be subject to hazing, capture, testing and vaccination, or lethal removal" (*Record of Decision*, 2000, p. 30).

"Attempting to exit the park" is signaled by what government agents perceive to be bison migrating. This terminology has allowed for the construction of the Stephens Creek capture facility within Zone 1 inside the park near its northern gateway, where bison are captured and shipped to slaughter.

This is in direct violation of the Congressional prohibitions for capture and destruction of wild animals in the park. But in the case of the IBMP, because these actions are court approved, such exceptions to these prohibitions are allowed on park property in Zone l.

If these migrating wild bison somehow travel to Zone 2, the following happens:

> The agencies will use hazing, capture facilities, or shooting, if necessary, to prevent bison from leaving management Zone 2, enforce zone management, and ensure the removal of all bison from management Zone 2 in the spring, to maintain temporal separation as described in the Joint Management Plan, infra. The agencies also will defer cattle grazing on the Gallatin National Forest for the summer until after bison are hazed back into the park in the spring. Additionally, the agencies will use vaccination of bison and cattle to reduce risk even further and to work toward the eventual elimination of brucellosis in bison.

The “eventual elimination of brucellosis” is a pipedream and has been so recognized by biologists with the acquisition of data between the years of 2000 and 2015, as will be shown later in the petition. The passage continues:

.

> These actions will ensure that sufficient time (initially approximately 45 days or less depending on research results) passes so that the *B. abortus* bacteria are unlikely to have survived when cattle return to graze in the summer. Research in Wyoming on *B. abortus* Strain RB51 bacteria (used as a surrogate for field strain *B. abortus* in the research) and data on field strain *B. abortus* in Yellowstone National Park indicate the bacteria are highly unlikely to survive after an approximate 45-day period (or less depending on research results) due to heat, ultraviolet light, and a number of other factors. The release of untested bison outside the park (i.e., Step Three) in the Joint Management Plan, however, relies on research sufficient to allow the agencies to determine an adequate temporal separation period. The research would address the viability and persistence of the bacteria in environments to the west and north of the park. Such release also relies on the initiation of a vaccination program for bison in the park with a safe and effective vaccine and a safe and effective remote delivery system.

An “effective vaccine and a safe and effective remote delivery system” have also proven infeasible, which will also be discussed in this petition. The passage goes on, describing how female pregnant bison will be monitored by telemetry (which consist of electronic monitors vaginally attached) and that such bison will be removed if signals indicate they are about to give birth:

> As with the modified preferred alternative, the agencies will use radiotelemetry to monitor seronegative pregnant bison outside the park in steps one and two to evaluate the risk and develop appropriate mitigation measures if needed. While the agencies collect data, they also will use telemetry to provide an added measure of security in the event that any of these bison either abort or give birth outside the park. In steps one and two, the agencies could remove telemetered females giving birth to live calves or aborting fetuses outside the park.

What is described in the last sentence is repugnant. Removing, either by hazing or lethally, a mother in the act of giving birth or aborting, connotes an agency obsessed with control. If a wild bison manages to survive the governmental gauntlet in its migratory progression through Zone 1 and Zone 2, reaching Zone 3, it is all over:

> Zone 3 is the area where bison that leave Zone 2 would be subject to lethal removal (*Record of Decision*, 2000, pp 8-11).

There is something Orwellian about this. While obviously bison are not people, wild bison are a public concern and asset, for they are owned by the public legally. These passages exude a totalitarian outlook, a certain "big brother is watching you" quality as described in George Orwell's novel *1984* and embody his fear that even such nations as the United States could fall under the control of "the intellectuals" who "are more totalitarian in outlook than the common people" and where "two and two could become five if the fuhrer wished it" (Orwell, 1944).

In the society that Orwell describes, every citizen is under constant surveillance by the authorities, mainly by telescreens. The people are constantly reminded of this by the phrase "Big Brother is watching you." However, in the nature of doublethink, this phrase is also intended to mean that Big Brother is a benevolent protector of all citizens (Big Brother [Nineteen Eighty-Four], 2015).

In the instance at hand, Big Brother is "protecting" the public from brucellosis and watching its property, the wild bison, by means of telemetry and government agents so as to control its property for them and, in so doing, driving the wild bison—this heritage of the American people—into extinction.

**Government perspective of conflict**

A government synopsis of the problem is found in *Brucellosis in Cattle, Bison, and Elk: Management Conflicts in a Society with Diverse Values*, written by P.C. Cross, M.R. Ebinger, V. Patrek and R. Wallen, a joint authorship by members of U.S. Geological Survey, Northern Rocky Mountain Science Center; Department of Ecology, Montana State University and the National Park Service, Yellowstone National Park.

It is a justification of wildlife harassment in the name of brucellosis control. Its conclusion that the management regime has been "highly effective" is an unscientifically-based claim and is in error. Rather, it has been a failure since the brucellosis eradication program has not reduced the prevalence of this disease in the park from day one and never will. The document states:

> Every year in late winter as the snow piles up in Yellowstone National Park (YNP), bison migrate to low elevation winter ranges outside the Park boundary where less snow makes foraging easier. Bison that migrate out of the park encounter a landscape where cattle ranching activities conflict with bison conservation near West Yellowstone and Gardiner, Montana. Once bison have left YNP they enter the jurisdiction of Montana Fish Wildlife and Parks (MFWP) and the Montana Department of Livestock (MDOL), which have different constituencies and mandates. MFWP treats the animals as a game species, while the MDOL view them as threats to the livestock industry. To manage bison in the conflict zone, these agencies, along with YNP, the Gallatin National Forest and the U. S. Animal and Plant Health Inspection Service developed an Interagency Bison Management Plan (IBMP) in 2000.

> The intention of this plan is to "maintain a wild, free-ranging population of bison and to manage the risk of brucellosis transmission from bison to livestock in Montana." The plan is focused on making sure that bison and cattle are separated during the late winter and early spring when the transmission of brucellosis is most likely. The IBMP allows for some bison in designated management areas during portions of the year that risk of brucellosis transmission is low. The plan calls for more aggressive control and culling of the population as the risk increases. Managing for a population abundance of about 3000 bison was determined to minimize the risk of bison migrating beyond the park boundary and thus reduce the risk of brucellosis transmission from bison to cattle (Cheville, McCullough & Paulson 1998). To keep bison within designated management areas and to keep abundance in these areas within accepted limits the agencies use a variety of tactics (riders on horseback, snowmobiles, helicopters) to haze bison away from cattle occupied areas and, if necessary, use corral traps located in the Madison Valley and Gardiner Basin to capture bison and remove them from the population.

To sum up these paragraphs, separation of bison from cattle has been adopted as the solution to the twin goals of maintaining wild bison as well as controlling brucellosis transmission to cattle. This makes good scientific sense. But the method of separation does not, for it involves violating the mandate not to capture or destroy wildlife for the sake of profit within the park, and clearly lethal removal via capture facilities on park property is such a violation, especially when one considers this is being done so that commercially sold cattle can graze near the park. A domesticated animal species just outside the park has been ascribed the status of a sacred cow and is given priority over wildlife within a wildlife ecosystem. That does not make good sense. The Cross document continues:

> In 2008, 1729 bison were removed from Yellowstone through hunting and management actions, which was roughly 40 percent of the pre-winter population estimate. This was the largest removal in the history of YNP. Conservation groups vary in their approach and philosophy, but most objected to this level of removal and the way in which it occurred. Part of the controversy revolves around the appropriate use of public lands outside of YNP. Some believe that bison, like other wildlife species, should be allowed access to public land, but this potentially brings them into close proximity with cattle herds. The extensive press coverage of bison management activities suggest that bison are a major risk of transmission to cattle. In fact, as is often mentioned by the press, there are no confirmed cases where bison have transmitted brucellosis to cattle in the wild. This is true, but not because bison are unable to transmit the disease to cattle, rather it is true because the current management practices of hazing, boundary quarantines, and removal effectively separate cattle and bison. The management regime is unpalatable to many conservation groups, but it is highly effective (Cross, 2010).

Highly effective? If what is meant here is that, *because of* the IBMP's lethal removal of bison from the cattle ranges near the park, *no transmission* of brucellosis between wild bison and cattle has occurred, then such a pat on the back is a delusional accolade that lacks scientific grounding. Correlating the findings of no brucellosis transmission between bison and cattle on common grazing land with the government's actions of lethal removal of cattle from those common areas is not necessarily a proof of causation.

For instance, look at the experiences of the neighboring state of Wyoming. In "Developing Sustainable Management Practices: Lessons from the Jackson Hole Bison Management Planning Process," Christina M. Cromley, Northern Rockies Conservation Cooperative, Yale School of Forestry and Environmental Studies, made the following observation:

> It is important to learn not just from scientific studies, but also from history and experience. For example, the attempt to eradicate brucellosis from the Jackson herd failed in the 1960s because of an inadequate vaccination and possibly re-infection of bison by elk. Given no safe, effective vaccine and the continued infection of elk, attempts to eradicate brucellosis from bison would probably fail. Additionally, Jackson area ranchers have grazed cattle next to bison for decades without a brucellosis outbreak, and they claim that vaccinating cattle works effectively to prevent the spread of brucellosis. One resident stated, "A serious attempt should be made to better educate the states bordering Wyoming as to the high improbability of cattle cont[r]acting brucellosis from the bison and to inform them that killing a herd of bison that may not even have brucellosis will serve no purpose" (Steller 1995). Experiential data like this can be used to promote Wyoming's cattle as clean despite brucellosis in wildlife (Cromley, 2000).

The Jackson area ranchers could just as easily claim that their program of allowing bison to graze with cattle was "highly effective" in avoiding a brucellosis outbreak.

**Pretty darn well?**

In reality, just what has been the effect of these bison management practices and how has that effect been measured? Boundary culling has not contributed to a measurable reduction in brucellosis infection in the bison population. In fact, the proportion of seropositive adult female bison has increased slightly since 1985 or remained constant at about 60 percent (Hobbs et al. 2009).

Further, what about the herds' genetic health as wild animals? Recall what was said by Chuck Davis, endangered species litigation coordinator for the FWS, regarding my failed original petition to list the wild Yellowstone bison. He said "Quite frankly our herd continues to grow and it doesn't show any problems with breeding and things like that. In fact, the herd is doing pretty darn well."

But what does the FWS mean by saying the herd is doing "pretty darn well"? That the herd is growing? So do herds of domestic ungulates. That they are breeding? So do domestic ungulates. It turns out they really don't know what they are talking about. If they did, they would not be practicing artificial selection on wildlife. What is happening in Yellowstone National Park is the opposite of the evolutionary forces of natural selection and survival of the fittest that has molded life in the wild for eons. The so called government protectors of park and ecosystem wildlife have a sort of an "in-your-face Darwin" attitude.

Let us look at what is happening on the borders of the park more closely. Prior to the formation of IBMP, thousands of wild bison had been culled attempting to leave the park for winter forage or to give birth outside the park's boundaries. Since IBMP's inception, thousands more have been shot or shipped to slaughter because they were headed toward the park boundaries, with the largest single herd reduction totaling 1,729 in the winter 2007-08. Nearly 7,200 wild bison have been eliminated from America's last wild population since 1985 by artificial means (Brister, 2014).

The major destinations of the bison migrations are two areas just outside the park. One is the Gardiner Basin just north of the park near the city of Gardiner and the other the Hebgen Lake region west of the park near West Yellowstone. These meadows occupy a small percentage of the total area of the park.

Of particular importance is the Gardiner Basin. It has become the "Achilles Heal" of the Greater Yellowstone Ecosystem, for it is there that both the northern and central herds attempt to enter during winter migration. It is also the gateway via Yankee Jim Canyon to Paradise Valley, home of Hollywood actors and actresses, producers, directors, publishers and song writers (Paradise Valley, Montana, 2014) as well as the site of a number of multi-million-dollar "executive ranches." The valley is a swath of spectacularly beautiful private property that cuts into the heart of the Greater Yellowstone Ecosystem and through which flows the Yellowstone River.

In hindsight, both the Gardiner and Hebgen Lake basins, as well as Paradise Valley and regions along the Madison River, should have been included in the park boundaries to enable proper function of this wildlife ecosystem. However, they were not.

Instead of being the exclusive habitat for wildlife, these regions are the site of a number of cattle operations. Being that Yankee Jim Canyon is a natural bottleneck through which passes the highway connecting Yellowstone National Park's northern entrance with such towns as Livingston, Montana, bison are prohibited from entering Paradise Valley by the walls of the canyon, the Yellowstone River, a cattle guard and fencing.

Bison headed toward this valley to escape the winter snow-levels in the park must first pass through the Gardiner Basin to the north. To get here, they follow the Yellowstone River and the Gardiner River. The Hebgen Lake region to the west does not pose a winter bison migration problem. Situated at a higher elevation than Gardiner Basin, it is often covered in four feet of snow during winter months. Such depths prohibit foraging, so it is not a significant winter migration destination. However, in the spring the Hebgen Lake region is a favorite calving spot for wild bison. To get here, they follow the Madison River through Madison Valley, which is bisected by the park's west boundary.

When the IBMP was formed in 2000, less than 2,000 cows were brought to graze every spring in both Gardiner and Hebgen Lake basins each year. They represented a fraction of the 2.5 million beef cattle in Montana. The two ranges where bison grazing overlaps with cattle are designated Special Management Areas.

Seasonally, some bison are found in the Gardiner Basin and the Hebgen Lake regions. Some are those that escaped the capture facilities, that is, those who did not migrate during the winter into these bison traps, which in effect automatically destroy hundreds, sometimes thousands of bison annually, functioning as wild bison disposal units. Others are those that come to these regions to calve in the spring, but are hazed back into the park while still in the process of nursing their young. Bison entering both regions sooner or later are either hazed out or slaughtered.

And they are doing “pretty darn well?” Welcome to the brave new world of wildlife preservation. We are watching ecological bankruptcy. What gives this region its value we are withdrawing beyond its capacity to sustain, especially in the genetic diversity of wild bison, for the management practices of the IBMP favor the non-migratory bison by its policy of selectivity toward eliminating the migratory members of those herds.

By not permitting wild bison to inhabit their natural range, by barring them from their once traditional spring and winter habitat, the IBMP is forcing this species into two related forms of extinction. While the FWS findings concerning my initial petition claim that the wild bison are being managed satisfactorily because they are still demonstrating migratory behavior and are “abundant,” and thus are not endangered or threatened with extinction, *by definition* the IBMP’s very actions have forced this species into two forms of extinction, namely, ecological extinction and local extinction, also known as extirpation.

Ecological extinction is defined as “the reduction of a species to such low abundance that, although it is still present in the community, it no longer interacts significantly with other species.” Local extinction is characterized by “the disappearance of a species from part of its natural range.” By restricting wild bison from Gardiner Basin during certain times of the year, as well as the Hebgen Lake region, the IBMP is causing their disappearance from part of their natural range (local extinction) and thus their ability to interact with other species in that excluded community (ecological extinction). Ecological extinction is functional extinction whereby a species, such as wild bison, does not significantly interact with other species in its environment where it was once common. It no longer counts there. Being absent, it no longer can interact as a competitor, symbiont, mutualist, or prey (Estes, 1989).

As mentioned, the habitats of both Gardiner Basin and Hebgen Lake region are managed by the Interagency partners according to zones, with bison movement becoming increasingly restrictive as an animal progresses from zone 1, a region in and outside the park, to zone 2, a region further outside the park, and finally to zone 3, which is anything outside zone 2, where the animals are subject to lethal control.

For the Hebgen Lake area, termed the Western Boundary Area, according to the *Record of Decision*:

> To ensure temporal separation [of bison from cattle] after May 15, the bison that agency personnel cannot haze or capture will be subject to lethal removal. The agencies also would manage all bison in the West Yellowstone area in zones, with progressively more intense management as bison move toward the edge of management Zone 2 (p. 12).

If the number of bison exceed 100 animals in the Hebgen Lake or Gardiner Basin region and/or if the bison population in the park exceeds 3,000 animals, then these levels can trigger management actions such as hazing, capturing or lethally removing them (pp. 26, 30).

For the Gardiner Basin area, termed the Northern Boundary (Reese Creek to Yankee Jim Canyon), according to the *Record of Decision*:

> NPS would continue to monitor bison from approximately November 1 to April 30 within YNP and use hazing within YNP to prevent bison movement north onto private and public lands in the Reese Creek area. If hazing is unsuccessful, the NPS will operate the Stephens Creek capture facility and capture all bison attempting to exit the Park in the area. The agencies will test all captured bison, send seropositives to slaughter, and temporarily hold up to 125 seronegative bison at the Stephens Creek capture facility. Vaccination eligible bison that are captured would be vaccinated with a safe vaccine. Once the capacity of the capture facility is reached, all additional bison attempting to exit YNP would be removed at the Stephens Creek facility (seropositive bison would be sent to slaughter and seronegative bison may be sent to a quarantine facility, if available, and, if not available may be sent to slaughter or be removed for jointly approved research. The seronegative bison held at the facility will not be retested and will be released to the Park in the spring. Bison outside the Park that cannot be hazed back into the Park and evade capture would be subject to lethal removal (p. 27).

As mentioned, it is not necessarily crossing the park boundaries that triggers their removal, but their movement north while still on park land. Zone 2 here comprises a narrow corridor that includes Highway 89 and the Yellowstone River. Reese Creek is part of the northern boundary of the park just south of the town of Gardiner. According to the *Record of Decision*:

> All bison outside YNP in Zone 2 would be hazed back into YNP no later than April 15. Those bison that cannot be hazed will be subject to lethal removal (p. 28).

As one can readily see, these habitats are fractured and fragmented both spatially and temporally. Bison of course have no concept of zones or survey lines or numbers permitted on the floor. Such designations are confusing to even those that presume to manage them, the functionaries of the IBMP.

Recently, the Interagencies appeared to be making attempts at being more bison-friendly. The 2013 Annual Report of the Interagency Bison Management recorded the following action (YELL stands for Yellowstone National Park):

> Adopted—New tolerance area north of YELL: The IBMP Partners negotiated an area of increased tolerance for bison in mid-March 2011. The enlarged conservation area encompasses the north end of the Gardner Basin on both sides of the Yellowstone River, extending essentially to Yankee Jim Canyon (pp. 4, 5).

This region would be Zone 2 of the Gardiner Basin. But a few paragraphs later in the annual report it says this:

> Adopted—Support hazing of bison within Zone 2: Partners agreed to an AM [Adaptive Management] change to support hazing of bison within Zone 2 for the entire management area to reduce the opportunity for bison to exit the tolerance area.

If bison are not allowed to enter this newly expanded area by means of hazing, it hardly can be termed a “new tolerance area.”

But it gets “curiouser and curiouser,” as Alice in *Alice in Wonderland* said as she grew taller and taller.

In February 2012 the Montana Fish, Wildlife and Parks and the Montana DOL jointly decided to allow bison seasonal access to winter and early spring habitat outside the north boundary of the park in the Gardiner Basin area until May 1 of each year. However, the Park County Stockgrowers Association, Montana Farm Bureau Federation, and Park County, Montana filed lawsuits to block implementation of the new policy and sought to require state officials to adhere to the original plans for bison hazing and slaughter.

This issue eventually reached the Montana Supreme Court, which affirmed a decision of a lower court, allowing wild bison room to roam outside the northern boundary of Yellowstone National Park.

In a news release, Earthjustice attorney Tim Preso, who defended the bison policy in the case on behalf of the Bear Creek Council (BCC), Greater Yellowstone Coalition (GYC), and Natural Resources Defense Council (NRDC) said that now that the Court has rejected claims requiring bison to be slaughtered at the park’s boundaries, “we can move forward to secure space for wild bison outside of Yellowstone National Park” (Richards, 2014).

Oh, happy day for bison. Except for one thing. All these actions and rulings and high-sounding words celebrating more tolerance and a “secure space for wild bison” mean absolutely nothing. In the end, it is the same old, same old.

As noted, come winter—and it is here—the powers that be are going to knock off a few more rare wild bison to the tune of almost one thousand animals as they head down along the Yellowstone and Gardiner Rivers to find forage and escape starvation. Here they will find the open arms of the Stephens Creek capture facility and its web of fences leading them in. Here they will find the squeeze chute. And kaput. Listen. From the halls of the IBMP I can hear the sound Yo-ha-ha-ha.

How can they do this? It is very simple. The *Record of Decision* has granted agents of National Park Service the legal authority to lethally control any bison that exceeds the magic herd limit of 3,000 animals. Hypothetically, all the habitat in the world could be acquired for wild bison to roam, but if the herd goes beyond the mandated abundance limit, bye-bye extra buffalo. Thus, the National Park Service has been given the authority to poach, the very activity the park was formed to protect bison against.

The word “magic” used to describe the herd limit size of 3,000 is an accurate adjectival choice. It achieves the magic needed to trick people into thinking that such a number of bison will protect the genetic diversity of the herd. It is, however, the use of science to deceive. It is not true, as will be shown later in this petition. According to the *Record of Decision*:

> As an additional risk management measure, the agencies would maintain a population target for the whole herd of 3,000 bison. This is the number above which the NAS (1998) report indicates bison are most likely to respond to heavy snow or ice by attempting to migrate to the lower elevation lands outside the park in the western and northern boundary areas (*Record of Decision*, 2000. p. 20).

Conclusion: kill those bison that are trying to survive. The purpose? Only one: so bison don't get near cattle. The *Record of Decision* states:

> Although it is true that environmental and other conditions in the analysis area are variable and other research suggests the population in the park would likely fluctuate between 1,700 and 3,500, the agencies are trying to balance factors such as natural regulation and maintaining ecosystem processes, which contribute to the wildness of the herd, with protection of Montana cattle from the risk of transmission. The agencies have adopted 3,000 as a spring population limit, maintained through culling of bison as they attempt to exit the park, to both maximize the effects of ecosystem processes inside the park and help keep relatively large-scale migrations from occurring. Additionally, the agencies recognize that severe winter weather conditions, including deep, crusted snow, can occur on bison winter ranges within the park. These conditions can force larger numbers of bison to lower elevation winter ranges outside the park (p. 52).

Despite the recognition that "natural regulation and maintaining ecosystem processes" "contribute to the wildness of the herd," and despite the recognition that "severe winter weather conditions" "can occur on bison winter ranges within the park," in carrying out the interagency goal of keeping the population at 3,000, these factors cease to have importance. IBMP is skilled at sounding like it has concerns for wild bison's survivalist need to migrate, while at the same time making it impossible for them to do so. To talk about an effort to "maximize the effects of ecosystem processes inside the park" is mere talk. Regardless of the rhetoric, wild bison's winter migrations are diverted into capture facilities, where bison are then shipped to slaughter.

**Migration to extinction**

This annual bison parade out of the park has become so routine that NASA has used satellite mapping to record the "migration routes" of bison during the winter into the "bison capture facility," as shown below. Also shown photographically is the herding of these wild bison into the capture facility, an aerial view of the capture facility itself, various views of its interior and the result of bison entering that facility.


**Figure 24. BISON MIGRATION ENDS in a capture facility, then slaughter. This image was created from NASA Landsat satellite data and shows the migratory path of the bison herd in Yellowstone National Park. *Credit: NASA (Cook-Anderson, 2006).***


**Figure 25. DRIVING WILD BISON into the Stephens Creek capture facility for purposes of "ship and slaughter" to carry out the mandates of the IBMP. *National Park Service photo.***

**Figure 26. AERIAL VIEW OF STEPHENS CREEK CAPTURE FACILITY on the north side of Yellowstone National Park near Gardiner, Montana. Here on park property thousands of bison have been captured mid-migration and shipped to slaughter houses.** ***Photo courtesy of Buffalo Field Campaign.***

**Figure 27. BRUCELLOSIS IS PROMOTED BY CROWDING (White, 2011), yet captured bison are forced into pens and fed hay. Under one plan, bison that test negative for brucellosis and are *not* pregnant are ear-tagged, marked with a peroxide dye and hauled to nearby public land and released. The rest are hauled to slaughterhouses (McMillion, 1996).** ***Photo by Jim Peaco (Yellowstone's Photo Collection).***

**Figure 28. INTO THE MAW OF THE CAPTURE FACILITY. Wild bison travel increasingly narrower chutes and are finally secured by a rope and hook through the nose.** ***Photos courtesy of Buffalo Field Campaign.***

**Figure 29. WORKING BISON CHUTES AT STEPHENS CREEK in 1997 are Ranger Lloyd Kortge, managing the park's $100,000 capture facility, and Jerry Ryder (bottom) (McMillion, 1996). Bison are loaded onto awaiting livestock trailers and hauled to a slaughter house.** ***January 1997 photo by Jim Peaco (Yellowstone's Photo Collection).***

**Figure 30. OUTSIDE A SLAUGHTERING FACILITY, bison heads are stacked in the snow. The decapitated heads are from butchered wild bison initially trapped in a Yellowstone National Park capture facility.** ***Photo courtesy of Buffalo Field Campaign.***

What is going on here the IBMP calls Adaptive Management (AM). By this "adaptive management," the IBMP artificially selects only those bison with the potentially non-adaptive traits of the non-migratory. By this "adaptive management" bison are selectively excluded from significantly contributing on a continuous basis to the environment of these two regions just outside the park.

### Is it worth the price?

Is this worth the price? Bison are a keystone species. A keystone species is one that has a disproportionately large effect on its environment relative to its abundance. Such species are described as playing a critical role in maintaining the structure of an ecological community, affecting many other organisms in an ecosystem and helping to determine the types and numbers of various other species in the community. But today they are being systematically barred from their historical range. How is this "adaptive management"? What is probably the underlying meaning is that bison must adapt, or else.

All this ecological havoc for the sake of a few cows whose owners are determined to craze on two bubbles of land, one at the north of the park, one at the west. According to information supplied in March 2006 by the US Forest Service and the Greater Yellowstone Coalition, the specific number of head of cattle being grazed in the western (Hebgen Lake) and northern (Gardiner Basin) Special Management Areas were 266 (four herds) and 0 in winter, respectively, and 677 (nine herds) and 686 (nine herds) in spring, respectively. This totals 1,629 head of cattle yearly on 9,360 ha in size in the northern SMA and 31,025 ha in the western SMA, amounting to a total of 40,385 ha (Kilpatrick, 2009).

Much of the SMA is not pasture. The state of Montana measures 38,083,807 hectares, meaning the dispute is over .1 percent of the state. If it takes about one hectare to graze one cow, than 2,000 cows need about 2,000 hectares. If the total SMA is about 40,000 hectares, then roughly 1/20 of it is suitable for grazing, meaning the area in dispute is actually 1/20 of .1 percent of the state.

Further, if bison take about the same amount of grazing land as cattle, it would mean that 2,000 more bison could be supported by this region if the cattle were gone.

**Economics of running a cattle operation in an ecosystem**

According to the US Government Accountability Office, the agencies comprising the IBMP are spending $3 million annually to manage wild bison migrating out of the park, with the major management task being to separate them from the cattle grazing on plots bordering the park (Yellowstone bison: Interagency plan and agencies' management need improvement to better address bison-cattle brucellosis controversy, 2008).

The Livestock Marketing Information Center projects returns over cash costs (including pasture rent) to be near $350/head for an "average" cow-calf operation in 2014. If realized, that would be sharply higher than the $123/head return in 2013 and the previous record high of $150/head in 2004. Production and marketing risks could reduce those projected returns, as they did in 2012 and 2013. In 2013 an average profit of $160 per head for a cow-calf producer was predicted. Profit per head in 2012 was $48 and in 2011 was $75 (Darrell, 2014; Boetel, 2013).

If we take the average profit per head for the years 2011 ($75), 2012 ($48), 2013 ($123) and 2014 ($350), we get a four year average profit for a cow-calf producer of about $150 per head. Roughly speaking, this would mean an average annual profit of $244,350 on 1,629 head of cattle, the number grazing in the SMAs bordering the park. Let us round this figure off to $300,000 a year profit for the owners of up to 2,000 cattle in the area.

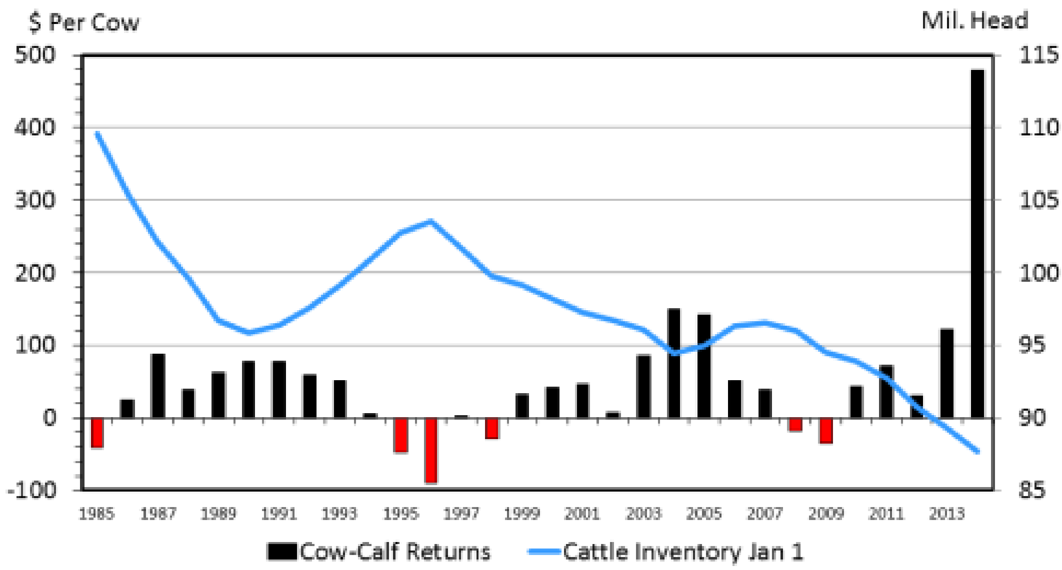


**Figure 31. ANNUAL U.S. COW-CALF RETURNS AND CATTLE NUMBERS. Data source: USDA-AMS and USDA-NASS, compilation and analysis by Livestock Marketing Information Center. 07/16/14 (Mayo, 2014).**

Ask yourself this question. Does it make sense for the government to expend $3 million each year so that a few cow-calf producers can make a total profit of $300,000? Should it be a public responsibility to finance the choice of a business to operate in a high risk biohazadarous environment by underwriting the cost of doing business there, spending ten times the profit of that enterprise to protect it via publically-funded emergency responders (via squad cars, snowmobiles, ATVs, horseback riders, helicopters, pickups and livestock trailers)? The figures cited are for example only. Profits in the cattle industry fluctuate dramatically. Some years are good and some years are bad. Given all the ups and downs in the cattle market, the average annual profit industry-wide is about at the break-even level due to the cyclical risks involved.

As Wes Ishmael in *Cattle Today Online* pointed out in 2003: “Thankfully, there will never be any marketing guarantees since reward necessitates risk.”

Ishmael noted:

> “The average cow/calf producer has made about $3.04 per head since 1980. On average high return producers realize about $65 per head higher profits than an average producer, while low return producers return about $54 per head lower profits than average,” says Cattle-Fax. “High return producers (low cost and high production) have been profitable most of the time over the past 20 years. Low return producers are likely eroding away the equity in their land” (Ishmael, 2003).

In the January 2014 *Farm Journal’s Beef Today*, Greg Henderson said, “Indeed, price and profit expectations are sky high for 2014. With tight supplies, analysts project record-high prices for every class of cattle, and average profits of nearly $300 per cow,” (Henderson, 2014).

A portion of the financial risks involved is the cost of grazing land, which is measured in animal unit months or AUMs. An AUM is the unit of measure for livestock grazing and equates to forage needed to support one cow/calf pair for one month. The rate for an AUM in 2012 was only $1.35 for land rented by the Bureau of Land Management. Private grazing land, on the other hand, was $16.80 per AUM in 2011. Grazing on BLM public lands accounts for 0.41 percent of the nation's livestock receipts (Cole, 2013).

What a windfall if a cow-calf producer can get cheap land via government grazing allotments, as well as protection by the government from grazing competitors by means of emergency responders, who will provide free hazing and lethal removal services of wildlife ungulates that come onto that public land.

If you round off the number of cattle grazing on this land adjacent to the park to 2,000 head per year, this means the government is spending $3 million annually for the protection of a commercial enterprise doing business on public land, yet charging land rental fees amounting to $1.35 (AUM) x 4 (cattle graze here 4 months: mid-June to mid-October) x 2,000 (head of cattle) annually, or $10,800.

If one looks at an ecosystem as a house, the government is annually charging $10,800 in rent for the residents to live there, but providing $3 million in protection services free for the occupants. If these calculations are correct, what can we conclude from this? One thing is certain: something does not add up. No business should get such governmental favoritism. It is economically unfair to the American public, unjust and promotes risky ecological and financial choices. If a business does not have to pay for risks it takes, why should they bother to make prudent financial decisions? The government is not protecting the public from brucellosis; rather, it appears that it is using that protective ruse to shield its real purpose: protecting the cattle industry, and a few individuals in that industry, at any cost. But why?

The more closely one looks at the issues surrounding IBMP's actions, the less they makes sense—especially when one considers that protection from disease involves separation from *all* disease carriers. In the case of cattle grazing near Yellowstone National Park, protection from a zoonotic disease—potentially spread to cattle by such wildlife as elk and bison that are not fenced and that are obeying a natural instinct of survival, namely migratory behavior—cannot be done. One would have to manage *both* bison and elk.

What is to be gained by managing just one species, bison? By default, the only solution left entails not granting permits for grazing allotments near the park to cattle operators and not allowing cattle on private land near the park. It is that simple. That is the only way the effective separation of domestic livestock and wildlife can be achieved. That is the only way the APHIS protocol of closed herd management for effective disease control can be accomplished, that is, by moving herds away from the source of the disease.

Interspecies disease transmission is a two-way street, with pathogens such as brucellosis being first introduced into the park's wild bison via cattle, then back to cattle again via bison. Invasive species such as cattle are the original culprit. Not only are cattle potential vectors of disease transmission to wildlife, but so is other livestock, such as domestic sheep.

Montana Fish, Wildlife and Parks reported December 15, 2014 that ten bighorn sheep had died of pneumonia near Gardiner, noting that currently there are flocks of domestic sheep in the area. While the cause of the outbreak is unknown, research has shown bacteria can be transmitted from healthy domestic sheep (or goats) to bighorn sheep, causing pneumonia in the wild sheep.

And what is the solution devised by the FWP? Instead of banning domestic sheep from the region of the park borders, FWP, a member of IBMP, "within its scope of authority, works to ensure separation of domestic and wild sheep. This includes the lethal removal of any wild sheep known to have been in direct contact with a domestic sheep" (Pneumonia Detected in Gardiner Area Bighorn Sheep, 2014).

To allow domestic sheep near an ecosystem that contains wildlife susceptible to the diseases of domestic sheep makes no sense. A wildlife conservation agency such as the Montana Fish, Wildlife and Parks that goes about its job of protecting wildlife by participating in the killing of those species which it is responsible to protect, such as bison, wolves and bighorn sheep, while letting livestock grazing in the wildlife ecosystem off the hook, appears irresponsible. In having a policy of killing bighorn sheep, such as those in the Gardiner Basin, that come in contact with domestic sheep, the Montana FWP is simply killing the messenger. The message is this: do not allow grazing of livestock in a wildlife ecosystem for they cause harm to wildlife.

**Land use plan needed**

What is missing from the environs of the Greater Yellowstone Ecosystem is a land use plan. Questions must be asked and answered. For instance, what is the best way to make use of the animals and plants growing in this ecosystem, which includes Paradise Valley, Gardiner Basin and the Hebgen Lake region? One answer comes immediately to mind: it is by first satisfying the needs of local residents and secondly by meeting the needs of visitors.

This means that hunters should have access to private and public lands outside the park and adjacent to it. It means that ungulates should be allowed out of the park so that both local and out-of-area hunters could hunt those animals that inhabit the park, but migrate to regions outside the park. It means that the wild nature of these animals should be preserved so that they will migrate. It means that cattle and livestock should be kept out of the habitats bordering the park so that wildlife, such as bison, can migrate into these regions for the purpose of survival and for the purpose of providing access to them for hunting. It means finding ways to prosper by utilizing the wildlife resources so unique to this area, instead of depleting it. This perspective has been especially strong with regard to trout fishing, elk hunting and wolf watching. The same could be done with bison with regard to both viewing and hunting.

With regard to the value of the park economically and ecologically, a letter by Daniel N. Wenk, superintendent of Yellowstone National Park, to Jeff Hagener, director of Montana Fish, Wildlife & Parks, concerning proposed Montana wolf hunting and trapping regulations, is instructive and relates to the entire arena of wildlife preservation, not just wolves.

He said June 13, 2013:

> As stated in your 2008 Strategic Plan, the mission of Montana Fish, Wildlife & Parks is to provide "for the stewardship of the fish, wildlife, parks, and recreational resources of Montana, while contributing to the quality of life for present and future generations." This is accomplished by providing "the leadership necessary to create a commitment in the hearts and minds of people to ensure that, in our second century, and in partnership with many others, we will sustain our diverse fish, wildlife and parks resources and the quality recreational opportunities that are essential to a high quality of life for Montanans and our guests."
>
> The State of Montana benefits directly from tourism and wildlife viewing in and around YNP. More than 3.4 million people visited YNP during 2012, and 50-90% of the visitors to YNP indicate the park was the primary reason for their trip to the area. A study by the University of Idaho in 2006 found that wildlife viewing is a primary motivation for tourism in YNP, with most visitors taking scenic drives and watching wildlife. According to a Michigan State University study, visitors spent more than $270 million within 150 miles of the park during 2006, which supported almost 5,000 jobs in the area and generated $336 million in sales, $133 million in labor income, and $201 million in value added (e.g., labor income, profits, rent, sales, and excise taxes) (Wenk, 2013).

Thus, the park contributes about $1 billion annually to the local economy.

With the main attractions being wildlife, it would make sense that wild species be protected from practices that have the potential of driving them to extinction as wild animals. At present the greatest threat to this end is the presence of livestock grazing within the ecosystem and on the borders of the park.

If diverse groups, such as elk hunters, bison hunters, wildlife viewers, cattle ranchers, domestic sheep ranchers, wildlife biologists, and the various governmental agencies and conservation groups cannot sit down and decide collectively what would be the best use of the ecosystem in which they operate or visit, then by default there can be no leadership and no commitment in the hearts and minds of the people. The result will be continued war between the various interests groups and the degradation of the ecosystem.

The leadership that is now being provided is largely dysfunctional, with a prime example being the IBMP.

**IBMP: An example of collective delusion**

We read stories like the following. Under the heading "Agreement to let bison roam Gardiner Basin finalized," Carly Flandro, staff writer for the Bozeman Daily Chronicle, April 15, 2011 wrote about a plan developed by the FWS and the Montana DOL:

> For bison in the Gardiner Basin, tolerance is a new word.

> For years, the animals have been hazed, fenced, shot and sent to slaughter for migrating to the basin north of Yellowstone National Park.
>
> But on Thursday, an agreement was finalized that will allow bison to roam on the same land they've been pushed away from for decades.
>
> Nine signatures from tribal, state and federal representatives were needed to make the agreement valid. The InterTribal Buffalo Council was the last to sign the document Thursday evening.
>
> The agreement calls for installation of fences and bison guards at the southern end of Yankee Jim Canyon, and bison hunting on all public lands outside the park, and private land with permission, during the hunting season. However, the plan's biggest impacts won't likely be felt until next winter.

The head of the DOL praised the new plan, with Flandro reporting that:

> Christian Mackay, executive director of the Montana Department of Livestock, said the new agreement has "some very positive things about it for the livestock industry."
>
> For one, the fence and bison guards will help keep bison from leaving the Gardiner Basin and heading north toward Paradise Valley, Mackay said. There are more cattle herds in the Paradise Valley.
>
> Secondly, there will be zero tolerance for bison outside the new boundaries of the plan. That means if the animals leave the Gardiner Basin, they'll immediately be "removed lethally," Mackay said.
>
> "It's a no-second-chances plan, so there's no herd memory of getting out," he said. Mackay added that agency partners are still deciding whether all bison will be able to roam the basin, or if that will depend on whether the animals test positive for exposure to brucellosis (Flandro, 2011).

Then one reads that despite the fact that the FWP received almost 120,000 comments from the public in favor of the proposed expansion to open up the Gardiner Basin's Gallatin National Forest to migratory bison, as well as the expansion being endorsed by numerous wildlife groups,

> In January [2014], the Board of Livestock voted to conditionally reject any expanded tolerance for bison, sending it back to FWP and DOL for more specifics.
>
> After considering the compromise proposed in March, the board voted in May to indefinitely delay action on the assessment, saying it wanted to wait until the park produced a new Interagency Bison Management Plan. But the new plan will take three to four years to develop (Lundquist, 2014).

Then one reads the following, written August 1, 2014 by Bozeman Daily Chronicle reporter Lundquist, headed “Yellowstone proposes to eliminate more bison,” concerning the targeting of those bison attempting to migrate into Gardiner Basin:

> On Wednesday during the Interagency Bison Management Plan meeting in Polson, Yellowstone National Park representatives recommended removing about 900 park bison this winter through both hunting and ship-to-slaughter . . .
>
> Yellowstone representatives said the higher cull rate was needed after the park’s July census counted more than 4,800 bison in the park, almost the same as last year. They noted that the summer range is heavily cropped.
>
> Last year, after 640 bison were eliminated through hunting and trapping for slaughter, the park expected that winter-kill and predation would further reduce the population by around 450 animals. But the census showed the actual number of natural deaths was about half that.
>
> The park considered three scenarios that would remove 600 to 1,000 bison, half of which would be female. The removal of 900 is predicted to result in a population of about 3,700 bison by the end of the winter.
>
> The park predicted more than 400 could be eliminated through hunting with much of the rest going to slaughter.
>
> The livestock department and FWP concurred with the proposal, but tribal representatives from the CSKT [Confederated Salish Kootenai Tribes], Nez Perce and InterTribal Buffalo Council questioned the increase. (Lundquist, 2014).

Then you read online in “Bison Management” by the National Park Service, in its rationale for slaughtering migratory wild bison:

> . . . bison could rapidly fill available habitat, and if given the opportunity, attempt to migrate further during some winters, which will eventually bring them into areas (e.g., Paradise Valley) occupied by many hundreds of cattle. Without human intervention, some bison that spend winter north and west of Yellowstone National Park in Montana will not migrate back into the park during spring, but will attempt to expand their range into other areas with suitable habitat but currently no tolerance for bison (Bison Management, 2014).

And you read in its rationale for the need for the currently planned slaughter:

> The food-limited carrying capacity inside the park could be as high as 5,500 to 7,500 bison during winter . . . (Frequently Asked Questions: Bison Management, 2014).

If one puts this line of thought together here is what one comes up with:

- that an agreement to let bison roam Gardiner Basin has been finalized,

- that the agreement calls for installation of fences and bison guards at the southern end of Yankee Jim Canyon,

- that the Montana DOL finds the plan to have some very positive things about it for the livestock industry,

- that despite massive public approval of the expanded tolerance for bison in the Gardiner Basin, as well as its support form numerous wildlife groups, the Montana Board of Livestock blocked its approval,

- that Yellowstone National Park representatives recommend lethally removing about 900 park bison that attempt to migrate into Gardiner Basin this winter,

- that tribal representatives question this increased removal number and

- that, while the NPS claimed "the summer range is heavily cropped," the "food-limited carrying capacity inside the park could be as high as 5,500 to 7,500 bison during winter" and that there is now substantially less than this amount, namely 4,900 bison.

- that this is all necessary because even though Yankee Jim Canyon is a bottleneck, bison might get through to Paradise Valley because some bison "will not migrate back into the park during spring, but will attempt to expand their range . . ."

By and large, this is all baloney, as will be shown.

**Groupthink**

The one rational group appears to be the tribal representatives of the Interagency Bison Management Plan coalition who questioned the slaughter. Most likely what is going on within the original sector of the IBMP, those members prior to the addition of the tribes, that is, the Montana DOL, FWS, APHIS, NPS and Montana FWP, is a form of "groupthink," defined in Merriam-Webster's dictionary as "a pattern of thought characterized by self-deception, forced manufacture of consent, and conformity to group values and ethics."

Roland Bénabou in "Groupthink: Collective Delusions in Organizations and Markets" notes that

> . . . groupthink was strikingly documented in the official inquiries conducted on the Challenger and Columbia space shuttle disasters. It has also been invoked as a contributing factor in the failures of companies such as Enron and Worldcom, in some decisions relating to the second Iraq war, and most recently in the housing and mortgage-related financial crisis.

Benabou explains that:

> In the aftermath of corporate and public-policy disasters, it often emerges that participants fell prey to a collective form of overconfidence and willful blindness: mounting warning signals were systematically ignored or met with denial, evidence avoided, cast aside or

> selectively reinterpreted, dissenters discouraged and shunned. Market bubbles and manias exhibit the same pattern of investors acting "color-blind in a sea of red flags," followed by a crash (Benabou, 2009).

The term "collective delusion" may be defined as delusions of threats to society that spread rapidly through rumors and fear. Groupthink gets its fuel to influence others to do a group's bidding by the promotion of fear, such as has been the case in IBMP's utilization of the threat of the spread of brucellosis from bison to cattle, even though no transmission of the disease has been recorded as occurring in the field between bison and cattle.

If members of the IBMP were truly concerned with the chance of the spread of the disease due to cattle grazing in the proximity of the park that contains brucellosis-infected wildlife, it would not facilitate the grazing of cattle there. Prudence and economics would argue against grazing cattle next to one of the continent's largest ecosystems, for brucellosis infection can place in jeopardy the brucellosis-free status of a state.

No field studies have shown that the type of culling being employed by the IBMP is necessary or works to accomplish any goals stated.

Culling based on invalid assumptions has been historically exemplified by actions directed toward red deer, thar and chamois in New Zealand mountains, according to population ecologist G. Caughley in "Dynamics of large mammals and their relevance to culling." For 50 years these animals were vigorously culled on the assumption that these lethal removal operations significantly slowed the rate of flooding and riverbed deposits in the lowlands. Research proved the assumption wrong.

This type of culling, guided by assumption and wishful thinking, is being conducted by the IBMP and its member agencies. According to Caughley such lethal removal of wildlife has been termed IDIOTIC culling, an acronym for

> "Inept Decisions, Ignorance Or Thoughtlessness, In Combination." Here included are those operations that are unnecessary or counterproductive to their stated objectives, or those objectives themselves reflect invalid assumptions. Usually they take the form of indefinite culling to hold densities at economic carrying capacity under the misapprehension that this represents ecological carrying capacity (Caughley, 1983, p. 118).

The IBMP's culling of wild bison is IDIOTIC, indeed.

**Rationale of 2015 culling**

Let us examine the rationale and potential outcome of the impending (and as of this submission ongoing) culling of 900 wild bison. In so doing, some of the issues involved will be examined more closely, expanded upon and recast. A thesis of this petition is that the endangerment of extinction of the wild bison in Yellowstone is due to a multitude of environmental forces involved in a trophic cascade, with trophic coming from the Greek meaning nourishment. The solution is not to just list wild bison as endangered, with the resultant prohibition of their taking, but instead an entire network of actions, such as limiting the taking of wild bison by hunting, restoring the Yellowstone bison's historical migration routes, the continued restoration of the wolf population and removing cattle from the grasslands adjacent to the park. The following analysis will attempt to provide support for those actions.

The most contested region and where the wild bison culling will be entirely focused this winter is the northern range. The northern Special Management Area comprises the Gardiner Basin.

**Northern range grassland**

Of special importance is that portion of the northern range grasslands extending beyond the park's northern boundary to Yankee Jim Canyon (see map, Figure 32). Notice that the entire grassland, both in and outside the park, is bisected by the northern boundary of the park. The grassland slopes downward toward the town of Gardiner, drained by the Lamar River and the Yellowstone, with the Gardiner Basin several thousand feet lower than the upper end of the range.

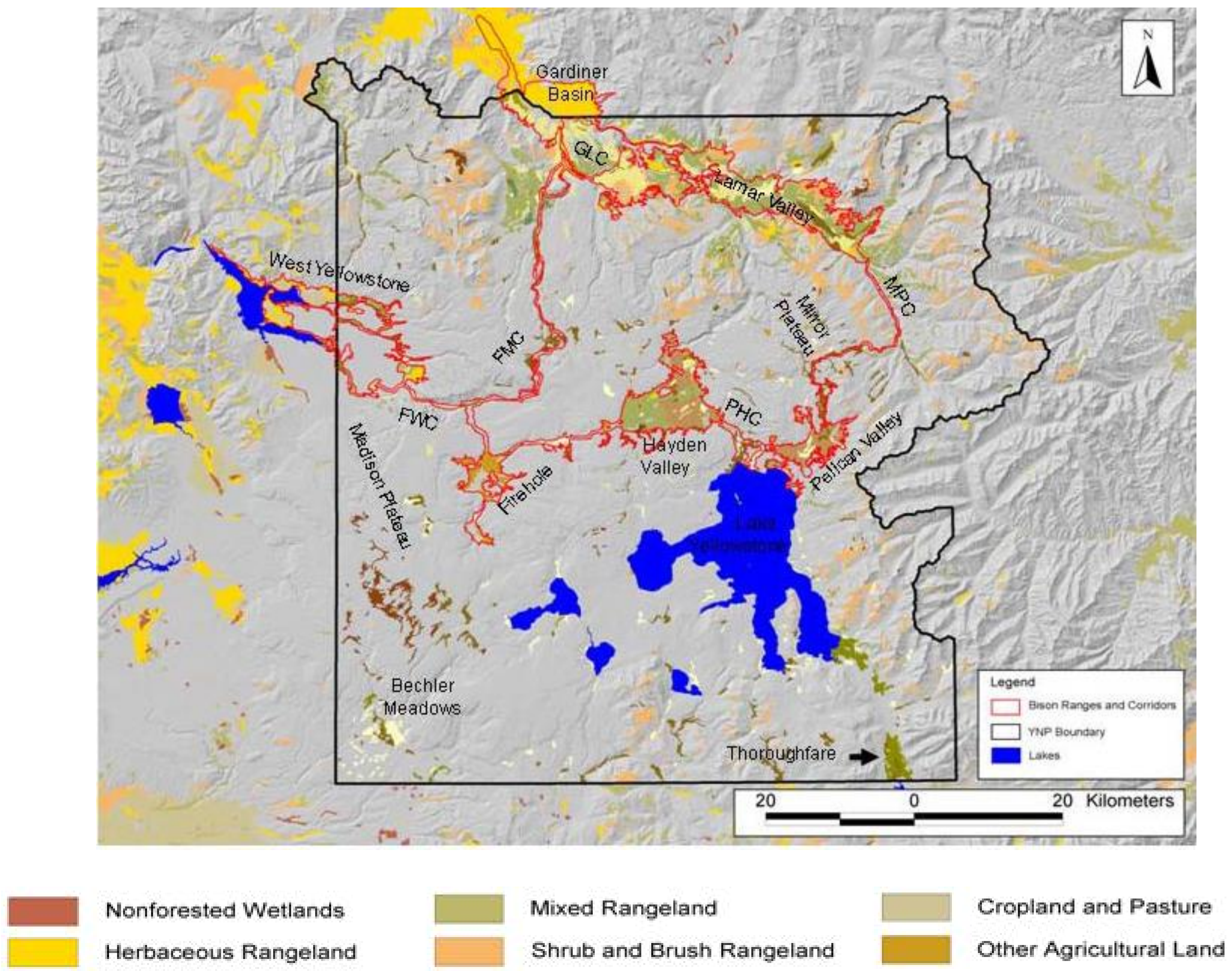


**Figure 32. YELLOWSTONE'S NORTHERN GRASSLAND RANGE includes Lamar Valley and Gardiner Basin, extending outside the park to Yankee Jim Canyon (about 20 miles north of the park, located at the northern-most portion of the boundary shown by the red line). Red lines demarcate locations of bison winter ranges and winter movement corridors. Habitat class color codes are given above (Gates, 2005).**

A limited number of bison are sometimes permitted into the Gardiner Basin, which is just beyond the park borders. It is to this basin that wild bison attempt to migrate to find forage during winter as the snow piles up inside the park, and where wolves also congregate. The basin is also habitat for spring calving. Wild species obviously cannot tell where the park's boundary begins or ends but merely occupy this grassland in response to environmental conditions, not the rules of men. They should not be expected to comply with invisible demarcations.

They have migrated here since prehistoric times. But as mentioned there are also a number of cows here, grazing on privately held or low-rent federal land adjacent to the park, all within a national forest environment.

Historically Yellowstone pronghorn followed a route out of the park similar to the historical bison migration route, following the Yellowstone River in winter to the lower elevations of Paradise Valley. Over the past 80 years, habitat fragmentation has truncated the migration, and now most of the 200 Yellowstone pronghorn are forced to stop in the Gardiner Basin, restricted by fences. Because pronghorn are reluctant to jump these traditional cattle barriers—strands of barbed wire—they are a major impediment to pronghorn movement. Conservationists are working with rangers to make more pronghorn-friendly fences by removing the lower strand so they can crawl under that barrier.

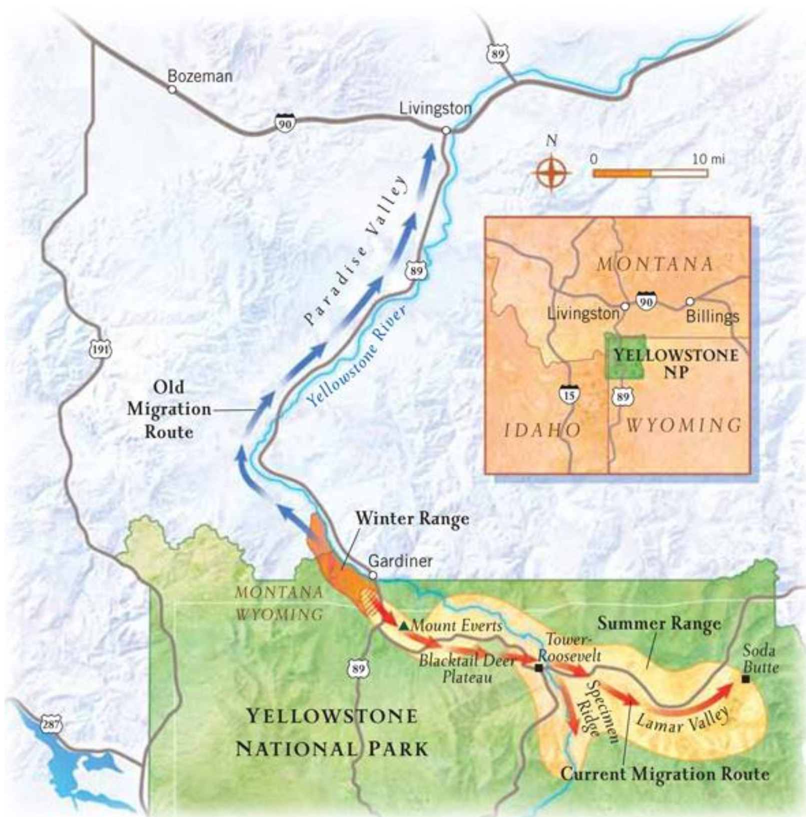


**Figure 33. HISTORICAL YELLOWSTONE PRONGHORN MIGRATION was similar to the Yellowstone bison migration. Now this pronghorn herd's winter habitat is restricted to Gardiner Basin (brown shaded area) (Porco, 2011).**

Elk continue to exhibit a migratory pattern similar to the historical routes of both bison and pronghorn

C. Cormack Gates documented the importance of this grassland to both bison and Native Americans historically in *The Ecology of Bison Movements and Distribution in and Beyond Yellowstone National Park: A Critical Review with Implications for Winter Use and Transboundary Population Management*. He said (citations omitted):

> The Lamar Valley and the Yellowstone River Valley north of the park to Livingston and beyond was an important area for bison and Native peoples throughout the Holocene. This system can be considered the original Northern Range for Yellowstone bison, functioning as an ecological continuum of grasslands that likely supported seasonal migrations by bison as far south as the high elevation ranges in the Upper Lamar Valley. Davis and Zeier described the lower Yellowstone Valley as an exceptional area for Native people to gather, drive and kill bison. Eight bison jumps and three kill sites have been documented south of Livingston. The closest jump site to YNP is 25 km north of the park boundary. It was used during the late prehistoric period between 1,700 and 200 b.p. There is evidence of a human use corridor from the Gallatin and Madison River drainages into the interior Yellowstone National Park. Several major bison kill sites are located in the Gallatin Valley outside of Bozeman, Montana.

This grassland is thought to have been in continuous use by both bison and Native Americans for 10,000 years. Gates continues:

> Although the exact nature of early historic period bison movements is a matter of conjecture, inferences can be drawn from knowledge of contemporary movement patterns and archaeological evidence. Mary Meagher inferred that prehistorically, during the spring and early summer, bison would have moved into YNP following advancing plant phenology. Depending on snow conditions in the park, most would have moved out to lower elevation ranges during the fall and early winter. However, Meagher provided evidence that some bison wintered in the park in the Lamar, Pelican and Hayden Valleys.
>
> What is now considered the Northern Range used to extend from the Upper Lamar Valley to Livingston Montana and beyond. This larger area is considered the prehistoric annual range of northern herd, occupied continuously by bison for ca. 10,000 years. There are a dozen or so buffalo jumps documented between Yellowstone and Livingston, indicating the Yellowstone and Lamar Valleys were important for both bison and the original human occupants of the region (Gates, 2005).

**Potential outcome of the scheduled culling**

A new version of a bison jump site is now located on park property that is vastly more effective than the old ones, compliments of the government, specifically IBMP. It is the Stephens Creek capture facility. While the culling currently going on there has been described as "random," this is not so. Not only is it limited to the migratory bison, but the incidence of culling most likely will fall disproportionally on the central herd. Contrary to what the IBMP originally expected at the inception of the plan, according to over a decade of field studies, “findings based on radio-collared bison suggest that the vast majority of bison culled at both the northern and western boundary areas during 1995-2006 came from the central herd” (Garrott, 2009, p. 273).

**Figure 34. BISON MOTHER NURSING HER CALF in the spring. It is at this time that the IBMP hazes back into the park those bison that escaped the winter lethal removals, severely disrupting the bison’s calving season. *Photo courtesy Buffalo Field Campaign.***

Aerial surveys the summer of 2014 by Yellowstone National Park counted 3,500 bison in the northern herd, 1,400 in the central herd and a total of 740 calves (Yellowstone Releases Summer 2014 Bison Population Estimate, 2014). If one were to consider the term “vast majority” to mean 90 percent, then about 800 bison from the central herd can be expected to be culled this winter. With a total of 1,400 animals in the central herd, this scheduled lethal removal action would reduce the herd by 60 percent, which would decimate the herd, leaving 600 surviving bison in that herd.

For those bison that escape culling by remaining within the park, additional mortality can be expected due to winterkill and starvation. Aerial counts have shown that the decrease due to winter in animals older than calves can be 15-20 percent (Meagher, 1971, updated 2005). Further, winter mortality for calves can exceed 50 percent by the end of the second year (Meyer, 1995).

Due to government action and winter mortality, bison central herd numbers may plummet, forever erasing by artificial methods genetic diversity and the learned behavior of herd leaders. Sooner or later this can end in herd collapse.

Without regard to the bison’s genetics, disease status, age, sex or herd membership or herd status, migrating animals will be culled at random. They will be lethally removed for one trait only: migratory behavior. The National Park Service sates:

> The plan is to capture and ship at least 25 to 50 bison per week from mid-January through mid-February without regard for age, sex, or disease status.

As spring approaches (calving season):

> Another 200 to 300 females (8 months to 5 years of age) will be shipped during the last two weeks of February and first week of March (Frequently asked questions: Bison management, 2014).

Most likely, these young female bison will be pregnant.

The hypocrisy of the IBMP's stated goal to "maintain a wild, free-ranging bison population" in the park is self-evident.

**Culling not the solution**

Why is this being done? As mentioned, because half the wild bison in the YNP herds have *Brucella abortus*. Even though the IBMP has acknowledged that risk of inter-species transmission of the disease between cattle and bison is remote, it is, as it says in its environmental report, "not zero."

While no transmission of the *B. abortus* bacteria between bison and cattle has been documented under field conditions, its possibility to do so has been demonstrated under laboratory conditions of confinement. University experiments have shown that when infected bison are penned in close confinement with cattle, the disease can be transmitted inter-species. Similar laboratory experiments have shown that it can also be transmitted by diseased elk and diseased coyotes to cattle when confined closely together.

In an outdoor wildlife region such as the GYE, *B. abortus* is thought to be transmitted to other animals via contact with birthing materials, such as the fetus or placenta. However, while substantial shedding of *B. abortus* is from bison, the most substantial risk of *B. abortus* transmission to cattle is from elk, whose range, like bison, overlaps with domestic cattle grazing allotments adjacent to the park (Garrott, 2009).

After years of attempting to eradicate brucellosis from the Greater Yellowstone Ecosystem, with Yellowstone bison currently experiencing a brucellosis seroprevalence of around 50 percent (Cross, 2010), the program administered by the IBMP can be accurately termed a complete failure. Killing thousands upon thousands of wild bison plus attempts to vaccinate them has done nothing to eliminate or even reduce the disease inside the park.

In fact, it can be argued that the potential of inter-species transmission between the park's bison, elk and cattle has only been exacerbated by the actions of diverse government agencies. Artificially feeding elk can promote the very conditions shown in the laboratory to contribute to inter-species disease transmission, namely, crowding. Increasingly, scientific findings indicate that minimizing disease spillover to cattle grazing in the Greater Yellowstone Area is best addressed by reducing elk herd densities (Schumaker, 2013). That would mean not providing feed for elk.

The practice of such feeding was questioned in "Brucellosis in Cattle, Bison, and Elk: Management Conflicts in a Society with Diverse Values," a joint report written by members of the U.S. Geological Survey, Northern Rocky Mountain Science Center; Department of Ecology, Montana State University and the National Park Service, Yellowstone National Park. Wildlife scientists noted that feeding elk presents a puzzle:

> In the Jackson and Pinedale regions of Wyoming, state and federal wildlife managers feed elk during the winter at 23 sites . . . to control the spread of brucellosis from elk to cattle. The supplemental feeding program cost the state of Wyoming $1.5 million in 2007, but the feeding also appears to increase the prevalence of brucellosis among the portion of the elk population that frequent feeding grounds. This leads us to another riddle. Why do managers spend time and money on a policy that increases the prevalence of a disease in one host in order to decrease the chances that it infects another? (Cross, 2010).

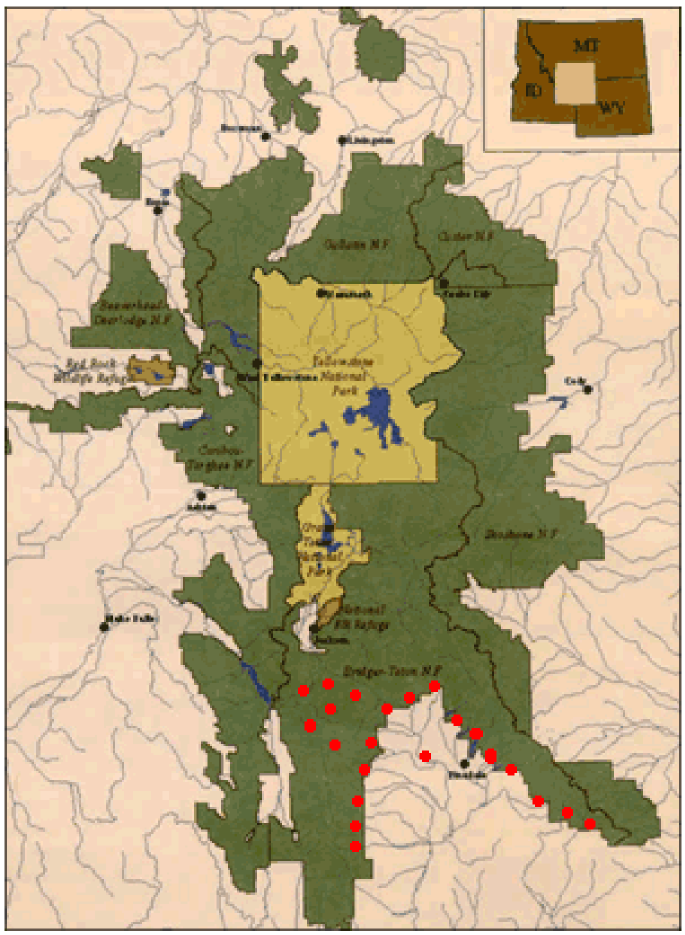


**Figure 35. MAP OF THE GREATER YELLOWSTONE ECOSYSTEM. Public lands are green. Yellowstone and Grand Teton National Parks are tan. Approximate location of the supplemental elk feed grounds are shown as red dots (Cross, 2010).** ***Map (Greater Yellowstone Area, 2015) modified by James Horsley.***

Adding insult to injury, the government's penning of bison and feeding them hay in the various capture facilities creates once again the crowded conditions that promote such disease transmission. This has been acknowledged by Yellowstone park officials.

**Increased bison population**

Accompanying the practice of large herd reductions has been the continued increase in bison population. The population is now headed toward 5,000. Survival rates may have increased due to government programs of intervention. While female bison that have contracted brucellosis usually eventually gain immunity to the disease, they also experience reduced fertility rates. P.J. White, chief of wildlife and aquatic resources at Yellowstone National Park, in a report notes:

> There was a reproductive cost of diminished birth rates following brucellosis infection, with only 59% of seropositive and recently seroconverting females with calves compared to 79% of seronegative females with calves (White, 2008, updated 2014).

By killing those animals with brucellosis, the net effect is a herd with a higher percentage of fertile females and thus a higher reproductive rate.

In addition, the practice of vaccinating bison has the potential to increase their survival rate (Garrott, 2009) and their productivity, thereby increasing the very numbers that contribute to bison migration, exacerbating the resultant conflict with cattle interests.

Studies on the central bison herd of the park have determined that:

> . . . population growth rates will likely increase by more than 15% if vaccination plans are implemented and successful. Wildlife managers would then be challenged with greater numbers of disease-free bison dispersing or migrating outside of the park in response to density and climate effects (Garrott, 2009).

Further, the IBMP has a program of testing captured animals, slaughtering those that test positive for brucellosis, quarantining healthy animals and later letting them go. Result? More productive animals.

While it is well known that stress in animals, such as captivity in zoos, decreases productivity, stress can also have the opposite effect. In an experiment involving zebra finches, stressed males produced more offspring than their unstressed brethren (Brookshire, 2014).

Government reintroduction of wolves may also have increased bison population numbers. Wolf predation on elk has reduced the elk population, decreasing ungulate grazing, leaving more fodder for bison (Ripple, 2011).

Contributing to even greater productivity has been the relatively recent decision to now depopulate the wolf packs in the Rocky Mountain states. The resultant reduced predation on bison automatically increases the survival rates of calves and young females, thereby increasing reproductive levels due to a less diminished population.

Result of that result? More bison—and members of the national park service and others scratching their heads saying that the Yellowstone bison herds for some reason are more productive than expected.

Again and again the problems posed by Yellowstone bison turn out to be caused by the government intervention sought to solve the problem, creating a cascade of ecological dysfunction.

Thus governmental intrusion, by increasing the percentage of fertile females, by its vaccination program, by stressing bison herd members through the disruption of family bonds via slaughter and hazing and by wolf pack reductions, may be producing the very effect not wanted by opponents of bison migration, namely, larger populations.

It all amounts to the practice of pseudo-science by the IBMP members. And one of the most glaring cases in point is the show of brucellosis control by targeting only one vector of the disease, bison, while irresponsibly ignoring a more contagious vector, elk. This would be similar to quarantining one patient with Ebola but allowing another to immigrate and wondering why Ebola was spreading.

**Selective, non-random culling**

As we have seen, because of this population increase, park officials this year announced plans to cull up to 900 animals attempting to leave the park by means of the North Gateway route this winter, reducing the total bison population of 4,900 by one fifth (Zuckerman, 2014). This is being done despite findings that the park's grazing capacity is estimated to be as high as 5,500 to 7,500 bison during winter (Frequently asked questions: Bison management, 2014), and despite recommendations by wildlife scientists to avoid large-scale herd reductions because of the deleterious potential of reducing genetic diversity by such a practice.

While this herd reduction by lethal control is touted by the government as being random, this is of course not true, for the targeted animals will be those heading out of the park toward the Stephens Creek capture facility that has been placed strategically in their migratory path. Killing only migratory animals is artificially selecting out which animals will survive, defeating nature's method of favoring the most fit via natural selection and survival of the fittest. In the artificial environment of Yellowstone National Park, the fittest now become those that are the least apt to migrate, along with associated traits, such as leadership, knowledge and aggressiveness. The government is selecting in favor of traits such as non-migratory behavior and docility, i.e., domesticity. So much for wildness.

It is ironic and instructive that these wild animals, feared because of the disease they carry, contracted this disease from cattle when these domestic animals were first brought to the park years ago. The introduction of captive animals into the park has caused bison to be captives of the park.

As mentioned, crowding is the root cause of the interspecies spread of brucellosis. Fencing causes crowding. So does feeding elk hay in the winter. Such crowding at feedgrounds increases the spread of brucellosis among elk. Packing bison into capture facilities and feeding them hay increases the chance of brucellosis transmission. Domestic animals such as cattle are notorious for having diseases of all types when put in stockyards because of the intensification of close proximity between animals.

Bison do not function as a preferential host and a reservoir for transmission of brucellosis, particularly in the wild. The host-organism relationship in bison differs markedly from that of cattle and abortions are relatively rare. It is domestication, with its associated crowding of animals, that is the causative source of the disease. Mary Meagher, writing in "The origin of brucellosis in bison in Yellowstone National Park: A review," noted:

> Domestication likely ensured that more animals remained in relatively close contact for longer periods of time and in more restrictive loci than occurs among naturally gregarious wild ancestors. There seems little reason to doubt the influence of man in domesticating livestock and thereby ensuring that most brucellosis foci would be called anthropogenic. Brucella appear primarily to be organisms of animal husbandry that have adapted to and exist secondarily in some wildlife hosts (Meagher, 1994).

But it is the practice of domestication of wild bison that is going on near the northern gateway of the park and elsewhere just outside the park, the very practice that promotes brucellosis. By park bison not being allowed to disperse via migration and by putting animals in capture facilities, feeding them hay and crowding them together, the environment of domestication is promoted and thus increases the propensity for incubation and transmission of the very disease the government is trying to control. Behind this governmental policy is either naivety or stubbornness or delusion, or a combination of these factors. It is not good science.

Although bison have been the biased target of the government's policy of separation-by-slaughter disease-control methods for the park, the next wild animal on this agenda most likely will be elk. In the past, while elk herds are known to have brucellosis, elk have been allowed to migrate out of the park and have been exempt from the government's lethal control program. But recently, elk have been deemed to pose a greater risk than bison concerning the transmission of brucellosis to cattle in the ecosystem. To be consistent, wildlife managers will be increasingly forced to constrain elk movements also.

For instance, in 2007 cattle were tested positive for exposure to brucellosis in Paradise Valley just north of Gardiner. Following a study, elk were blamed for the transmission, although it has never been conclusively proven that elk were the cause. The Montana Fish, Wildlife and Park Commission recently approved lethal control of elk for the valley, as well as governmental assistance to help finance special fencing to keep migrating elk away from cattle grazing there (Adams, 2014).

The plan was delayed following the filing of a lawsuit in opposition to it by sportsmen's clubs, asking that an environmental impact review be performed before any further action is taken to haze, fence out or kill elk on private land in an attempt to control the spread of brucellosis (French, 2014). However, in November 2014, the plan was once again approved by the Montana FWP to control the movement of elk that may be infected with brucellosis.

Director of Communication and Education Ron Asheim said the effort continues to keep wild elk from mixing with commercial cattle, because of the risk of exposing livestock to brucellosis.

“This is the third year that the plan has been in place by a local working group made up of landowners, sportsmen and the agency,” Aasheim said. “The plan potentially includes some fencing and in some cases, some lethal removal. The whole idea is to minimize the potential risk of transmission of brucellosis to livestock from elk” (Christian, 2014).

But are the elk, like bison, prohibited by the Montana FWP en masse from migrating? No.

If the goal is the realistic suppression of the spread of brucellosis to cattle, the rational mind asks: Why not? Why the differential in treatment of two species that both carry the disease? Not to be anthropomorphic about this, but surely it could not be some form of animal racism, that is, a bias toward persecuting one species over another for no reason other than the species it is.

One thing is certain: with regard to the restraining of wild bison, something strange is going on.

**Vaccination not a solution**

As mentioned, epidemiologically, the control of such a disease as brucellosis either in the wild or elsewhere is through separation. This can be achieved in several ways: a fence, the removal of the infected animals from the environment shared by the animals to be protected, or the removal of attractants that promote crowding, such as hay at feed grounds.

About 50 percent of wild bison have *B. abortus*. After decades of culling of wild bison, no reduction of the disease has been achieved among the herds. The practice is a proven failure. The only alternatives to the control of this disease here would be fencing the park, which is incompatible with wildlife management for an ecosystem, or by removing cattle from the park environment.

Attempting to mitigate the disease by means of vaccination is useless, because it is not effective and because no matter what, bison must be kept separate from cattle. According to the National Park Service:

> Even if brucellosis prevalence could be reduced by 50% (i.e., to about 30%), which would be quite difficult to achieve given current technology and conditions, such a change would not have any significant effect on bison management practices or the risk of brucellosis transmission from bison to cattle, which is already extremely low compared to elk. Bison would still need to be managed to maintain separation with cattle and mitigate human safety and property issues. Testing requirements for livestock producers within the greater Yellowstone area would not change because elk would remain a far greater threat of brucellosis transmission to livestock than bison. There have been zero incidences of Yellowstone bison transmitting brucellosis to cattle, while at least 23 cattle and domestic bison herds have been infected with brucellosis by elk since 2002. The states in the greater Yellowstone area have not lost their class-free status in recent years despite multiple brucellosis outbreaks in cattle and domestic bison herds due to transmission by elk. Thus, there is no reason these states should lose their class-free status if there is one or more outbreaks due to transmission from wild bison.

And even if brucellosis could be eliminated from Yellowstone bison, “Reinfection of bison by elk would likely occur in the future,” according to the National Park Service (Frequently Asked Questions: Bison Vaccination, 2014).

According to the NPS:

> Moreover, the implementation of aggressive, intrusive actions to suppress brucellosis in bison, while not taking similar actions to address increasing prevalence in elk across the greater Yellowstone area, is difficult to justify given the high costs and values that many residents, visitors, and tribal interests have toward bison. A reduction in brucellosis prevalence in Yellowstone bison will have little to no effect on the risk of brucellosis transmission to cattle if the prevalence of brucellosis in elk is stable or increasing throughout the greater Yellowstone area and substantial, region-wide actions are not taken to prevent comingling of elk and cattle during the elk abortion and calving season (which overlaps with cattle occupancy on private lands and with cattle turn-on dates throughout the area) (Remote Vaccination of Bison, 2014).

For these reasons, there is no point in trying to eliminate the disease in bison in the Greater Yellowstone Ecosystem, other than creating jobs for government officials and providing the delusion that by working toward this end the goal can be achieved. It simply cannot be and still maintain a wilderness. Bacteria are predators, too, just like wolves, and are part of the ecosystem.

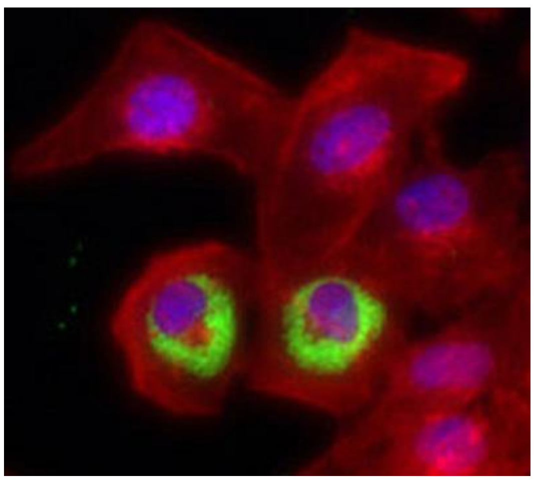

**Figure 36. *BRUCELLA ABORTUS* under the microscope. Here Hela cells, a cell line used in scientific research, infected with green fluorescent protein-expressing *Brucella abortus* (green) bacteria are being examined microscopically *(Research group Christoph Dehio, 2014).***

Given this scenario, by default one would logically choose the only tenable option, namely, removing cattle from the perimeters of the park. But this, of course, is not being done. So how is this policy continuing to be supported? Here is the official line as stated by the National Park Service in its online information piece “Bison Management.”

**The Martians are coming**

First, we are provided with the information that migration by bison is a necessary survival behavior when herds are experiencing a deep snow pack:

> Yellowstone bison are prolific and have high survival rates, with wolves currently killing few bison because elk are more vulnerable prey. As a result, bison numbers increase rapidly when environmental conditions are suitable, with abundance increasing to more than 4,000 individuals on several occasions and reaching a high of approximately 5,000 bison in 2005. At these numbers, a winter with deep snow pack can induce many hundreds of bison to migrate into Montana because lower-elevation habitat for bison is limited by mountainous topography within Yellowstone National Park. As a result, bison will continue to move from the park into Montana during winter, with higher numbers migrating as bison abundance and winter severity increase.

While migration is stated to be necessary for survival, it is deemed unacceptable for bison to do so by the National Park Service and its allied government partners. Here is why:

> Due to existing agriculture and development in the Yellowstone and Madison River valleys, however, there is not sufficient low-elevation, valley bottom habitat north and west of Yellowstone National Park where bison are currently tolerated that could sustain many hundreds or thousands of bison for extended lengths of time during winter. Thus, bison could rapidly fill available habitat, and if given the opportunity, attempt to migrate further during some winters, which will eventually bring them into areas (e.g., Paradise Valley) occupied by many hundreds of cattle. Without human intervention, some bison that spend winter north and west of Yellowstone National Park in Montana will not migrate back into the park during spring, but will attempt to expand their range into other areas with suitable habitat but currently no tolerance for bison. In addition, there are still tangible concerns about the transmission of brucellosis from bison to cattle, with regulatory and economic consequences of cattle contracting brucellosis. As a result, there is a need to manage bison to prevent comingling with cattle. Furthermore, there are political and social concerns about allowing large numbers of these massive, wild animals into Montana, and options for relocating Yellowstone bison elsewhere are limited by real and perceived disease and social concerns. Therefore, bison will at times need to be intensively managed and culled from the population to prevent the limited tolerance for wild bison on the landscape in Montana from being rescinded (Bison Management, 2014).

The expressed concern is that bison, these “massive, wild animals” will eventually burst through into Paradise Valley and flood Montana. This statement promotes hysteria and is akin to saying “The Martians are coming,” as did Orson Welles in a 1938 Halloween radio broadcast called “War of the Worlds,” about a fictitious attack by creatures from Mars. It threw numerous listeners into a panic.

How could this hysterical reaction happen? Hadley Cantril, chairman of the Princeton University Department of Psychology, in his study “The Invasion from Mars” had this to say:

> The persons who were frightened by the broadcast were, for this occasion at least, highly suggestible, that is, they believed what they heard without making sufficient checks to prove to themselves that the broadcast was only a story."(Cantril, 2014).

In sum, he said, such persons lacked "critical ability."

**A critical look**

Let's exercise a little critical ability, instead of assuming the government is correct. If one looks into the statement by the NPS that a bison invasion of Montana is bound to happen if migration is permitted, one finds it is not credible.

First of all, the only way that bison can exit the valley floor of the Gardiner Basin into Paradise Valley is through Yankee Jim Canyon, which is a bottleneck formed by the walls of a canyon through which the Yellowstone River flows. On one side of the road exiting the basin is a cliff. Descending partly down the walls to the roadbed is fencing. The road itself contains a heavy-duty cattle guard. On the other side of the road is a rail and a cliff falling down to the Yellowstone River below, at this point being white-water rapids.

This passage has always been a bottleneck for travel between Paradise Valley and the park. It was originally called "Yankee Jim's Canyon" because James "Yankee Jim" George squatted here in 1871 on a newly built road from Bozeman, Montana, to Mammoth Hot Springs. Four months later, Yellowstone was designated America's first national park. Yankee Jim helped improve the road for the increased traffic, installed a gate on his claimed property through which the road ran, charged a toll for passage, and built a cabin where he offered food and lodging (Yankee Jim, 2014).


**Figure 37. YANKEE JIM CANYON, a bottleneck restricting bison passage into Paradise Valley, Montana. Notice cattle guard, cliffs and fencing to the right and railing and the Yellowstone River gorge to the left.** ***Photo courtesy of Buffalo Field Campaign.***

The only alternate route to Paradise Valley is over the crests of high mountain ranges rimming the basin. In the possibility that bison were to penetrate these obstacles, most likely fencing would stop them from co-mingling with cattle in the valley. As mentioned, a plan that incorporated fencing out, hazing and killing elk in the Paradise Valley in an attempt to prevent them from transmitting disease to cattle was approved in November, 2014 by the Montana Fish and Wildlife Commission. Such fencing would most likely also keep out stray bison (French, 2014).

Further, to address the possibility of bison migrating from the Gardiner Basin into Paradise Valley, as well as to provide more migratory room for wild bison, modifications to the presently existing plan (IBMP) were under study by Montana’s Department of Livestock and Department of Fish, Wildlife and Parks. This proposal sought to allow YNP bison to inhabit forest service and other lands north of the park boundary and south of Yankee Jim Canyon within the Gardiner Basin during the winter. Bison would be prohibited from moving north of the hydrological divide (i.e., mountain ridge-tops) between Dome Mountain/Paradise Valley and the Gardiner Basin on the east side of the Yellowstone River, and Tom Miner basin and the Gardiner Basin on the west side of the Yellowstone River (Draft Joint Environmental Assessment: Year-round Habitat for Yellowstone Bison, 2013).

However, as mentioned, the Montana Board of Livestock (BOL) tabled such proposals May, 2014, leaving the status quo in place, that is, lethal removal and hazing (Rice, 2014; Forrest, 2014). Creating a sense of urgency that something must be done to prevent bison from entering Paradise Valley, yet tabling measures that would have mitigated that need, demonstrate a lack of sincerity on behalf of the BOL and by repeating it on an NPS website, by this agency also.

What about the fear bison would not return to the park in the spring without hazing, as stated by the NPS above? Possibly the NPS should read the report it helped write, namely the 2013 Annual Report of the Interagency Bison Management Plan. It says the following:

> The timeframe for natural migration in the absence of hazing is difficult to identify because the agencies have hazed bison every year since the Adaptive Management Plan has been in place. However, observations over the past six to eight years show that at the beginning of the haze back program, few if any bison remain in the Park and immediately return to the boundary or beyond. Thus, the following analysis was conducted using an assumption that the bison are not likely to be successfully hazed until they are naturally inclined to migrate back to the Park. More likely, bison would migrate back to the Park on their own slightly later than the time period in which the agencies are successful at getting bison to stay in the Park following management hazing operations.

According to the IBMP, of which the NPS is a participating member, what does this suggest?

> The data suggest that bison are likely to return to the Park on their own between 24 May and 7 June most years. However, bison currently respond to multiple hazing operations during this time, therefore the timing and whether they would naturally return to the Park cannot be definitively assessed from this data (Annual Report of the IBMP, 2013).

The claim they make about bison not returning is not supported by data. And why is this? Because they have not allowed the data to be generated due to repetitive annual hazing. The limited data they do have suggests that bison will migrate back in the spring "between 24 May and 7 June most years."

**Control by wolf predation**

Central to the importance of protecting the wild bison is:

1. how to control its population so that it is kept within the carrying capacity of the park's grassland ranges as well as

2. how to best deal with its migratory behavior.

Since the founding of the park, the answer has been to have park management and now the IBMP cull bison that rise above a certain population number. Currently, those selected for killing are those animals that attempt to escape beyond the boundaries of the park when the total park bison population goes beyond 3,000.

An objective of this petition is to suggest that there is a better way than human intervention, a way that has been provided by nature for eons and has worked on the plains for millennia. That better way is to allow bison to migrate and to control excess population by wolf predation and hunting. It is better because it can more effectively restore the balance of nature in the park and retain genetic diversity of wild bison, as well as other animals there.

This petition will outline an argument that favors the New World methods of wildlife utilization for the good of society as practiced by American Indians prior to European settlement, as opposed to the Old World loathing of what is wild as demonstrated by the demonization of the wolf and the annihilation of the European bison, the wisent, the ancestor of the American buffalo.

The industrialized killing of wild bison in the Greater Yellowstone Ecosystem is simply a manifestation of a system that is out of whack. The problem does not just revolve around the preservation of wild bison, but rather, the preservation of the ecosystem. Without this generalist approach, nothing will work.

There is a promising bottom line to all this for all concerned: the preservation of wildlife can be profitable, more so than the exclusive dominance of cattle and other livestock in this ecosystem. Further, ask yourself this: how many people visit Yellowstone to see cattle?

So, let us look into the feasibility of the natural control of bison numbers via wolf predation. Recall that the NPS states:

> Yellowstone bison are prolific and have high survival rates, with wolves currently killing few bison because elk are more vulnerable prey.

One of the reasons wolves are “currently killing few bison” is because the states surrounding Yellowstone are currently killing off the gray wolves that were re-introduced to the park at a cost of millions of dollars.

Prior to reintroduction into Yellowstone, wolves had been exterminated systematically by government and private trappers and hunters. Following the destruction of the bison herds in the 1870s, wolves increasingly turned to cattle for prey. For the settler and the cattle rancher, this was intolerable. Wolf numbers declined from millions to a few hundred. They were poisoned by baiting carcasses with strychnine, trapped, shot, and the cubs killed in their dens. A few escaped the onslaught in Yellowstone, but even they were eventually destroyed. Between 1914 and 1926, at least 136 wolves were killed in the park. By the 1940s, wolf packs were rarely reported. By the mid-1900s, wolves had been almost entirely eliminated from the 48 states. A survey in the 1970s found no evidence of a wolf population in Yellowstone.

Following the passage of the Endangered Species Act in 1972 and after years of environmental impact studies, in 1995 gray wolves were first reintroduced into Yellowstone in the Lamar Valley. Today, 95 wolves in 10 packs are living in the park. Wolf numbers have decreased by about 45 percent since 2003 when the population estimate was 172. This is likely due to fewer elk in the ecosystem. Wolf numbers decreased less in the interior of the park than in northern Yellowstone, likely due to supplemental feeding on bison by those packs (Wolf Project Annual Report, 2013).

Adolph Murie, wildlife biologist who pioneered field research on wolves, in 1944 asked an important question:

> What, for instance, is the total effect of the wolf preying on the big game species in this national park? . . . How do such predators as the golden eagle, fox, grizzly bear, and lynx affect the hoofed animals, and how does the wolf affect these predators? In short, what is the ecological picture centering about the wolf . . .? (Murie, 1944, p. xiii).

These questions are still being asked today. Researchers are finding some interesting answers, beginning with how wolves interact with members of their own pack. D. Parks Collins with the National Center for Case Study Teaching in Science, wrote in “The Return of Canis lupus?” a description of an alpha male dubbed “Wolf #21”:

> Wolf #21 spent a little over two years with his mother (#9) before venturing out to become the alpha male of another pack. He fathered pups every year from 1998–2004, including 20 pups in 2000. #21 became a legend to “wolf watchers,” not only because of his size, but also because of his calm and gentle spirit. He was often seen walking away from a kill he had just made so that he could urinate or take a nap. This would allow the younger wolves to take their fill. Alphas typically eat first and will defend their right against others. #21 also was seen playing with the young wolves and letting them climb on top of him, much like a human father might do when wrestling with his young sons. Rick McIntyre, a biological technician for the Yellowstone Wolf Project, describes #21 the following way:
>
> “When pups harassed him by biting his tail or ears, #21 would often just walk away; I once saw him cross the road and hide in some bushes to get away from pups that were bothering

him. Of course, he also used his great size and strength to benefit his pack. If the younger wolves were attacking an elk, but could not pull it down, #21 would run in and help bring it down (Smith et al. 2005). #21 died in 2004, which made him an exceptionally long-lived wild wolf. He definitely left a legacy. In 2001, his pack numbered thirty-seven, the largest known wolf pack in history. Many of his pups went on to either join other packs or start other packs" (Collins, 2013).

To study these animals, park officials put GPS collars on some of the wolves to track their movements. One such animal was a large gray alpha female known as 832F. Nate Schweber, a New York Times reporter, described her:

> She also led the pack in Yellowstone's northeastern Lamar Valley, an area rich in bison and elk that has a road offering vantage points for wildlife watchers equipped with cameras and spotting scopes. The Lamar Canyon pack could be counted on to roam the valley near dawn and dusk, allowing scientists and tourists to observe wolf behavior at a level of detail rarely seen outside National Geographic specials.

"Wolf watchers" admired 832F's hunting prowess and fecundity and were moved by the way she cared for her pups, bringing them food and snarling ferociously at any animals that posed a threat to them (Schweber, 2012). They also called her "06" because she was born in 2006. She began to be termed the "most famous wolf in the world" (Platt, 2012).

Doug Smith, who heads the Yellowstone Wolf Project (which communicates findings of the park's wolf reintroduction program) talked about the wolf when interviewed by Beth Pratt, National Parks Traveler, on April 7, 2011:

> . . . what gets you stardom and fame is visibility and that happens in Lamar Valley and Slough Creek—and the pack in that area is Lamar Canyon. And what also gets you stardom and fame is having charismatic individuals. And Lamar Canyon does have one with their alpha female—06 is her nickname, but she's not collared. She's a very smart wolf, very atypical, and a big hunter. Males usually have a lot to do with the hunt—she does it all. To the wolf-watching community she is starting to be their rock star (Pratt, 2011).

However, they finally did get a collar on her. It took scientists years. She repeatedly hid from helicopters piloted by park scientists who were trying to capture her by using tranquilizing dart guns.

**Trophic cascade**

According to park officials, including wolf expert Smith, wildlife biologists are seeing some surprising results of wolf reintroduction—a phenomenon called "trophic cascade."

It is a top-down process involving environmental modifications. It works this way. Elk, which were overgrazing the park in absence of predators, are now declining, with wolves killing the weakest animals, making the elk herds healthier by removing the old, young and infirm. To avoid exposure to wolves and to avoid getting trapped out in the open, elk have changed their browsing behavior, staying away from the banks of rivers and open spaces. The result has been increased growth of aspen, willows, grasses and forbs. With more ground cover, stream erosion has been reduced.

More vegetation has increased bird species such as the yellow warbler and the willow flycatcher. More shrubs with berries have helped feed bears. Because there are now more aspen, beavers' favorite food and dam building material, more beaver-built ponds are being formed, providing increased habitat for fish, ducks, otters, muskrats, reptiles and amphibians.

Because wolves compete with coyotes for food supply, wolves kill coyotes. The reduction of coyotes increases the park's supply of rabbits and mice, leading to an increase of weasels and foxes and such birds of prey as bald eagles and hawks. Because the pronghorn antelope's major predator is the coyote, with fewer coyotes, there are now more pronghorns.

When wolves kill prey, the resultant carcasses attract a host of scavengers such as ravens, magpies, eagles, grizzly bears, coyotes and vultures as well as multiple insect species such as scavenger beetles.

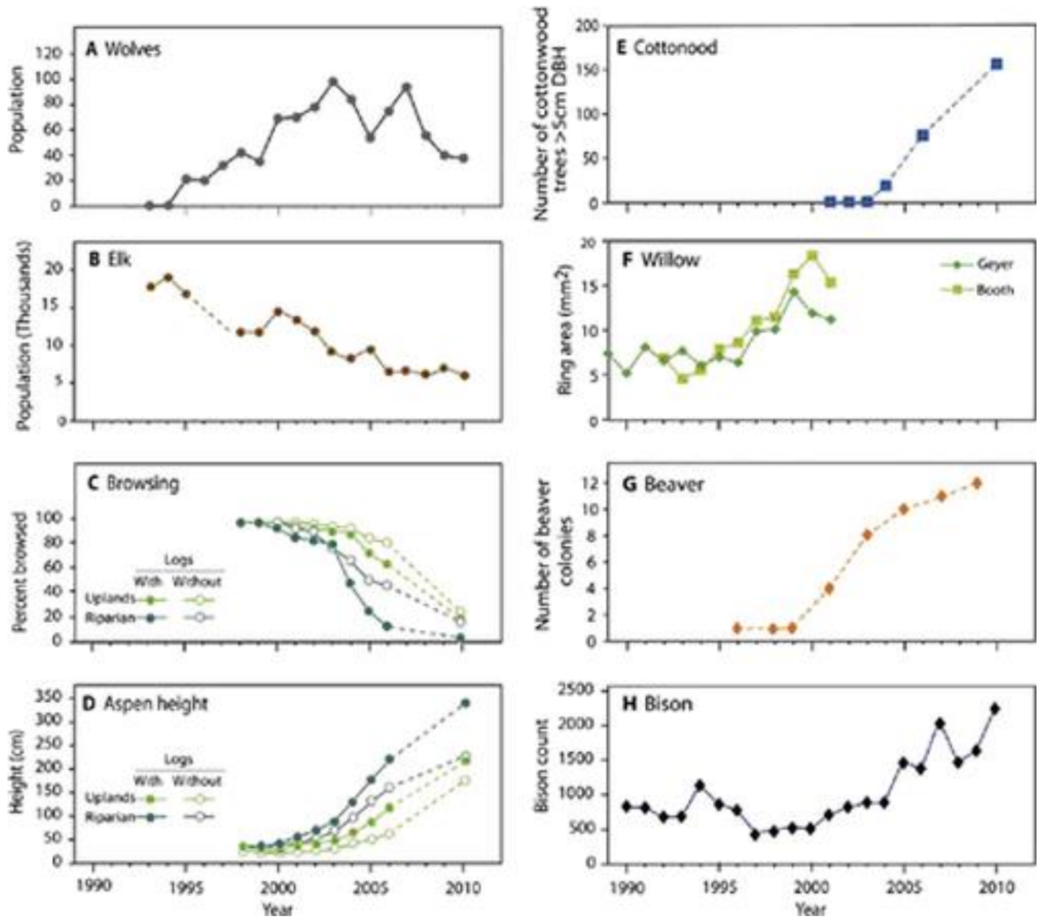


**Fig. 23. TROPHIC CASCADE after wolf reintroduction in Yellowstone National Park, with subsequent trends in (A) wolf populations, (B) minimum elk populations from annual counts, (C) percentage of aspen leaders [shoots] browsed, (D) mean aspen heights, (early springtime heights after winter browsing but before summer growth), (E) cottonwood recruitment, (F) willow ring area, (G) number of beaver colonies, and (H) summer bison counts (Ripple, 2011).**

In a study of the environmental rippling effect caused by the restoration of the wolf after its 70-year absence from the park, William J. Ripple and Robert L. Beschta reported their observations in "Trophic cascades in Yellowstone: The first 15 years after wolf reintroduction." They wrote:

> Synthesis results generally indicate that the reintroduction of wolves restored a trophic cascade with woody browse species growing taller and canopy cover increasing in some, but not all places. After wolf reintroduction, elk populations decreased, but both beaver (Caster canadensis) and bison (Bison bison) numbers increased, possibly due to the increase in available woody plants and herbaceous forage resulting from less competition with elk. Trophic cascades research during the first 15 years after wolf reintroduction indicated substantial initial effects on both plants and animals, but northern Yellowstone still appears to be in the early stages of ecosystem recovery. In ecosystems where wolves have been displaced or locally extirpated, their reintroduction may represent a particularly effective approach for passive restoration (Ripple, 2011).

Wolf restoration especially affected the population of not only elk, but two other keystone mammals, the beaver and bison. In fact, part of the reason for the bison increase can be credited to the wolf by making more forage available through its predation of elk, which had been over-grazing the park. But this trophic cascade is still in the early stages of ecosystem recovery. Looking back, the NPS noted in "Wolf Restoration Continued:"

> Today, it is difficult for many people to understand why early park managers would have participated in the extermination of wolves. After all, the Yellowstone National Park Act of 1872 stated that the Secretary of the Interior "shall provide against the wanton destruction of the fish and game found within said Park." But this was an era before people, including many biologists, understood the concepts of ecosystem and the interconnectedness of species. At the time, the wolves' habit of killing prey species was considered "wanton destruction" of the animals (Wolf Restoration Continued, 2014).

True words. However, the "era before people, including many biologists, understood the concepts of ecosystem and the interconnectedness of species" has evidently returned. All is not so rosy. With wolf re-introduction here and in other areas of the nation, conflicts awakened the age-old prejudices against the big bad wolf. Livestock owners decried losses to wolves, despite programs of indemnification of ranchers and others for losses due to wolf predation and despite the fact that such losses were miniscule. Special interest groups such as elk hunters and elk hunting guide outfitters grew increasingly more vocal in opposition to the presence of the wolf in the park. They claimed that elk populations had fallen to unacceptable levels and that the primary cause was wolf reintroduction. Eventually, federal protection of the gray wolf was removed. Gray wolves were delisted in Idaho and Montana in 2011 and in Wyoming in 2012. These states now manage wolf harvest seasons, although by court order the wolf has been re-listed in Wyoming.

But just what are acceptable elk population levels? Prior to 1968, elk populations were kept at what was considered the acceptable population for the park's carrying capacity, about 4,000 animals. The herd was intensively culled by park managers from 1935 to 1968. On average, 2,040 elk were removed each year in an attempt to alleviate or prevent presumed range damage. Since 1968, the northern Yellowstone elk herd has been managed under a philosophy of natural regulation. In 20 years, the herd grew from 4,305 elk in 1968 to 18,913 in 1988 (Coughenour, 1996).

Following wolf reintroduction in 1995 the elk population declined to 3,915 in 2013, about the level of what park managers originally thought would be the right-sized population level.

What effect has the wolf had on humans hunting elk? Through an analysis of hunting licenses issued by Montana and elk harvest statistics from 1999 to 2010 Steven Robert Hazen, in a thesis for his masters degree in applied economics, found “no significant impact of wolves upon hunter harvest in any of the three regions analyzed” in the state. However, in both southwest and west central portions of the state, the presence of wolves were found to decrease hunter applications, specifically, wolves within 25 miles of YNP decreased hunter applications by 36 percent, while wolves within 25-50 miles increased applications by 11 percent. He reasoned that this effect may be due to game being pushed out of areas close to the park and moving to areas approximately 50 miles away and that hunters are adjusting to this migration by shifting applications to these districts (Hazen, 2012).

What one might call a certain degree of “wolf-phobia” has resulted in a state stripping almost all regulations regarding the taking of wolves following delisting. Over most of Wyoming, for instance, after delisting it was “open season” on wolves. This, in turn, was challenged in court by conservationist groups such as Defenders of Wildlife, Natural Resources Defense Council, the Sierra Club and the Center for Biological Diversity, with the result that the courts ordered the wolf re-listed in Wyoming due to a lack of guidelines. Earthjustice attorney Tim Preso, who represented the groups, objected to what he termed “Wyoming’s kill-on-sight approach to wolf management.” He said Wyoming treated wolves as “vermin” and allowed them to be hunted “along the borders of Yellowstone National Park and throughout national forest lands south of Jackson Hole.” Following the opening of 80 percent of Wyoming to “unlimited” killing, the group said 219 wolves have been killed. The groups also claimed that “weak protections” existed for wolves in the remaining 20 percent of the state (Winter, 2014).

One of those wolves killed was alpha female 832F, or 06, as some called her. She was one of the first to go following delisting. In December of 2012, she had strayed outside the protected boundaries of the park into Wyoming where a hunter waiting near the border shot her. The unidentified “trophy hunter” handed her $4,000 GPS radio collar over to authorities.

Doug Smith termed the wolf’s death a serious blow to wolf conservation research (Platt, 2012). According to Smith, because 832F was the alpha, or breeding, female in the Lamar Canyon Pack, her death is also likely to have “important social impacts” on the park’s wolves. Wolves from one pack occasionally attack a wolf from another pack, and in some of these cases, the alpha female has died—an event that can lead to the pack’s break-up (Morell, 2012).

**Figure 38. ALPHA FEMALE 832F, OR "06," a wolf from Yellowstone National Park, had a fervent following (Schweber, 2012).** ***(Photo from Yellowstone Wolves Killed, 2012)***

Annual reports of the Wolf Project give a good insight into what the removal of a wolf from its pack, especially an alpha member, can mean behaviorally, namely, it can result in the disbandment of the pack:

- In 2012 the alpha females of the Agate Creek and Mary Mountain packs were pregnant, but died near their whelping dates. Both packs disbanded soon after.

- In late December 2005 the founding member and longtime alpha female of the Nez Perce pack was killed in the park interior by the Gibbon Meadows pack. At age nine, she was the oldest known wolf in the park population. Shortly after her death pack members split up and dispersed.

- In March 2005 the alpha male (#227) was killed by the Slough Creek pack and the founding alpha female (#106) disappeared and probably died. The combination of these events resulted in the dissolution of the pack (Wolf Project, 2012, 2005).

It is interesting to note that the largest packs not only survived, but thrived. The 2005 annual report of the Wolf Project records:

> At 17 wolves, the Yellowstone Delta pack was the largest in the park. The Yellowstone Delta and Bechler packs thrived in 2005, despite living in a deep snow/low prey environment. These wolves made forays outside the park in search of wintering ungulates.

Following the delisting, Wolf Project's 2012 annual report concluded that there should be no distinction between wolves living in and out of the park. The park border, for all practical purposes with regard to wildlife and its management, is a fiction. It said:

> Important highlights of 2012 were that wolf numbers were down to approximately the level that was present in the late 1990s, and that state hunting seasons outside of the park harvested 12 wolves that primarily lived inside YNP. These results generated a lot of comment and discussion about state and national park policy objectives, and what factors contributed to the drop in wolf numbers. Our work, some of which is presented here, suggests that there are multiple influences on wolves in YNP and, as importantly, it is misleading to consider wolves in YNP and those living adjacent to the park as two distinct populations—they are essentially one.

With the decline in elk prey and greater exposure to increasing numbers of bison, it appears that wolves are switching more to bison. This is called "prey switching." The 2012 annual report of the Wolf Project noted:

> An interesting finding from 2012 data is that wolves utilized more bison than any other year so far. Greater exposure to bison due to increasing numbers on the northern range was likely a factor. Also, winter 2011–2012 was mild, so there were fewer vulnerable elk in spring, and this is when most of the bison were consumed by wolves. In short, wolves ate neonate bison because bison calve earlier than elk, and adult elk are hard to kill. This shift toward bison will be an important development to track in the future.

**Are wolves to blame?**

Perceptions vary with regard to the population dynamics in the park. While wolves have been blamed for much of the decline in the park's elk numbers, the park's wolves numbered 83 in 2013, only 20 of which were living in the northern range.

Despite these low numbers, Billings Gazette reporter Brett French wrote March 9, 2013 that:

> Yellowstone National Park's abundant carnivore population has meant a continued decline in the northern Yellowstone elk herd, according to a Feb. 18 aerial survey by the Montana Department of Fish, Wildlife and Parks and the National Park Service.

Yet wolf biologist Doug Smith noted in the interview with French that the northern range wolf population hasn't been this low since 1996. Concerning the decline in wolf numbers, he said:

> "I think they're low because there's fewer elk" (French, 2013).

These declines may be part of the fluctuations seen in predator-prey dynamics. A good example of a predator-prey relationship would be the cycling of lynx and snowshoe hare populations in Northern

Ontario. As hare populations increase, the lynx populations also increase due to increased food supplies. Many lynx eating many hares causes a decline in the hare population. This decrease in hares results in a corresponding decrease in the lynx population because of now lower food supplies. Then the cycle begins again (Predation, Herbivory, and the Competitive Exclusion Principle, 2014).

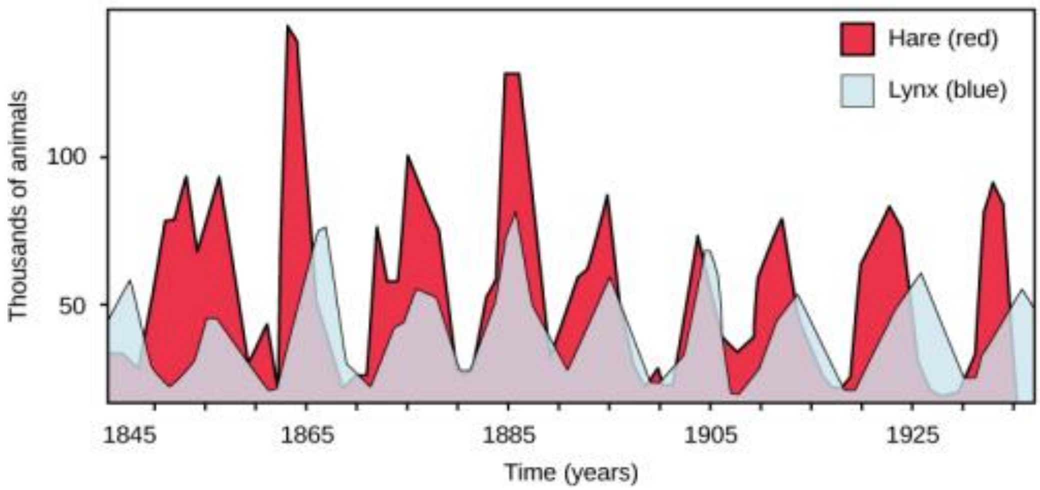


**Figure 39. PREDATOR-PREY DYNAMICS of the hare and lynx. Notice that the peak of the lynx population follows the peak of the hare population, which in turn creates greater predation of hares and a corresponding decline of lynx because of a diminished prey base. *Image: Boundless.***

According to the predator-prey model, if the elk population declines due to wolves, then one would expect that a decrease in wolves would produce a corresponding increase in elk. However, this does not appear to be the case, although it is hard to tell, since there are periods of concurrent declines and rises in predator-prey populations that can span a number of years.

Wolf numbers have been declining since 2003. As reported in the Wolf Project's 2013 annual report:

> There were at least 95 wolves in 10 packs and one group (8 breeding pairs) living primarily in Yellowstone National Park during December 2013. These totals are slightly higher than reported in 2012, but similar to previous years when about 100 wolves were counted. Wolf numbers have decreased by about 45% since 2003 when the population estimate was 172. This is likely due to fewer elk in the ecosystem (Wolf Project annual report, 2013).

Even several years after wolf reintroduction, the elk population was considered too high and Montana Fish, Wildlife and Parks allowed an aggressive hunt for cow elk that migrated out of the park in 2005. According to FWP's news release August 23, 2005:

> FWP wildlife officials believe that by creating a larger pool of hunters with the option of taking a cow, elk numbers may be reduced, especially in areas where land-owners have severe depredation problems (Consider the Cow Elk Option, 2005).

Smith noted in the 2013 interview that the northern elk herd, which is only a portion of the park's entire elk herd, has declined from a high of more than 19,000 before wolves were reintroduced into the park in 1995 to 3,915 in 2013. The decline has been between 6 and 8 percent per year. He hinted that there may be an error in the count. He said it is more difficult to count elk within the park these days because they are in smaller groups often hidden in the trees.

"In the old days, I'd see 300 to 500 elk out in the open," he said.

But that is not the case anymore. Herds are in smaller groups.

"That's due to predation. A smaller herd is harder to find" (French, 2013).

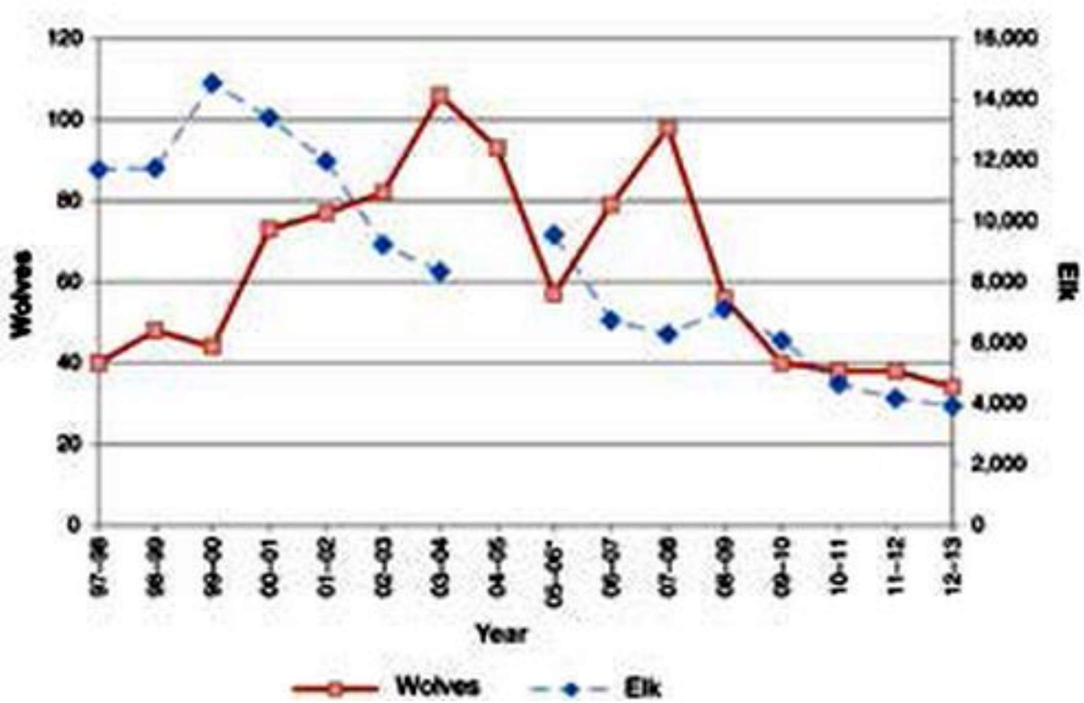


**Figure 40. WOLF VERSUS ELK POPULATIONS** ***(Wolf Project annual report, 2012).***

As one can see in the graph of Figure 40, mapping population trends since wolf reintroduction in the park, the wolf population on average has been dropping. But so has the elk population. Contrary to the typical predator-prey cycle of ups and downs, it is all downs for both species' populations. (The steep decline in 2005 for wolves, the largest population decline since reintroduction, was attributed to pup mortality and disease.)

How could this concurrent sustained decline of both predator and prey be explained? Logically speaking, only two possibilities exist. One, either there has not been a sufficient lapse of time for the predator-prey cycling to manifest itself, or two, some force other than wolf predation is causing the decline of elk numbers. This latter hypothesis could be explained as follows.

It is a given that the Yellowstone wolf population has declined by almost 50 percent since 2003. It has been theorized that this is due to the decline of the wolf's primary food source, the elk. But contrary to the predator-prey model, a corresponding increase in elk numbers has not followed that drop in the wolf population, even though that decline has continued more than a decade. This must mean that the decline in the elk populations is not due to the wolf itself, but because of some factor other than wolves consuming elk. The wolves are dying off because something other than themselves is responsible for elk mortality, the wolf's primary food source.

A ten-year period separates the troughs and peaks of the lynx-hare cycling. Intuitively, it would seem that a decade or more should be enough time for the predator-prey relationship to kick in and exhibit a cycling. But that has not happened. So what might be going on?

While the reintroduction of wolves to the park landscape was followed by a trophic cascade, the explanation of this rejuvenation as being solely attributed to wolves consuming elk may be too simplistic. Park scientists are studying the possibility that the reduction of elk, the primary trigger of the cascade, may have other, even more significant causes. Data indicate that it is not just limited to wolf predation, but a complex puzzle involving such factors as a six-year drought as well as other predators, such as grizzly bears, cougars, coyotes and heavy hunting pressures by humans (Stratton, 2013; Smith, 2008).

Scott Creel, an ecologist at Montana State University, published a study suggesting that the reason for the drop in elk numbers is due to a "non-consumptive effect," that is, instead of the decline in numbers being due to wolves eating elk, the mere presence of wolves has stressed the elk, causing them to flee into forests, reduce their feeding (elk prefer grazing to browsing) and increase their vigilance, leading to poor female health and fewer pregnancies (Creel, 2009).

But if this were the case, with a reduction of the number of wolves since 2003, and thus their intimidating presence, why was there not a population increase in over a decade in the now supposedly less-stressed elk?

In the Creel study, the supposed mechanism behind the elk population decline is that decreased forage intake results in a loss of body mass and fat, which in turn reduces progesterone concentrations, a hormone necessary for pregnancy, resulting in elk either failing to conceive during the autumn rut or elk losing the fetus during winter.

This hypothesis was tested in a study led by P. J. White, supervisory wildlife biologist at Yellowstone National Park. For both pre-wolf and post-wolf periods, they found that body fat of female elk was similarly high, as well as pregnancy rates at about 90 percent for both periods. The study concluded:

> Thus, there was little evidence in these data to support strong effects of wolf presence on elk pregnancy.

But there has been little hard data tracking elk movements with wolf movements. To gain more direct insights, Ecologist Arthur D. Middleton led a study that focused on the interactions of wolves and elk in the Absaroka Mountains, working in collaboration with the Wyoming Cooperative Fish &

Wildlife Research Unit, the Wyoming Game & Fish Department, and the U.S. Fish & Wildlife Service.

The team studied members of the Clarks Fork elk herd, which ranges in the Absaroka Mountains between Cody, Wyoming and the headwaters of the Lamar River inside Yellowstone National Park. There are two herds here: a resident or non-migratory herd that remains in the Absaroka foothills, where they have access to irrigated fields, and a migratory herd that travels up into the park to graze on the alpine meadows.

He fitted 90 female elk and 15 wolves with GPS collars, recording their coordinates every three hours to track their simultaneous movements. He also monitored elk body-fat levels and reproduction through biannual recaptures and closely observing winter elk behavior. From these data, a detailed map of long-term elk and wolf movements emerged.

His crew also counted the number of calves that survived each summer and recaptured the collared female elk twice a year for health checkups. He determined that the pregnancy rate among elk in the migrating herd was 19 percent lower than non-migrating herds nearby, and that from 1989 to 2009, the number of calves surviving to adulthood had declined 74 percent.

Results of the study indicate that elk responded to wolves, but only when wolves approached within about a half mile. Small increases in vigilance and movement occurred during the 24 hours after these encounters, but no changes in elk habitat use. He found that a typical migratory elk encountered a wolf within the half-mile range less than once a week. This relatively low encounter rate and the modest behavioral responses suggested that large, cumulative nutritional losses due to wolves should not be expected.

The study also found that the effect of elk body-fat losses over winter was not related to the frequency of wolf encounters, but rather to the amount of fat gained on the summer range—that is, those elk that got fatter during the summer did better during the winter. Further, the frequency of wolf encounters was found not to be related to pregnancy status. The study noted:

> These findings cast doubt on any link between the “fear” or “stress” of wolf predation and recent changes in the distribution, productivity, and abundance of elk.

What, then, caused the fall in the elk population?

> Among the elk we study (as discussed above), it seems more likely that the severe drought of the past decade, acting on an aging elk population, has reduced elk pregnancy—and that predators, particularly bears, kill many of the newborn elk calves (Absaroka Elk Ecology Project, 2010).

The bear connection to elk decline was unexpected. At the same time Middleton was doing his research, wildlife biologist Shannon Barber-Meyer, with the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota, followed 151 elk calves in Yellowstone for three years. Her team found that almost 70 percent of the calves died before their first birthdays and determined that wolves killed only 15 percent of them. On the other hand, 60 percent of the tagged calves had been killed by bears (more than half of them by grizzlies)—three times the level found two decades earlier (Barber-Meyer, 2008).

What had caused this shift? Jennifer Fortin, then a zoology Ph.D. student researching bear nutrition at Washington State University, conducted a long-term monitoring of grizzly bears in and around Yellowstone. She found that grizzlies had historically fed heavily on cutthroat trout they slapped out of the rivers as these fish spawned upstream. As reported by Christie Wilcox in *Discovery Magazine:*

> But in the 1980s, sport fishermen illegally released lake trout into Yellowstone Lake. The enormous invasive trout preyed on the native trout and competed with them for resources. And because the invasive trout spawn in deeper water than their native counterparts, they remain out of grizzlies' reach. Fortin's data showed that when fish were scarce, bears stalked the next easiest targets: elk calves.

But predation, even with bears included, didn't explain the low pregnancy rates of elk. Wilcox reported:

> A changing climate, on the other hand, did. Severe droughts since 2000, possibly correlated with climate change, reduced grass production in the areas of the park where elk migrate in the summer. Elk were forced to consume immense quantities of nutrient-poor fodder to try and meet their caloric needs, but most females were still undernourished and therefore unable to conceive (Wilcox, 2014).

The simplistic view that wolves were mainly responsible for the decline in the elk population was not supported by the data. Instead, it was a tangled web of contributing ecological factors: trout fishermen, bears, wolves, fish and climate change, with possibly others yet to be found.

**Invasive species**

But it doesn't stop here. To help restore the balance of nature that existed prior to the introduction of the invasive lake trout into Yellowstone Lake, park officials, along with Trout Unlimited and others are employing gill nets and fish traps to capture the non-native lake trout, removing so far 1.4 million. An initial study by Montana State University says that the invasive trout population is in decline (Miller, 2014). The effort in part is to keep bear predatory pressure off elk by providing them with their once favorite food: cutthroat trout.

The introduction of non-native fish goes back even further. Early park managers viewed fish in the park as resources to be used by sport anglers and to provide park visitors with fresh meals. Fish-eating wildlife, such as bears, ospreys, otters and pelicans were regarded as a nuisance, and many were destroyed as a result.

To supplement fishing and to counteract what was termed "destructive" consumption by wildlife, a fish stocking program was established in Yellowstone. Almost half of Yellowstone's waters were once fishless.

F. A. Boutelle, captain first cavalry, the acting park superintendent, mentioned in a report to the Secretary of the Interior in 1890 that:

> In passing through the Park I noticed with surprise the barrenness of most of the water of the park. Besides the beautiful Shoshone and other smaller lakes there are hundreds of miles of as fine streams as any in existence without a fish of any kind. I have written to Marshall F. McDonald, U.S. Fish Commission, upon the subject and have received letters from him manifesting a great interest. I hope through him to see all of these waters so stocked that the pleasure-seeker in the Park can enjoy fine fishing within a few rods of any hotel or camp (Report of the Secretary of the Interior, 1890, pp. 148-9).

His recommendation led to a program that stocked more than 310 million native and non-native fish, such as brook, brown and lake trout, into Yellowstone between 1881 and 1955. This had an ecologically destructive effect on the native cutthroat trout. Attempts to undo this misstep are ongoing today (History of Fisheries Management in Yellowstone, 2014).

Now, to remove non-native brook trout from tributaries of the Yellowstone River and in other waters, biologists have introduced a fish toxin (a piscicide called rotenone) into the streams to remove the non-native brook trout as part of Yellowstone's Native Fish Conservation Plan and Environmental Assessment. The streams will be restocked with native Yellowstone cutthroat trout (Nash, 2014).

The moral of the story is if you want to make elk hunters angry at wolves, alter the ecosystem by doing such things as introducing lake trout into Yellowstone Lake. Of course this is said tongue-in-cheek, but this concatenation of events is implicit in a trophic cascade. But the cascade can go either direction. What might appear to be a trivial event or a good idea at the time can turn out to have catastrophic implications ecologically later on.

Over the years, what has been going wrong in Yellowstone National Park is the displacement of native species by the introduction of non-native species into the ecosystem. This is true of cutthroat trout, which are being pushed out of their native habitat by the human introduction of lake trout and other non-native trout. This is true for the park's wild bison, which are being pushed out of their native migratory habitat by the human introduction of cattle into the ecosystem. And this is true of the gray wolf, which is being killed because it kills the invasive species called cattle and because it kills elk, which hunters want to kill themselves.

When this is done, when humans begin to meddle with the way things were, the system begins to collapse, as we have seen—and that system, a wildlife system, is the ecosystem. In the case being studied, it is the Greater Yellowstone Ecosystem, with its centerpiece being Yellowstone National Park.

In life, predation is the name of the game. Animals eat plants and animals to survive. In a broad sense, ungulates and other grass and plant consumers are predators, for they eat what is alive, or has lived, to remain alive themselves. The word "predation" comes from Latin "praedatio," meaning the taking of booty. The zoological sense dates from the 1930s. Whether that booty or plunder is animal or plant, in the end makes little difference, for all are involved in the chain of life. When that chain, which has self-adjusted itself over a period of eons, is altered by man, the mechanism can be so changed that one of the cogs breaks. That break is called extinction. One of those stressed cogs today is the park's wild bison herd.

In effect, cattle have become the greatest predator of wild bison, for the IBMP, acting on behalf of its cows, is like the alpha male in a pack, with migratory wild bison its favorite and most vulnerable prey. Without exaggeration it can be said that every winter the IBMP pack engages in a feeding frenzy on its prey. Migration has ceased to be protective for bison in the park, but instead exposes it to its greatest mortality. With all other bison behind fences, the migratory instinct no longer serves its evolutionary developed purpose anywhere in the United States. In fact, migration is now its greatest liability.

Does it not seem reasonable that by systematically and lethally removing almost every migratory bison from the herd year in and year out, and by also lethally removing bison that test positive for brucellosis and thereby removing bison that have immunity to that disease, that some severely cold winter with deep ice-encrusted snow the entire herd might die of disease and starvation behind the imaginary fence established by the IBMP, that is, the park boundary that they cannot cross for survival? Nature gave the migratory instinct for a purpose, but the IBMP operates as though it is not important for survival. Apparently, either the IBMP thinks Mother Nature is wrong or does not care if she is right.

Perhaps one spring day following an aerial count of bison winter-kill, we might learn as a nation that the entire Yellowstone herd has died inside the park during a particularly severe winter and that the only ones that survived were those migrating out of the park—all of which had been slaughtered by the IBMP.

**Liability of migration for elk**

Like wild bison, elk are also finding migration becoming a liability. In the Ecological Society of America's June 2013 *Ecology*, Middleton reports another study, this one focusing on elk migration. Writing in "Animal migration amid shifting patterns of phenology and predation: lessons from a Yellowstone elk herd," he and his team found that migrating elk are not doing as well as non-migratory herds.

Take, for instance, the 4,000 elk of the Clarks Fork herd that winter near Cody, Wyoming. Every spring a portion of that herd follows the greening grass into the highlands of the Absaroka Mountains, where they spend the summer growing fat on vegetation fed by snowmelt. From 1979 to 1980 studies showed that 81 percent of that herd was migratory. However, things have changed. From 2005 to 2009 studies indicate that only 48 percent are currently migratory.

Why? The Middleton team found two factors that appeared to be reducing the benefits of migration in this population, as noted in a prior study: a growing abundance of carnivores, especially grizzly bears, and a severe, long-term drought. In contrast, the non-migratory resident elk appeared to be benefiting from the removal of such large carnivores as wolves, their hunting now legalized outside the park with the delisting of the grey wolf, and by irrigated agriculture in this area. Such human intervention, the study proposed, has contributed to the recent expansion of the non-migratory herd (Middleton, 2013).

Concurrent with this growing concentration of non-migratory elk has been an increase of brucellosis. According to the Wyoming Fish and Game Department, while there is a clear link showing higher prevalence of brucellosis in those elk that annually congregated on winter feedgrounds in northwestern Wyoming, in other areas of the state the disease historically has been either non-existent or present at very low levels in free-ranging elk (Wyoming Game and Fish, 2009).

Brucellosis seropositive levels in Cody elk were low between 1991 and 2004, with a range of 0 to 4 percent, rising after 2004 to 9 percent for three years and then peaked at 17 percent in 2009. In 2010 seropositive elk dropped to 11 percent, and then increased to 13 percent in 2011.

With regard to the increased levels of brucellosis in the Cody elk population, according to the Brucellosis Management Action Plan by the Wyoming Brucellosis Coordination Team:

> One potential cause is the large wintering elk groups that approximate densities seen on feedgrounds in western Wyoming (2012 Cody Elk BMAP, 2014).

The threat of the spread of brucellosis from elk vectors in and around the Greater Yellowstone Ecosystem is further exemplified by what is happening in Paradise Valley, Montana. Part of the job of Livingston-based wildlife biologist Karen Loveless, Montana Department of Fish, Wildlife & Parks, is to scare elk off agricultural lands. Such action is part of the state's plan to keep elk, some of which carry the brucellosis bacteria, from mingling with cattle. In recent years this has involved the lethal removal of elk in a herd in an attempt to disperse groups. The department is also helping to repair fences, fencing haystacks and firing nonlethal cracker shells to scare elk away from cow feeding areas (French, 2013).

Further, as mentioned previously, plans are being studied to institute lethal control of elk by private property owners in Paradise Valley, as well as providing financial assistance to fence off elk from possible contact with cattle.

In sum, the Rocky Mountain states adjoining the Greater Yellowstone Ecosystem are at war with their wildlife. Some interests want more elk, some want less, some want more bison, some want less, some want more wolves, some want less—all for conflicting reasons. The resultant tug-of-war can become rancorous. And it is not limited to Midwestern states alone. For instance, one comment following a guest opinion in the Herald and News, Klamath Falls, Oregon, concerning the re-introduction of the gray wolf, follows:

> I find it a shame that we have such idiots in charge of our game populations when organizations like The Rocky Mountain Elk Foundation, Mule Deer Foundation, Wild Sheep Foundation, and many more have raised monies for decades to make healthy populations of these ungulates. Now a bunch of psychopathic environmentalists are destroying everything, as well as the livelihood of many small ranchers, restaurants, gas stations, and other hunter and recreational businesses, and for what? (My Recent Comments, 2014).

For what?

**Ecosystem like an economy**
Part of the answer is that no matter what state agencies are in charge of this or that species or segment of wildlife, or what special interests are trying to exercise control to advance those interests, no one group is smart enough or rich enough to run wildlife. It is sort of like the economy.

The Greater Yellowstone Ecosystem can be compared to a nation. But this is a special type of nation, a nation of wildlife run by wildlife. In this nation, there are various resources, such as trees, meadows, rivers, lakes, and prey and predators. Who is in charge here? Who determines who survives and who gets this or that resource necessary for survival? Like an economy, it is a matter of supply and demand. If there are too many elk they will eat too much grass and the range cannot support them, so they dwindle and become less populous. Or if the population of elk becomes too dense, their close proximity encourages brucellosis and they die. If there are too many wolves and not enough elk, the wolf population declines.

The value of each animal and each plant is determined by the interaction of all the species. If a balance is not reached, if one animal or plant becomes too costly or too cheap in this wildlife economy, that animal or plant will eventually cease to prosper. But who establishes their various values? Who sets their ecological price, so to speak? It is the individual participants themselves comingling.

Shortly after the Russian Revolution, Ludwig von Mises, an Austrian economist, wrote in 1920 that Communism would fail because it had abolished free markets so that officials had no market prices to guide them in planning production (Greaves, 1991).

Communism failed in part because such a highly managed economy cannot control distribution or determine how much of this or that should be produced, because no central government can successfully set values. In the Soviet Union, planning was to be done by a central committee, insuring plenty for everyone. But it didn’t work because the owners’ lack of ability to exchange one item for another disabled the ability to determine worth.

When mankind in a wildlife setting starts to favor one species over another, setting itself up as the central planner, usurping Mother Nature, such a system will eventually collapse, just as did communism, because no one is smart enough to establish the value of each species or its contribution to the whole. They have to do it among themselves by species freely competing one with the other.

If this is not allowed, the system in the end will become diseased. And this is just what is happening by the encroaching spread of brucellosis in the GYE.

So, what can be done? One tactic would be to reduce densities of ungulates, but not necessarily to an unacceptable reduction in numbers. How can that be done? By encouraging dispersal by encouraging migration.

Areas with supplemental feeding grounds for elk had higher seroprevalence in 1991 than other regions, but by 2009 many areas distant from the feeding grounds were of comparable seroprevalence. A 19-year dataset of over 6,400 brucellosis tests of adult female elk in northwestern Wyoming was analyzed. The study showed that the seroprevalence of brucellosis in Wyoming elk is increasing in some regions where elk are not artificially aggregated onto supplemental feeding grounds and these increases in seroprevalence are correlated with elk densities at the hunt area.

This above study "Mapping Brucellosis Increases Relative to Elk Density Using Hierarchical Bayesian Models" involved Paul C. Cross and Angela Brennan of the Northern Rocky Mountain Science Center, Dennis M. Heisey of the National Wildlife Health Center, Brandon M. Scurlock and William H. Edwards of the Wyoming Game and Fish Department and Michael R. Ebinger of the Big Sky Institute, Montana State University (Cross, 2010).

To mitigate brucellosis prevalence, one proposal by the Wyoming Fish and Game Department is to allow more hunters on private land, with assistance given to land owners, so that elk harvest in the area could be increased (2012 Cody Elk BMAP, 2014) and thus elk densities decreased.

But there is another option beside human predation. While wolves have been blamed for much of the decline in the park's elk numbers, the northern range wolf population currently is now at its lowest since 1996. As mentioned, the park's wolf population since reintroduction in 1994 peaked in 2003 at 174 animals. At the end of 2011, the number had declined to 98 wolves. Twenty Yellowstone wolves were shot by hunters when they ventured out of the park into Montana and Wyoming in the 2011 hunting season.

In the past, elk found it profitable to migrate into the higher altitudes of the park because there was highly nutritional grass and less predation as compared to staying on the wintering grounds, which were populated with predators that were busy, as spring approached, giving birth, caring for their young and finding prey. But now that land in the wintering grounds is being irrigated and with wolf numbers reduced by hunting, it becomes considerably less profitable to migrate.

Further, as the migratory herd ages, with less reproduction, there are fewer young elk learning the migratory routes from their parents. At some point, this learned behavior most likely will be lost and herds will have collectively forgotten the knowledge of how to get into the high country or even where it is. Not harvesting or taking wolves as "trophies" in the wintering regions for elk would be an option to decrease elk densities in the Cody area through the stimulation of dispersal by predators.

**Value of wolves**

Which returns us to an important point epidemiologically. Instead of the demonization of the gray wolf, it should be considered as an ally in the reduction of brucellosis prevalence levels, for its presence and predatory behavior can serve to decrease detrimental ungulate densities. By not only allowing, but encouraging wolves into regions experiencing overpopulation of brucellosis-carrying ungulates, such places as Gardiner Basin, Montana and Cody, Wyoming would benefit from the wolves' deterrent effect on prey congregation.

With regard to Gardiner Basin and the Hebgen Lake region, let the wolf do the lethal removal and hazing of bison. It would in the end be far less costly both economically and genetically than involving humans via IBMP.

Which brings us to another, equally important point. As has been shown, killing a member of a wolf pack, especially an alpha male or female, can result in the disbanding of that pack. With regard to the control of wild bison within and without the park, this can have a detrimental impact.

Recent Wolf Project reports have shown an increased incidence of prey-switching from elk to bison by the gray wolf in Yellowstone National Park. A study this year using direct observations of Yellowstone wolves hunting bison, their most formidable prey, found that larger packs were more cooperative when hunting difficult prey and more successful.

The study by Daniel R. MacNulty and Aimee Tallian of the Department of Wildland Resources, Utah State University and Daniel R. Stahler and Douglas W. Smith of the Yellowstone Wolf Project correlated "capture success," that is, killing prey, and "wolf group size," that is, pack size. They knew from past study results that elk were three times easier for wolves to kill than bison. The team reported in their study that:

> Whereas improvement in elk capture success levelled off at 2–6 wolves, bison capture success levelled off at 9–13 wolves with evidence that it continued to increase beyond 13 wolves . . .
>
> Our evidence that bigger groups were better hunters of larger, more dangerous prey provides rare empirical support for the hypothesis that an advantage of grouping in carnivores is that it increases the diversity and size of prey they can capture.

As applied to Yellowstone, the authors noted:

> The ability to exploit a wide range of prey is likely a particular advantage in migratory ungulate systems, where the availability of different species is irregular. For example, in Yellowstone's Pelican Valley, where we recorded many wolf-bison interactions, migratory elk were absent in winter (December-April), leaving non-migratory bison as the main prey resource for the resident wolf pack.

Correspondence between the mean annual size of this pack (10.6 wolves) during the study (1999-2013) and the group size that apparently maximized bison capture success (11 wolves), implies that this pack is well-adapted to hunting bison. However, the study noted, the optimal group size for capturing bison may exceed 11 wolves.

According to the 2012 Wolf Project annual report, pack size that year ranged from 4 (Blacktail and Snake River) to 11 (Lamar Canyon, Cougar, and Yellowstone Delta) and averaged 10, which is the long-term average. But why, then, are Yellowstone wolves not killing more bison? As the study points out:

> . . . wolves in northern and western Yellowstone continue to hunt mainly elk despite decreasing elk availability relative to bison. On the other hand, wolves in Wood Buffalo National Park, Canada, hunt mainly bison yet live in packs somewhat smaller than those in Yellowstone (8.6 wolves . . .) So it seems unlikely that insufficient pack size constrains the ability of Yellowstone wolves to hunt bison. We suspect large wolf packs avoid hunting bison when and where less dangerous prey exist because the profitability (energetic gain/handling time) of bison, discounted for the fitness consequences of injury and probability of injury, is relatively low despite improved group hunting success. This highlights how generally invulnerable bison are to wolf predation as well as how the benefit

> of group hunting for increasing carnivore diet breadth can be contingent on other predator and prey traits that determine the outcome of predator-prey interactions.

With regard to the ability to hunt bison, wolves in Yellowstone appear to have sufficient pack size to do the job. As the study noted:

> Although improved ability to capture formidable prey is not an obvious driver of grouping patterns in Yellowstone wolves, our results demonstrate the potential for such an effect . . . Our study clarifies that the benefit of improved hunting success could favor large groups in populations and species that hunt large, dangerous prey (MacNulty, 2014).

The study in sum demonstrates that among wolves in the Yellowstone area "improved hunting success could favor large groups." The key word is "could." If wolves are to become a significant factor in bison predation in the GYE, what we must find is a situation that transforms "could" to "does." This is of importance if a balance of nature is to be established in the GYE, a balance that would exempt the role of the IBMP pack.

Let us look at another study, a PhD dissertation by Smith Becker titled "Applying predator-prey theory to evaluate large mammal dynamics: Wolf predation in a newly-established multiple-prey system."

The study area focused on the interaction of three species in the west-central portion of Yellowstone National Park called the Madison headwaters, that is, the two ungulate prey species comprising a non-migratory elk herd and a central bison herd, and their predator species the gray wolf. Data was collected from 1996-97 to 2006-07. Wolves were reintroduced and colonized the area beginning in 1995-96.

During the study period wolf numbers varied between 2-50 wolves in 1-5 packs. Elk were resident throughout the year, but their numbers decreased from approximately 600 to 174 following wolf establishment. In contrast, bison were seasonally migratory with numbers increasing through each winter (200-1500) until they exceeded elk numbers by several orders of magnitude in late winter.

Prior to wolf recolonization, late winter starvation was the primary source of mortality for both elk and bison. Following the reintroduction of wolves, the study found that elk were the preferred and primary prey for wolves in the Madison headwaters area, even though bison were more abundant during winter. Kill rates on elk were primarily influenced by elk abundance and wolf pack size, while kill rates on bison were primarily influenced by the abundance of bison calves and snow pack severity. The weakening influence of snow pack made formidable prey such as bison considerably more vulnerable to wolf predation.

The study concluded that:

> Prey-switching evaluations indicated increasing selection of bison with increasing bison:elk ratios, however no concurrent decrease in elk predation occurred. Increased bison predation is not solely dependent on relative abundance of the two prey species; therefore it is unlikely at this time that wolf prey-switching will stabilize the system.

What could be done to stabilize the system? To buffer the effects of predation, Becker posits that seasonal migrations to areas with lower snow pack must be restored. He reasons:

> . . . interactions between physical, behavioral and environmental vulnerability of a prey species that enhance its predation risk can result in substantial distribution and abundance changes across systems.
>
> A good example of this is the strong decrease documented in the resident Madison headwaters elk herd due to wolf predation. A nonmigratory herd in this system may have arisen due to the absence of wolf predation for nearly seven decades that allowed colonization of a formerly risky area, as elk likely historically wintered outside of these high-risk areas. The return of top predators such as wolves therefore emphasizes the need for broad-scale management of landscapes to effectively maintain prey assemblages and allow species to successfully employ the defenses they evolved with, such as seasonal migrations to areas with lower snow pack, to buffer the effects of predation. Conservation of high-quality ungulate wintering ranges outside protected areas is therefore of paramount importance (Becker, 2008).

Apparently, elk have lost the ability to migrate and that ability most likely has been lost because of the effects of natural selection and survival of the fittest. Once the wolves were extirpated, the elk that had the greatest survival differential were those that stayed within the park, as opposed to those that went beyond the park boundaries and were shot by elk hunters. The offspring of the stay-at-home parents grew up, survived and had offspring themselves. None of those that survived in this herd knew the way out of the park and therefore stayed in the Madison headwaters area. Those that survived are those elk that had no one to teach them where to go in the winter.

When the wolf was reintroduced into the area, these now non-migratory elk simply did what their parents did, that is, remain as elk residents of their area. Gradually, year after year their numbers declined because the wolf population, regardless of the number of elk in the area and regardless of the number of bison, preferred the easier prey: elk.

Thus, the only way to stabilize the predation ratio of elk versus bison here is to restore elk migration. If there are no elk to kill, no elk will be lost as prey. But how does one get elk to migrate when they have lost that instinct?

### Restoring elk migration

Possibly all is not lost. Maybe it is just a matter of time that is needed for elk to adjust to the new predator environment. Maybe some of the park-resident elk, also called sedentary elk, have not lost that instinct after all. Possibly one of the reasons for the decline in non-migratory elk numbers in that region is because some of these elk have become migratory. Clair N. Gower with the Department of Ecology, Montana State University, led a study of elk and wolf interactions in the Madison headwaters of Yellowstone, as reported in chapter 18 of *The Ecology of Large Mammals in Central Yellowstone,* titled "Spatial Responses of Elk to Wolf Predation Risk: Using the Landscape to Balance Multiple Demands." She made the following observations (citations omitted):

> . . . while an environment without predation may favor year-round sedentary behavior, migratory movements may be evolving as the environment changes with the addition of wolves. In African systems migration has been suggested as a way to enhance survivorship. Theoretical modeling of migration in the Serengeti ecosystem suggests that population regulation by predators may affect non-migratory animals, while migratory species are more commonly regulated by food. This implies that the top-down effect of predation would dominate in a non-migratory herd such as the Madison headwaters. Thus, it is not surprising that high wolf numbers have contributed to low rates of over-winter adult survival, low calf recruitment, and a significant population decrease. In the Madison headwaters, winter is a time when deep snow exacerbates the vulnerability of large herbivores to wolves due to reduced mobility and potential for escape. It is also the time when wolves have an almost continual presence within the Madison headwaters. Under these conditions, seasonally escaping predators during winter when vulnerability reaches a peak, and returning in summer when vulnerability is reduced may be more profitable. Interestingly, all long distance movements that we documented following reintroduction occurred from areas of intensive wolf activity. No collared animals vacated the Madison drainage, which is the area wolves frequented least. These data thus allow us to speculate that animals that have displayed strong fidelity to a range can actually "make a decision" that their traditional range has changed in such a fundamental way that it is no longer conducive to remain in this area. Thus while it has been documented that density dependent factors such as crowding and resource limitation would promote animals to relocate in search of more profitable surroundings, our data suggest that the risk of predation can promote a similar response. These results also indicate that while we attribute the majority of the decline of the Madison headwaters elk population to direct predator mortality, permanent dispersal and animal switching from non-migratory to migratory seasonal movement strategies also contributed to the population decline (Garrott, 2009, pp. 391-392).

But what are the various factors making up this herd's behavior, as well as the migratory behavior of other herds in the Greater Yellowstone Ecosystem? It is not well understood. We do know that each spring thousands of elk in a number of separate herds migrate from winter ranges in Wyoming, Montana, and Idaho to high-elevation summer ranges in the interior of the park. They are a keystone species sustaining numerous species of carnivores and scavengers.

Some of these elk populations are declining due to the reintroduction or growth in numbers of such predators as the gray wolf and the grizzly bear, loss of habitat, the effects of hotter and drier summers, invasive species and the introduction of disease, such as brucellosis from cattle.

While some of the individual herds have been studied, an understanding of their collective migratory behaviors at the ecosystem scale is lacking, such as migration routes, seasonal ranges, the productivity of the herds and the influence of spring and summer climate on elk migration behavior.

A project is now underway to get a better understanding through a "rediscovery" of elk migration, led by Middleton and Joe Riis, a wildlife photojournalist and a contract photographer for National Geographic. They will attempt to get a broader public awareness through the use of photography, including camera traps at migration bottlenecks.

The two-year project is scheduled for completion by spring 2016. Collected data will be used to produce a comprehensive map and scientific report that reveal the elk migrations and highlight key management challenges at the scale of the entire GYE. Collared migratory elk in the Cody herd will be fitted with satellite collars that transmit "real-time" locations that will be used to identify migration bottlenecks. A museum photography exhibition as well as a short film are planned for release during late 2015.

Project cooperators include the Wyoming Game and Fish Department, Montana Fish Wildlife and Parks, the National Park Service (Yellowstone Center for Resources), the U.S. Fish and Wildlife Service (National Elk Refuge), the U.S. Forest Service (Shoshone National Forest), the Wildlife Conservation Society, and numerous private ranches in the Greybull and South Fork of the Shoshone River valleys. Project funders include the Prince Albert II of Monaco Foundation, the Buffalo Bill Center of the West, the University of Wyoming's Biodiversity Institute, the George B. Storer Foundation, the Knobloch Family Foundation, the Fran and Lenox Baker Foundation, the National Geographic Expeditions Council, and the Rocky Mountain Elk Foundation (Elk Migrations of the Greater Yellowstone: Project Overview, 2014).

A similar project should be launched for the wild bison, but this would mean allowing the bison to migrate instead of slaughtering them mid-migration. In fact, merely allowing the bison to migrate while this important study and public outreach is going on would contribute to a better understanding of the synergistic effect of the two main ungulates in this system (elk and bison) as they interact with the various carnivore populations. Without it, the project will obtain data on an artificial environment, that is, one that reflects the annual artificially selecting-out of migratory wild bison from this ecosystem by the actions of the IBMP.

**Et tu, bison?**

And just like the non-migratory elk in the Madison headwaters, bison in the park's Pelican Valley are getting whacked by wolves. Why? Because these bison are also non-migratory. To kill an elk, it appears that only one big male wolf is needed. However, as Doug Smith pointed out:

> With bison, it appears that you need multiple big males because bison are twice the size of an elk, and they stand their ground . . . You need huskier, stronger animals. And the bison kills I've seen, I've seen up to four big males ripping and tearing at the same bison and you won't often see that with elk.

In the Pelican Valley and along the Firehole River, wolves stay behind in the fall when the elk head to lower wintering grounds. Why the wolves do not follow the elk is not known, but what is known is that the wolves have figured out how to effectively kill bison. These wolves are 5-10 percent larger than those that prey on elk through the winter. One male from the Mollie Pack weighed 144 pounds. Smith noted that:

> The pack that lives in Pelican Valley kills nothing but bison all winter. In the summer they switch back to elk, because the elk return. If you get a choice, you're going to take elk . . . They have that skill now, they know how to do it, and when elk leave they just stick and kill bison. That's what they've been doing the last few years. They just start whacking bison as

soon as the elk leave. And that pack, as well as the one that lives in the Firehole, has more large males than any other pack in the park (Repanshek, 2010).

It would be interesting to know what percentage of these Pelican Valley bison, if any, belong to the elusive Mountain bison herd that some have claimed to have sighted and that historically inhabited this region.


**Figure 41. BEHAVIOR OF WOLVES HUNTING BISON: (a) approach, (b) attack-individual, (c, d) capture. "Attacking" is the transition from (a) to (b), and "capturing" is the transition from (b) to (c, d) (MacNulty, 2014).** ***Photo credit: Daniel Stahler, Douglas Smith.***

**IBMP's erroneous self-justification**
One of the tactics used by the IBMP to justify its actions is to establish a premise that leads to the conclusion wanted. In the case at hand, that premise is the need to keep the wild bison herd at the 3,000 population level.

The *Record of Decision* first establishes a premise, namely, that as a risk management measure a population of 3,000 park bison must be maintained. It states:

A. As an additional risk management measure, the agencies would maintain a population target for the whole herd of 3,000 bison. This is the number above which the NAS (1998) report indicates bison are most likely to respond to heavy snow or ice by attempting to migrate to the lower elevation lands outside the park in the western and northern boundary areas (p. 20).

Then it concludes from the above premise the actions it can take to maintain that 3,000 population target:

B. If the late-winter/early-spring bison population is above the 3,000 target, specific management actions may be undertaken at the Stephens Creek capture facility or outside the Park in the western boundary area to reduce its size. For example, instead of hazing bison remaining in boundary areas back into the park in the spring, they may be removed to quarantine or slaughter (p. 32).

In the National Park Service's website on Yellowstone under the heading of "Frequently Asked Questions: Bison Management" the following line of logic was built on the above premise and conclusion:

- During summer 2014, there were about 4,900 bison in the Yellowstone population following calving, including about 3,500 bison in the northern herd and 1,400 in the central herd.

- In 2000, the Secretaries of Agriculture and Interior and the Governor of Montana signed a court-mediated agreement that included guidelines to limit bison abundance near 3,000.

- Biologists from the National Park Service (NPS) have proposed removing 900 bison near the northern boundary this winter to reduce population growth and the potential for a mass migration of bison into Montana.

- Bison populations increase rapidly when environmental conditions are suitable. Yellowstone bison are prolific and have high survival rates, with wolves currently killing few bison because elk are more vulnerable prey.

- Bison need to be removed from the population at times. The fast-growing bison population could fill available habitat and out-pace the acquisition of additional habitat and tolerance for bison in Montana. Options for relocating Yellowstone bison elsewhere are limited by real and perceived disease and social concerns.

- Under-nutrition (starvation) only contributes to high mortality when bison abundance is high and snow pack is at or above average. Also, most bison migrate to lower elevation areas in response to such severe weather events—which eventually brings them into conflict with agriculture and development.

- The food-limited carrying capacity inside the park could be as high as 5,500 to 7,500 bison during winter, but lower-elevation habitat for bison is limited by mountains in the park and by competition with agriculture, development, and transportation systems outside the park.

- A panel of expert scientists reviewing Yellowstone bison and brucellosis issues in 2013 concluded that culling or removals of bison, along with hunting, would be necessary to limit the size of the bison population for biological, social, and political reasons.

C. Therefore, bison will at times need to be intensively managed and culled from the population to prevent the limited tolerance for wild bison on the landscape in Montana from being rescinded.

The above points are direct quotes from the website, except for the additions of the lettering A, B, C. The line of reasoning leads from A to B to the need for item C. If we boil this line of reasoning down to its essentials, here is what is being said:

1. Because wild bison tend to migrate out of the park in the winter in search of forage when their population exceeds 3,000, kill beyond that number those that attempt to migrate.

2. If we do not kill 900, there is the potential of a mass migration of wild bison into Montana.

3. Wolves cannot do the job of herd reductions of wild bison since wolves currently are killing few bison because elk are more vulnerable prey.

4. Wild bison might starve during a severe winter, so we might as well kill them off when they try to migrate to lower elevations to avoid starvation.

5. Lower-elevation habitat for bison is limited by mountains in the park and by competition with cattle outside the park.

6. A panel of expert scientists has concluded that lethal removal of wild bison is necessary because of disease, social and political reasons.

7. Therefore, off with their heads.

**Big questions**
Question: with regard to those animals to be removed lethally, how do those government agencies or the “expert scientists” know which wild bison are diseased and which animals might die of starvation? How do they know which animals have valuable genetics or immunity? How do they know what population level is optimal genetically? The answer is, they do not. There is only one agent smart enough to know this and that is the wolf, which kills vulnerable prey, including the

diseased, aged and lame. That the wolf cannot serve in this capacity as claimed by the National Park Service is not supported by the data. The issues listed above, cited for the support of the removal of bison from the park by the IBMP, do not hold water. The only reason the bison are being removed is to make way for cattle, an invasive species within this ecosystem.

Further, why is there a level of brucellosis infection among migratory elk of 1 to 3 percent, among non-migratory elk of 20 percent and bison of 50 percent? The answer may be because none of the so-called migratory bison are being allowed to migrate. By eliminating on a systematic basis those animals that try to disperse, a non-migratory regimen is being encouraged in the park, one that leads to concentration of population. And it is crowding that promotes disease.

What better incubator of disease could there be than such an overcrowded environment that exists around the thermal pools of the park? Here is warmth. Here is limited forage. Here is contamination of this area by fecal material that is fed upon by bison during the winter. Here is where many are trapped by the IBMP's policy of killing all those who venture away.

Moreover, the percentage of bison labeled as having brucellosis infection may not be accurate because present tests only indicate whether the animal once was infected. If the animal has recovered and no longer has an active brucellosis disease, it is still termed by park managers to have the disease, when it does not. As biologist John J. Treanor of Yellowstone National Park and his park colleagues point out in "Estimating probabilities of active brucellosis infection in Yellowstone bison through quantitative serology and tissue culture":

> In bison, *B. abortus* antibodies are long lived (Rhyan et al. 2009); thus, seroprevalence overestimates the level of active infection (Roffe et al. 1999) by failing to distinguish between infected and recovered animals (i.e. bison that have cleared the bacteria) (Treanor, 2011).

And lastly, how do we know that wild bison, if not reduced by 900 animals, will migrate into Montana, that is, the whole state of Montana? Of course they will go into the Gardiner Basin, which is in Montana. That region was the proposed expansion area that was recently shot down by the Montana Board of Livestock. But the National Park Service should be able to tell us how they expect wild bison to go beyond Yankee Jim Canyon. How are masses of bison to get through the fencing and the cattle guard there? It is a major migratory bottleneck for all animals.

Yes, the National Park Service may be technically correct in saying that bison will migrate into Montana, which is just across the northern border of the park, but what is implied by saying there is the "potential for a mass migration of bison into Montana" is that the state will be overrun by these wild animals. That is not true and thus it is fear mongering. Such claims by governmental authorities are an exercise in duplicity.

Once again, it is simply kowtowing to the cattle industry.

**Conservation of habitat outside the park**

In his dissertation, Becker recommends the "conservation of high-quality ungulate wintering ranges outside protected areas." But what does that entail? Elk, such as those elk near Cody, Wyoming, have protected ranges outside the park, and here they are experiencing elevated brucellosis rates due to unhealthy concentrations. With plenty of irrigated alfalfa fields for forage and with their habitat protected now from predation due to the wolf's delisting as a protected species, from an elk's point of view, why leave?

But staying put creates vulnerability, both to disease and predation. Like a stagnant pond, Greater Yellowstone Ecosystem has become an incubator of disease. Without ungulate movement and without predation to stimulate that movement, with fences in such places as Paradise Valley acting like dams to retard flow of these animals, and with fields devoted to fodder for domestic animals acting as attractants to ungulates, wild animals will stagnate.

With regard to wild bison, those habitats outside the park that could serve as wintering ranges are essentially off limits.

While private land may be owned contiguous to the park and while public non-park land may be used privately bordering the park, to alter the land by the use of fences, the introduction of non-native species such as cattle and the cultivation and irrigation of these properties bordering the park, as well as the elimination of predators that serve to selectively maintain a balance of species in the region, and at the same time expect this wild system, this ecosystem, to run smoothly with such alterations is simply irresponsible and unrealistic.

The Yellowstone region is beautiful because it is wild. To alter her is to make her ugly and to do so for private gain is to prostitute her. Leave her alone and she will flourish. She will be able to run, dance and play and not be imbalanced and a contagion of disease. A sultan's attitude of dominance toward wildlife is incompatible with a healthy Greater Yellowstone Ecosystem.

**IBMP has wild bison under house arrest**

The word ecosystem comes from the Greek oikos "house" combined with the word "system." The Greater Yellowstone Ecosystem is indeed like a house for the animals that live in it. But, if one were to prohibit movement in that house, the occupant would most likely die. The inhabitant would perish because it could not move into the kitchen when hungry nor move to another room to protect itself if attacked. But think of the horror and impossibility of such a life if the occupant when it did attempt to move was shot by a government agent stationed at the door for making such a move.

That is what is transpiring in Yellowstone National Park for the wild bison when it attempts to forage at lower elevations and to avoid wolf attacks in the deep snow. Literally standing at the exit of the northern door of the park are government agents whose one purpose is to see that they move no further and they accomplish this mandated purpose by slaughtering them. For the wild bison the park is a prison and the custodians of the park their executioners.

The Northern Gateway to the park now functions as the Berlin Wall for bison.

In the preparation of this petition, what is so frustrating is that a wealth of data and research points to the inadvisability of large herd reductions of these wild animals. This information is often in the form of studies generated by government staff, such as those working for the National Park Service and Yellowstone National Park. Yet time and again, after stating the merits of allowing wildlife to function without human intrusion, the reports end up recommending lethal removal of bison.

Among the apologists for the mass culling of wild bison is Dr. P.J. White, chief of wildlife resources, Yellowstone National Park. Writing in "Management of Yellowstone bison and brucellosis transmission risk: Implications for conservation and restoration," along with co-authors Rick L. Wallen, Chris Geremia, John J. Treanor and Douglas W. Blanton, his *Biological Conservation* review article of the problems surrounding the issues related to bison migration out of the park—which in its survey delineates the ecologically destructive consequences of large-scale bison culls—concludes by citing research that justifies such removals and gives those advocating large-scale culls, such as the IBMP, the cover they need. The problem is that the pivotal study used for this justification is a mathematical model of prediction and is not based on field evidence. It is tantamount to an opinion. Pretending that it is fact is, to say the least, disappointing.

White's review begins by pointing out that not allowing ungulates such as bison to migrate creates crowding in the park and thus greater risk of disease transmission both within and outside the park. He states (citations omitted):

> Infectious diseases transmitted between wildlife and livestock are increasingly becoming one of the primary drivers threatening the long-term viability of wildlife populations through the isolation of protected areas. The increase in human agricultural activities along the boundaries of wildlife reserves has augmented the sharing of diseases between wildlife, livestock, and humans. These multi-host situations, where the disease has been eradicated or is under control in domestic livestock, are exceptionally difficult to manage because a single transmission from wildlife to livestock can have severe consequences for public health, the region's economy, and wildlife conservation … As a result, wildlife hosts are often restricted to reserves which may not offer all the seasonal habitat requirements for survival and reproduction. This is the case for many migratory ungulates, where most protected areas do not include the entire migratory range and intact ungulate migrations have declined as these conservation areas have become increasingly insularized by human activities. A consequence of restricting wildlife access outside reserves is the crowding of hosts within protected areas which can lead to an increase in disease transmission within the wildlife host populations and, ultimately, greater transmission risk to nearby livestock.

That crowding promotes disease and that migration by promoting dispersal mitigates disease is a major thesis of this petition.

According to White, migration is an essential behavioral feature necessary for bison survival. An essential characteristic of this migratory pattern is seasonal movements out of and then back into the park (or at least attempts to do so, as most migratory bison are diverted into the Stephens Creek capture facility and lethally removed). He states (citations omitted):

> Large annual migrations of bison to low-elevation winter ranges north and west of the park boundary highlight the importance of these areas as winter habitat for bison. Migration during winter allows bison to access food resources that are more readily available in lower snow depth areas of their range, and serves to release portions of the bison range in the park

> from intensive use for a portion of the year. Most bison migration into Montana occurs during mid-to late winter, with peak numbers moving to the north boundary in late February and March and to the west boundary in April and May as vegetation begins to green-up on low-elevation ranges. Migration back to interior park ranges typically occurs during May through June, following the wave of growing vegetation from lower to higher elevations, similar to other ungulates in this system. Thus, hazing operations to move all bison back into the park during mid-May often occur at a time when bison are undernourished at the end of winter, have vulnerable newborn calves, and may want to remain on low-elevation ranges with new grasses because there is typically still substantial snow on their higher-elevation summer ranges. The reluctance of bison to be returned to the park before sufficient vegetation green-up at higher elevations is evidenced by the repeated attempts of hazed bison to return to lower-elevation ranges with new grasses in Montana during May and early June.

White claims that if the bison population in the park can be maintained at above 3,000, adaptive capabilities and genetic diversity will be maintained. Providing four citations to support this claim, he states:

> . . . recent demographic and genetic analyses suggest that an average of more than 3000 bison total on a decadal scale is likely needed to maintain a demographically robust and resilient population that retains its adaptive capabilities with relatively high genetic diversity (Gross et al., 2006; Freese et al., 2007; Plumb et al., 2009; Pérez-Figueroa et al., 2010).

In the review White states that large scale culling can have detrimental consequences:

> Brucellosis risk management actions have been periodically implemented under the IBMP to reduce the numbers of bison attempting to move outside the park. However, more than 1000 bison (21%) were culled from the population during winter 2006 and 1700 bison (37%) were culled during winter 2008 because hazing was no longer effective at keeping them in the park or adjacent conservation areas, as required during step 1 of the IBMP. Frequent large-scale, non-random culls could have unintended effects on the long-term conservation of bison, similar to demographic side effects detected in other ungulate populations around the world.

He noted that 556 bison were sent to slaughter from the west boundary and 2,650 bison from the north boundary of the park during 2003–2008. An analysis of that group's sex ratio showed more females than males were slaughtered, contributing to changes in the gender ratio of bison in the park. White stated that:

> Skewing bison sex ratios in favor of males could increase mate competition among males and result in higher levels of aggression and mortality during the breeding season. Also, over-winter survival is usually lower in males than females in large sexually dimorphic species such as bison due to the expenditure of resources during the rut. For male Yellowstone bison, internal resources depleted during the autumn rut cannot be replenished until new forage is produced in the spring. Thus, management actions that skew the sex ratio

> in favor of males may further reduce male over-winter survival by increasing the intensity of competitive interactions during the breeding season.

By such non-random culling, the central herd's productivity is being diminished. As White pointed out:

> In addition, large-scale culls of females apparently reduced the productivity of the central herd . . .

White noted that while "relatively few calves show positive responses on serological tests" for brucellosis, an age analysis of the 488 female bison "processed" at the Stephens Creek capture facility during the winters 2006 and 2008 revealed for those years one-third and one-half of the park's calf crop, respectively, had been wiped out by culling. These calves had not been tested for brucellosis prior to culling, resulting in the needless lethal removal of juvenile wild bison. These were the calves that had migrated with their mothers to survive. In sum, White noted:

> Large-scale culls also contributed to a substantial reduction in juvenile cohorts when captured bison were not tested for brucellosis exposure before being removed from the population.

White stated that at the time of his review (2011) "there is no evidence that culling has significantly altered the genetic structure or diversity in the Yellowstone bison population." But he had this warning:

> However, our analyses suggest the continuation of erratic, large-scale culls over the coming decades could have unintended consequences on the demography of Yellowstone bison.

The critical importance of conserving bison in their wild state is discussed in the review. White states:

> Yellowstone bison are managed as wildlife in multiple, large herds that migrate and disperse across an extensive landscape (>90,000 ha) they share with a full suite of native ungulates and predators, and are subject to natural selection factors such as competition for food and mates, predation and survival under substantial environmental variability. Thus, they have retained the adaptive capabilities of plains bison, which is an essential quality for restoring other wild populations, and contribute significant and unique genetic diversity to plains bison. The ecological future of plains bison could be significantly enhanced by resolving issues of disease and social tolerance for Yellowstone bison so that their wild state and genetic diversity are retained and can be used to synergize the recovery of the species and the restoration of grassland biodiversity across central and western North America.

But there is a problem involved, White claims, in the conservation of wild bison and it is this: if left alone, they might invade Montana. He states:

> Yellowstone bison will continue to migrate into Montana during winter, with higher numbers migrating as bison abundance and winter severity increase. Without human

> intervention, some bison will not migrate back into Yellowstone National Park during spring, but will attempt to expand their range into suitable habitat areas in Montana (Plumb et al., 2009).

And then immediately follows this big "thus:"

> Thus, a deliberate risk management strategy such as the IBMP is necessary to maintain separation between bison and cattle and prevent the tangible risk of brucellosis transmission between these species (White, 2011).

And thus is provided justification for the past orders and the impending order this winter by the IBMP of "off with their heads," that is, off with wild bison heads—900 of them this winter.

**The Plumb study**

Let us look at the cited study "Plumb et al., 2009." The title is "Carrying capacity, migration, and dispersal in Yellowstone bison," published in *Biological Conservation*. The lead author is G.E. Plumb, with co-authors P.J. White, M. B. Coughenour and R.L. Wallen. Plumb, White and Wallen are all with Yellowstone National Park and Coughenour with Natural Resource Ecology Laboratory. Both White and Wallen were authors of the review article citing the Plumb et al. 2009 study and both papers were published in *Biological Conservation*.

As Plumb notes with regard to the rarity of the Yellowstone bison and attempts to limit their abundance:

> . . . by the early 20th century, YNP provided sanctuary to the only relict, wild and free-ranging bison remaining in the United States. Park ungulate management policies evolved in 1969 to preclude deliberate culling inside the park and allow ungulate abundance to fluctuate in response to weather, predators, resource limitations, and outside the-park hunting and land uses. Bison numbers increased rapidly under this policy and, since the 1980s, increasing numbers have moved outside the park during winter where some have been culled or hunted by state, tribal, and federal agencies. The YNP policy of ''natural regulation" proved to be a highly contentious approach to wildlife management, with criticisms primarily focused on effects of perceived overabundance of wild ungulates on range health in the park. Bison movements beyond the YNP boundary led to claims that bison were overabundant and had degraded the range health inside the park. Such claims, in turn, have led to calls for intensive management to limit the abundance and distribution of bison inside YNP, including fencing, fertility control, hunting, and brucellosis test-and-slaughter programs.

According to Plumb:

> A central question in this debate is whether bison move outside the park because their abundance has surpassed levels that can be supported by the forage base in the park, considering year-to-year variations in food production, habitat use, diet selection, and energy balance.

To help answer this question, Plumb looked at a number of analytical studies that evaluated whether bison numbers have exceeded their theoretical food-limited carrying capacity in the park and why bison moved outside the park during winter and spring. He examined data on "site water balance, plant biomass production, plant population dynamics, litter decomposition and nitrogen cycling, ungulate herbivory, ungulate spatial distribution, ungulate energy balance, ungulate population dynamics, predation, and predator population dynamics submodels."

What is important to realize is that the method employed here to determine answers is a theoretical one, using a computer and a mathematical model of a biological system, in this case the Yellowstone ecosystem, to simulate the behavior of that system. The answer is an "if this, then we can expect that" type of answer—an educated guess, a prediction.

According to the review:

> When the model was run for eight simulations for the northern and central herds simultaneously over 50 years . . . neither the central nor the northern bison herds have exceeded the estimated mean food-limited carrying capacities in the park . . .

However, there is a caveat. Plumb noted:

> During severe winters, the energy balance model predicted that the populations would be under nutritional stress well below food-limited carrying capacity and, as a result, the population model predicted considerable calf mortality and small increases in adult mortality due to starvation.

The simulations reviewed by Plumb indicated that a factor in nutritional stress was that during severe winters as more bison came down from the higher elevations in the park, where there was higher-quality foraging, densities of bison at the lower level in the park increased, creating pressures on resident bison, forcing them to move out of the park. He noted:

> There were indications of nutritional stress via decreasing minimum body condition and calf:cow ratios in simulations of Yellowstone bison dynamics during 1969 through the mid-1990s as bison and elk numbers increased. These findings suggest there was increased competition for food supplies, even though less than one-half of the total forage was eaten. Higher-quality foraging areas for bison in YNP are limited in overall area, patchily-distributed, and likely depleted first. Residence times in winter foraging areas were negatively correlated with bison numbers, suggesting that competition increased in high-quality foraging areas as more bison moved onto the winter range and bison travel and redistribution increased suggested an increasing probability of larger bison movement beyond the park boundary when their abundance exceeded 3000. More-recent analyses of data collected during 1970–2008 suggest that limiting the population to <3500 bison in the central herd and <1200 bison in the northern herd could abate most large-scale movements outside the park during near-average winter conditions.

As Plumb noted, the population level at which migration out of the park is triggered according to recent simulations is 3,500 in the central herd and 1,200 in the northern herd. Previously, it was predicted that this trigger would be reached at the 3,000 level for both herds together.

Plumb explained that climate variability is a primary factor in bison migratory behavior:

> Yellowstone bison spend the majority of their time finding and eating forage during winter, with nearly one-third of that time spent displacing snow to reach forage. Thus, snow is the primary factor that reduces foraging efficiency and bison prefer patches with minimal snow pack compared to the surrounding landscape. As snow depth increases, the available foraging area for Yellowstone bison is reduced to increasingly limited areas at lower elevations and on thermally warmed ground, even though many geothermal areas contain low biomass and/or relatively poor quality forage. Also, snow melts earlier at lower elevations and, as a result, there is earlier green-up and energy-efficient foraging opportunities while upper-elevation portions of the winter range are still covered with snow. Thus, the numbers and timing of bison migrating from the summer range to the winter range is positively related to snow build-up on the summer range, while return migration from lower elevation winter ranges aligns with temporal and spatial patterns of onset phenology [that is, climatic response]. Upon initiation, onset phenology occurs progressively at the rate of approximately 10 days for every 300 m. of elevation gained, suggesting Yellowstone bison may employ a conditional migration strategy based on climate variability.

Plumb concludes his review by stating that even though bison are not overgrazing the park nor exceeding its carrying capacity of 6,200, large-scale bison migration could “overwhelm manager’s abilities to maintain separation between bison and livestock,” making it necessary to prevent dispersal and range expansion via hunting and culling. He stated:

> While evidence indicates the Yellowstone bison population has not exceeded the park’s food-limited carrying capacity of approximately 6200, it also appears that the interactive effects of severe winters with population levels greater than 4700 bison could induce large-scale movements of bison to lower-elevation winter range outside YNP. Such large movements jeopardize brucellosis risk management objectives by overwhelming manager’s abilities to maintain separation between bison and livestock. Thus, we propose that a Yellowstone bison population that varies on a decadal scale between 2500 and 4500 animals should satisfy the collective long-term interests of stakeholders, as a balance between the park’s forage base, conservation of the genetic integrity of the bison population, protection of their migratory tendencies, brucellosis risk management, and other societal constraints. Within this range of abundance, management agencies should continue to prioritize conservation of bison migration to essential winter range areas within and adjacent to the park, while also actively preventing dispersal and range expansion via hunting, outside YNP, and periodic brucellosis risk-management (i.e., dispersal sink) (Plumb, 2009).

But one wonders how “protection of their migratory tendencies” is accomplished “while also actively preventing dispersal and range expansion via hunting, outside YNP, and periodic brucellosis risk-management (i.e., dispersal sink).”

One wonders how “protection of their migratory tendencies” can be a goal, when Plumb reports that historically and at present “range expansion beyond park boundaries” has been “precluded.” Plumb stated:

> Since the mid-20th century, and more recently under the IBMP, range expansion beyond park boundaries was precluded by culling and hazing bison back into the park during winter and spring to reduce the risk of brucellosis transmission to livestock.

Dispersal is defined by Plumb as “movement from one spatial unit to another, without return (at least in the short term), while range expansion is the outward dispersal of animals beyond the limits of the traditional distribution for a population.”

According to Plumb’s definition, it is not only range expansion that is being precluded by the culling practices, but dispersal also.

One wonders what is meant by the term “dispersal sink.” Plumb equates culling with “periodic brucellosis risk-management (i.e., dispersal sink).”

In ecology literature, a “dispersal sink” is defined as any habitat in which, in the absence of immigration, the resident population is expected to decline to extinction because local births are insufficient to compensate for local deaths. Dispersal sinks are assumed to occur in suboptimal habitat, whereas “source” populations from which immigrants derive, that is, those populations where births are greater than deaths, are assumed to occur in optimal habitat (Clinchy, 2001).

Or simply put, as defined by Frank B. Golley et al. in *Small Mammals: Their Productivity and Population Dynamics:*

> Space which provides an outlet for wandering impulses is termed a “dispersal sink” (Golley, 1975).

Recall the quote from the White review that started this discussion, the one that ended with the Plumb, 2009 citation, namely:

> Yellowstone bison will continue to migrate into Montana during winter, with higher numbers migrating as bison abundance and winter severity increase (Geremia et al., 2011). Without human intervention, some bison will not migrate back into Yellowstone National Park during spring, but will attempt to expand their range into suitable habitat areas in Montana (Plumb et al., 2009) (White, 2010).

A search of the Plumb article, however, does not mention anything about the bison “not migrating” back in the spring, but it does mention a simulation representing a dispersal sink from which some bison would leave the “higher-elevation park landscape and not return.” The simulation discussed is what would be predicted to happen if 45 percent of the migratory herd were culled. Plumb writes:

> In simulations that represented a brucellosis risk management induced off-take of 45% of bison leaving the park, the northern herd fluctuated between 200 and 400 animals and the

> central herd fluctuated between 1700 and 2500 animals. This simulation can be thought of as representing a dispersal sink, wherein some bison would normally leave the higher elevation park landscape and not return.

Plumb continues, noting that:

> Dispersal movements and sinks are common in wildlife populations and should be expected in nomadic, wide-ranging species such as bison.

Culling is thus equated with a "dispersal sink," supposedly a normal event that "should be expected in nomadic, wide-ranging species such as bison." Plumb continues:

> Intermittent brucellosis risk-management removals at the park boundary, combined with over-winter natural mortality, of >1000 bison in 1997, 2006, and 2008 temporarily reduced the density of bison and likely diminished the magnitude of density dependent effects on demography and movements. Conversely, in the absence of hunting or brucellosis risk management removals, hazing bison back into the park likely maintained the density dependent effects of exploitative competition (Gates et al., 2005), and increased retention of learned movement behaviors that otherwise would be lost in a management-induced ''dispersal sink."

Of special importance is the statement that "hazing bison back into the park likely maintained the density dependent effects of exploitative competition (Gates et al., 2005), and increased retention of learned movement behaviors that otherwise would be lost in a management-induced 'dispersal sink.'"

The Gates et al, 2005 citation mentioned by Plumb is contained in *The Ecology of Bison Movements and Distribution in and Beyond Yellowstone National Park.* Gates states:

> Under the Interagency Bison Management Plan, state and federal agency officials either haze bison that leave YNP back into the park, or bison are captured and tested for brucellosis and those testing positive are slaughtered. Removals at the boundary temporarily reduce the density of the park population, diminishing the magnitude of density dependent effects on survival and reproduction from resource limitation within the park bison ranges. Either range expansion or removals at the boundaries compensate for forage limitation effects within the park on fecundity and particularly juvenile survivorship. Hazing bison back into the park should result in maintaining density dependent effects caused by exploitative competition. The additional energetic cost induced by hazing should accentuate the negative effects of resource limitation for bison exposed to this action.

Notice that Gates' statement concerning the effects of "hazing bison back into the park" is followed by noting a negative outcome:

> The additional energetic cost induced by hazing should accentuate the negative effects of resource limitation for bison exposed to this action.

On the other hand, the Plumb passage notes a positive outcome as the result of "hazing bison back into the park," namely,

> . . . increased retention of learned movement behaviors that otherwise would be lost in a management-induced ''dispersal sink."

Since bison are not hazed back in the winter (for the simple reason they will not return to an environment they tried to escape via dispersal), the hazing mentioned must be those that survived lethal removals or those that migrated down in the late winter or early spring months. What we do know about them is that they are the ones that "otherwise would be lost in a management-induced 'dispersal sink'" and that, because they had not been lost, had "increased retention of learned movement behaviors," most likely referring to their knowledge of migration routes out of the park.

Plumb elaborates on the merits of a "dispersal sink":

> In natural populations, animals often disperse to marginal habitats in response to food competition and nutritional stress in core, high quality habitats. Thus, the dispersal area acts as a population sink (Owen-Smith, 1983; Coughenour, 2008). In a situation like YNP, these movements are a natural process resulting from successful conservation and population increases inside the park. Though potential bison habitats adjacent to YNP should not be considered marginal, lethal brucellosis risk management in these areas can serve as a surrogate for the dispersal sink that would otherwise be an expected part of natural ecosystem processes.

So these dispersal sinks are just a substitute for marginal habitats. But wait a minute. How can this type of a dispersal sink be a good thing for bison when those that are not hazed back, those that enter it, are lost along with their "learned movement behaviors," lost in the IBMP's "management-induced 'dispersal sink.'"?

Plumb's passage that reasoned that "increased retention of learned movement behaviors that otherwise would be lost in a management-induced 'dispersal sink'," was immediately followed by this non sequitur:

> Without this intensive management intervention, there is little doubt that bison would have continued to expand their winter range and dispersed to suitable habitat outside the northern and western boundaries of the park (p. 2384).

That statement, combined with the Plumb statement quoted previously, namely:

> This simulation can be thought of as representing a dispersal sink, wherein some bison would normally leave the higher-elevation park landscape and not return (p. 2383),

most likely provided the synthetic support for the following statement by White upon which the artifice of the IBMP and the NPS's justification for lethal removal of bison rests:

> Without human intervention, some bison will not migrate back into Yellowstone National Park during spring, but will attempt to expand their range into suitable habitat areas in Montana (White, 2010).

The statement that bison "will not migrate back" is built on the statement describing a computer-generated model that shows some bison entering marginal habitat called a dispersal sink will "not return." This is true, because they have entered a dispersal sink of a special type, one that involves "periodic brucellosis risk-management (i.e., dispersal sink)," also termed a "management-induced 'dispersal sink,'" that is, the Stephens Creek capture facility.

Except for the few that are vaccinated and released in the spring, they do not return or migrate back because from the capture facility there is no return—they are dead, slaughtered by the IBMP.

Recall the statement providing the rationale for slaughtering 900 bison this winter:

> Biologists from the National Park Service (NPS) have proposed removing 900 bison near the northern boundary this winter to reduce population growth and the potential for a mass migration of bison into Montana.

That statement is based on the kind of thinking delineated above. What the NPS is warning us about and what we must protect the state of Montana from, in actuality, is a mathematically-simulated mass invasion of wild bison ghosts.

In keeping with this warning of impending bison doom and as background music for this cinematic-quality fantastical thinking, let us now play Darth Vader's Imperial Death March.

We have been sold a pack of lies. In other studies, recall we have been told that bison are most likely to return in the spring to take advantage of spring grasses with higher nutritional value in the higher elevations. We have also been told they most likely would return by themselves without hazing, but since they have never been allowed to follow this instinct because of annual spring hazing by the IBMP, we do not have the data to support that likelihood. And we have also been told that culling does not necessarily improve fecundity. It removes disproportionally younger females and calves. To imply, as does the National Park Service in its apparent reliance on such studies as the Plumb study, that the IBMP is Mother Nature herself, and that on top of that we need the management actions of the IBMP to protect the state of Montana from a mass bison migratory invasion, is using science to mislead.

It is intuitively obvious that culling is not natural and to try to pawn off on the pubic that it is natural is an example of scientific hubris. Dispersal sinks lead to extinction within the dispersal area when there are fewer births than deaths and when no immigration from outside makes up for the losses. Plumb identified IBMP's brucellosis control management, i.e., lethal removal, with a dispersal sink. When a spatial area is emptied routinely by killing its inhabitants, such a dispersal sink guarantees extinction of its occupants, for dead bison cannot multiply.

Douglas W. Morris, professor of evolutionary and conservation ecology at Lakehead University, writing in the American Naturalist "On the evolutionary stability of dispersal to sink habitats," argues that a dispersal sink without migration back to the source (in the case at hand, YNP), is not evolutionarily stable. He states:

> A recurring theme in the literature of population regulation is that surplus reproduction in high-quality “source” habitats is exported to low-quality “sink” habitats. Two recent innovative papers by Pulliam (1988) and Pulliam and Danielson (1991) have shown that equilibrium densities in both kinds of habitats can be maintained by an evolutionary stable strategy (ESS) of habitat selection. Yet the basic idea that populations exist indefinitely in habitats in which mortality exceeds recruitment seems counter to other evolutionary models that argue convincingly for habitat specialization. I show that emigration to sink habitats is likely to be an ESS only if there is reverse migration back to the source (Morris, 1991).

Neither dead bison, nor their ghosts, can migrate back or return to the park, nor expand their range, except in a computer simulation. Yellowstone National Park is not, however, a Nintendo game, although some biologists studying the park are treating it as such.

The point is this: while computer simulations of wildlife behavior have their place, with regard to making studies on migratory behavior of something as complex and controversial as wild bison migratory movements, field biologists should also be conducting the studies. And this means allowing the bison to migrate outside the park so that their migratory behavior can be examined in real life, not simulated life.

If one looks at past field studies and records, the fears expressed by the National Park Service that wild bison will invade the state of Montana if allowed to migrate is unfounded. According to the Plumb review, the map below shows the extent of the range of the wild bison presently and historically. A similar map is depicted in the White review.

Notice that even if wild bison expanded their range to its historical limits it would only occupy portions of the Madison Valley and Paradise Valley, a range expansion amounting to a small part of the entire state of Montana. The present distribution of wild bison is indicated by the dark shaded areas. The regions being subjected to lethal removal are those relatively small areas extending just beyond the borders of the park as well as small portions within the park (Zone 1). Since the Madison River exit is essentially blocked at Hebgen Dam due to terrain, the dam and high winter snows, and since the Yankee Jim Canyon exit is blocked by fencing and a cattle guard, migration beyond these regions is unlikely.

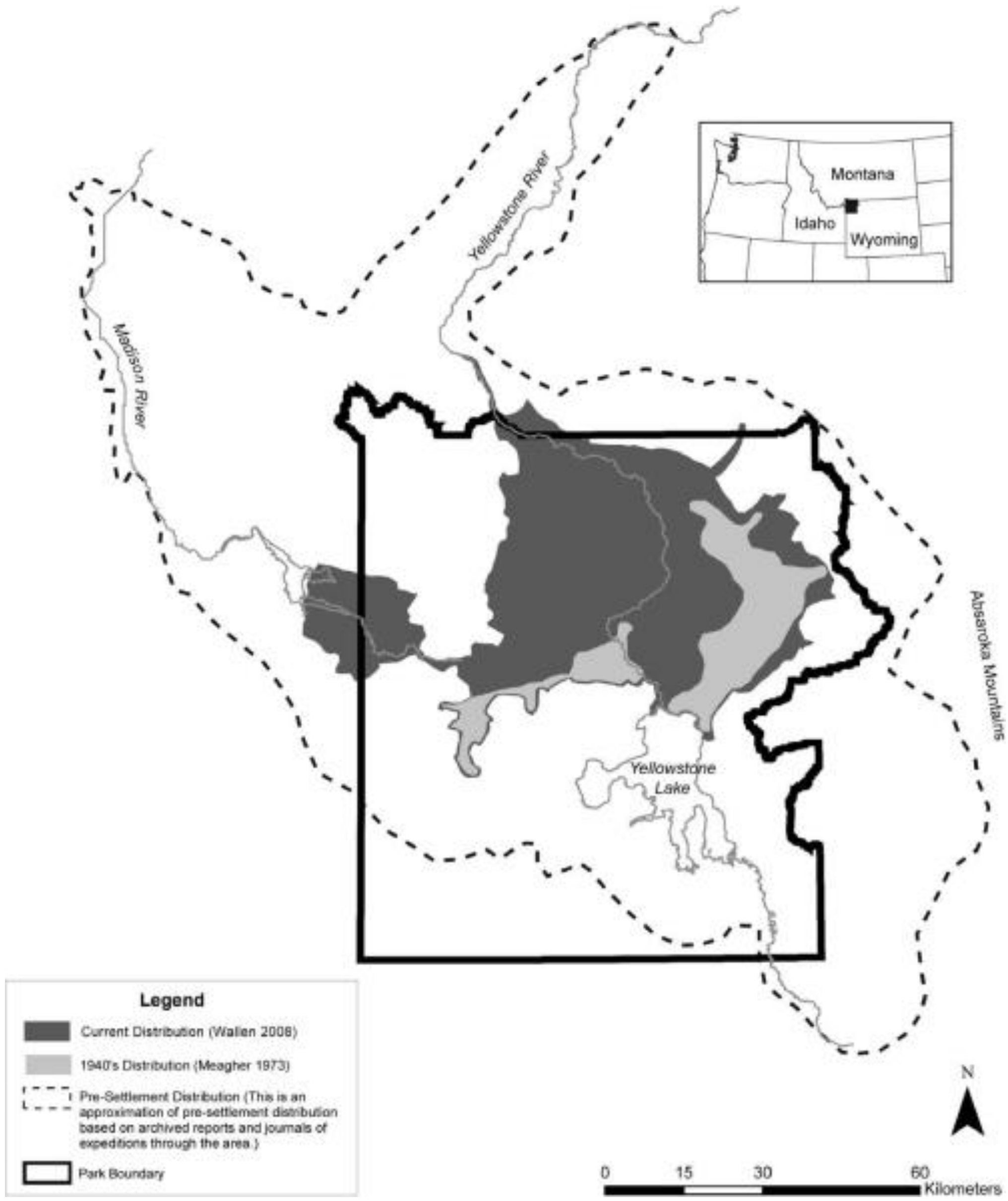


**Figure 42. BISON DISTRIBUTION NOW AND THEN. Map depicting Yellowstone National Park and the pre-settlement, mid-20$^{th}$ century, and current distribution of Yellowstone bison.** ***From Plumb, 2009.***

The most plausible reason for this limitation of range expansion historically is due to energy expenditures by bison as they seasonally travel from the high elevation areas of the park in winter down to the lower elevations. If they were to travel further distances than the range boundary indicated by the dotted line, the amount of energy expended to get back to the high elevations of the park would most likely be too costly.

To better understand such migratory returns and why extensive range expansion is not likely by wild bison in Yellowstone, nor a Montana bison invasion, think like a buffalo. If your favorite restaurant was up in the mountains and it was opening up in the spring, why go the opposite way to a greasy hamburger joint on the plains? As the snows melt, the upper elevations begin to green with the bison's favorite sedges, forbs and grasses, and off they go. For these Yellowstone bison, being "snowbirds" has been a family tradition for millennia. But they come back when the weather gets good.

A similar range limitation caused by altitudinal migration movements apparently is in operation for the European bison or wisent of the Caucasus Mountains, but more on this later.

Once the rationale for culling had been established, the number to be culled had to be determined and supported by the members of the IBMP.

**The magic number of 3,000**

Recall that in the justification to cull 900 bison, the National Park Service stated in its "Frequently Asked Questions: Bison Management" that:

> In 2000, the Secretaries of Agriculture and Interior and the Governor of Montana signed a court-mediated agreement that included guidelines to limit bison abundance near 3,000.

Since the signing of this agreement, biologists have been trying to justify this number as sufficient to maintain genetic diversity. You see, it would be helpful for the slaughter apologists to have their wild bison population cut-off legal agreement agree with science.

Writing in 2009, Plumb noted that to maintain genetic diversity of the park's wild bison a population of 2,500 bison would be needed. The importance of wild bison, the need to preserve their wild traits and what is needed to do so is eloquently stated:

> Freese et al. (2007) documented that the North American bison is ecologically extinct across its former range and, along with Sanderson et al. (2008), called for urgent measures to conserve the remaining wild and free-ranging bison, and restore the species as wildlife in focal areas across its historic range. Conservation of the migratory and nomadic tendencies of bison, as well as their genetic integrity and ecological role, is paramount for the perpetuation of the species. Yellowstone bison can be characterized as a single population with two genetically distinguishable breeding groups or subpopulations (Halbert, 2003; Gardipee, 2007). Analyses estimate that 1000–2000 bison likely are needed in each of the central and northern breeding herds to retain enough genetic diversity to enable bison to adapt to a changing environment through natural selection, drift, and mutation (Gross and Wang, 2005; Gross et al., 2006; Freese et al., 2007). Also, many thousands of bison are likely necessary to fully express their ecological role through the creation of landscape heterozygosity, nutrient redistribution, competition with other ungulates, prey for carnivores, habitat creation for grassland birds and other species, provision of carcasses for scavengers, stimulation of primary production, and opened access to vegetation through snow cover (Freese et al., 2007; Sanderson et al., 2008). Thus, while the IBMP initially indicated that 2100 bison would satisfy conservation values (US Department of Interior, 2000a,b), strong scientific and management support has developed for managing the Yellowstone population above a minimum conservation target of 2500 bison.

Writing in 2011, White noted that to maintain genetic diversity and the adaptive capabilities of the park's wild bison a population of more than 3,000 bison would be needed. He stated:

> Until the late 1970s, bison persisted at relatively low numbers (less than 1500 total) and generally remained isolated in interior park valleys by deep snows (Meagher, 1998). However, recent demographic and genetic analyses suggest that an average of more than 3000 bison total on a decadal scale is likely needed to maintain a demographically robust and resilient population that retains its adaptive capabilities with relatively high genetic diversity (Gross et al., 2006; Freese et al., 2007; Plumb et al., 2009; Pérez-Figueroa et al., 2010).

The three studies they cite to support their claims for the appropriate population levels to maintain genetic diversity and adaptive capabilities are:

1. Gross, J.E., Wang, G., Halbert, N.D., Gogan, P.A., Derr, J.N., Templeton, J.W., 2006. Effects of Population Control Strategies on Retention of Genetic Diversity in National Park Service Bison (Bison bison) Herds. United States Geological Survey, Biological Resources.

2. Freese, C.H., Aune, K.E., Boyd, D.P., Derr, J.N., Forrest, S.C., Gates, C.C., Gogan, P.J.P., Grassel, S.M., Halbert, N.D., Kunkel, K., Redford, K.H., 2007. Second chance for the plains bison. Biological Conservation 136, 175–184.

3. Pérez-Figueroa, A., Wallen, R., Antao, T., Coombs, J.A., Schwartz, M.K., Allendorf, F.W., Luikart, G., White, P.J., 2010. Conserving Genetic Variation in Large Mammals: Effect of Population Fluctuations and Male Reproductive Success on Genetic Variation in Yellowstone Bison. University of Montana, Missoula, Montana.

Following is a summary of the findings of each study and the methods employed to reach each finding. A major concept to understand is the term heterozygosity. High heterozygosity means lots of genetic variability. Low heterozygosity means little genetic variability. Genes often come in different versions, which are called alleles. These DNA codings determine distinct traits that can be passed on from parents to offspring. Genetic diversity has been defined as the variety of alleles and genotypes present in a population and this is reflected in the structural, functional and behavioral differences between individuals and populations.

**Study 1**

The Gross 2005 study concluded:

> A moderate bison population size—about 1000 animals—is necessary to meet a long-term goal of achieving a 90% probability of retaining 90% of allelic diversity for 200 years.

Methods used were computer simulations of herds. Gross noted:

> We simulated the dynamics of bison herds inhabiting National Park Service (NPS) units to evaluate the consequences of management actions on retention of genetic diversity. We used an individual-based model to evaluate the effects of management strategies on the retention of genetic heterozygosity (H0), retention of alleles, and on herd sex and age structure. To identify general recommendations that could be applied across conditions typical of captive bison herds, we estimated vital rates of herds occupying harsh, average, or good ranges, and we used these vital rates to drive simulations with herd size targets of 200 to 2000 animals. Simulations were initialized with data from observations of microsatellite allele frequencies obtained from NPS bison herds (Halbert 2003).

The study evaluated removals according to the following groups:

> We examined the effects of removal of bison that were young, old, or a random selection of ages, and removals that contained a high proportion of cow-calf groups (24% or 50% of animals removed) (Gross, 2006).

**Study 2**

The Freese 2007 study is a review of other studies. It concluded:

> Gross and Wang (2005) estimate that to retain 90% of existing alleles over 200 years an actual population size of 1000 bison is required. However, to meet the need for bison to adapt to new areas where they are reintroduced and to adapt to large current (e.g., exotic diseases) and future (e.g., climate change) alterations in their habitats, as well as for the intrinsic value of conserving genetic diversity, a more prudent goal would be retention of at least 95% of allelic diversity over 200 years. Their analysis suggests a herd size of at least 2000 animals is required to meet this goal.

It stressed the importance of the preservation of wild bison genes and behavior:

> Urgent measures are needed to conserve the wild bison genome and to restore the ecological role of bison in grassland ecosystems (Freese, 2007).

**Study 3**

The Pérez-Figueroa 2010 study involves “stochastic simulation modeling” to “investigate strategies to conserve genetic variation for nearly any species or population with age structure and complex demography, as illustrated here for bison.” A stochastic system is one whose state is non-deterministic, that is “random,” and in such a system the subsequent state of the system is determined probabilistically. Used here, simulation modeling can provide an estimate of a population’s level of genetic diversity.

In the simulation model:

> Culling was random among all age classes or random within the age groups culled (e.g., among juveniles less than 3 years old or adults greater than 3 years old). Individuals were culled until the target population size (2500 or 3000) was reached.

According to Perez-Figueroa the Yellowstone bison are unique:

> Yellowstone is the only remaining wild population of plains bison that currently meets the objective of maintaining a large population size with greater than 2000 individuals. Most North American populations have fewer than 400 bison because this species requires large conservation areas and modern society currently provides little space for wild bison outside nature preserves and national parks.

The study concludes by saying the genetic diversity can be maintained with about 3,250 bison:

> These simulations suggest that fluctuations in population census size do not necessarily accelerate the loss of genetic variation, at least for the relatively large census size and growing populations such as in Yellowstone bison. They also suggest that the conservation of high allelic diversity (>95%) at loci with many alleles (e.g., P5) will require maintenance of a population size greater than approximately 3250 and removal of mainly or only juveniles (Perez-Figueroa, 2012 [2010]).

It is interesting that with each subsequent study, the bottom line for a population size that must be maintained to assure genetic diversity in the future gets higher and higher.

It is also interesting to note that removal of mainly juveniles is what the wolf does in its relationship with bison or other prey.

**Studies must reflect reality to be useful**

While these studies are interesting and make several valuable points, with regard to the population size needed to preserve the genetic diversity of the wild bison in Yellowstone, they are useless as a guide for the genetic and behavioral conservation of the herd. In the simulation models cited, all culling scenarios are on a *random* basis. The culling at Yellowstone National Park, however, is not random but deterministic, selecting out bison for lethal removal only those bison that are exercising their migratory instincts. No population level of wild bison in the park will assure the preservation of genetic diversity if the IBMP's policy of artificially selecting out only migratory animals continues.

These studies and the propaganda resulting from them have created a false sense of complacency with the status quo. As pointed out throughout this petition, if the trajectory of these studies continues to be followed, it will inevitably lead to the genomic extinction of the Yellowstone wild bison. In reality, wild bison are going down the dispersal sink of the Stephens Creek capture facility and other such facilities and we will not get them back. And no one knows, including any biologist, how much has already been lost nor what genetic strengths have been forever destroyed.

**Reality check needed**
If Yellowstone biologists are interested in simulating what is actually going on at YNP, why not consult Vishwesha Guttal and Iain D. Couzin, Department of Ecology and Evolutionary Biology, Princeton University. In their study titled "Leadership, collective motion and the evolution of migratory strategies," they discuss results and insights from a recent computational model developed to "investigate the evolution of leadership and collective motion in migratory populations" based on evolutionary biology.

Guttal and Couzin write:

> Our entire biosphere is under severe threat due to increasing anthropogenic influences, and as a consequence many migrations around the world are at risk. Our computational and evolutionary approach may offer potentially useful insights into the influence of human activities such as hunting or habitat fragmentation on animal migration.

Preventing bison from migrating into regions such as the Gardiner Basin, the Hebgen region and other environs of the Madison and Yellowstone Rivers is habitat fragmentation. Wild bison are not only prevented from entering critical habitat, but killed upon doing so. Eventually this can lead to the "collapse of migration." They write:

> . . . genetically coded migratory behavior can undergo rapid changes on relatively short ecological time scales such as decades, as seen in wild populations of blackcaps [a grey warbler with a black head cap]. In such scenarios, where environmental deterioration and evolutionary processes occur over comparable time scales, our model predicts that [the] number of leaders in the population reduces to zero leading to a collapse of migration.
>
> Changes in migratory patterns have been recorded in many natural populations; for example, migration has disappeared in bison (Bison bison) of North America and wildebeest of the Kalahari. Wildebeest in the Serengeti may face a similar fate due to a proposed road that bisects the national park in Tanzania. Our model predicts a potentially bleak future for such migrants; it suggests that it may be extremely difficult to recover lost migrations. This is because leader mutants are not as favorable, and occur infrequently, in highly fragmented habitats. Much greater habitat restoration is required to recover such lost migration (in the parlance of physical sciences, this is known as the hysteresis effect).

Hysteresis is the lagging of an effect behind its cause, as when the change in magnetism of a body lags behind changes in the magnetic field. In other words, the effects of hindering migration can develop later and result in problematic restoration.

Migratory behavior is characterized by going in one direction en masse toward a habitat. The authors explain:

> A key feature that characterizes migratory individuals is relatively long-term directionality of motion to reach habitats that offer safety from predation, better grazing grounds, and/or enhanced opportunities for breeding. This process is often facilitated by individuals sensing and following directional cues from the environment.

Migration is achieved by animals interacting with one another to achieve a correct direction:

> In addition to responding to environmental cues, migratory organisms may interact socially with one another. In some cases social interactions during migration result in the formation of very large mobile groups, the mass migration of wildebeest of the Serengeti being an iconic example. Previous mathematical models have shown that although each individual may, itself, be error prone in determining correctly the direction in which to move, combining information with others (through relatively simple local interactions such as a tendency to align direction of travel with near neighbors) reduces this noise, facilitating effective information transfer about resources and migratory routes over large spatial scales.

Summing up their methodology, they state:

> In summary, we present a novel approach to the study of leadership, collective motion and migration by looking at plausible origins of these processes. We show how simple trade-offs between individuality (i.e., leadership) and collectivity, result in a wide range of migratory strategies, including resident populations, solitary migrants and those who migrate collectively. Among these, collective migration occurs over a very wide range of ecological assumptions, and within such populations there typically exist a relatively small proportion of leaders who can sense and follow environmental cues, and a majority who migrate by following social cues.
>
> Our model predictions could provide potentially useful insights into conservation and management of migratory species. That leaders are often relatively few in number could mean that collective migrations may be prone to sudden, and practically irreversible, collapse in the event of leader populations undergoing extinction due to inherent fluctuations, habitat fragmentation, disease or through harvesting by humans.

The authors note that indigenous Arctic caribou hunters do not harvest the herd leaders, but instead take those in the middle, serving as an example of the need to preserve leaders to conserve migratory populations. They state:

> It is worth noting that indigenous peoples in the Canadian Arctic hold the belief that migratory caribou herds have few leaders. Furthermore, their traditional hunting practices allow the migratory front to pass before beginning the hunt and then they take those from the middle of the herds since this is considered to reduce chances of eliminating leaders, and thus of disrupting migratory routes. In light of our model predictions, a rigorous scientific test of this traditional knowledge may aid in designing sound management practices for preserving populations of caribou herds, and to limit their hunting to within sustainable levels. More generally, our work highlights that an approach that considers both proximate and ultimate factors will be crucial for developing strategies for long term conservation of migratory populations (Guttala, 2011).

Before it is too late and before the genetic and behavioral components of the migratory response of Yellowstone's bison are lost, it would appear to be prudent to have these biologists examine the potential outcome of IBMP's continued lethal control of Yellowstone's wild bison.

**Station keeping**

No one knows where we are in the historical timeline that has been transpiring in the destruction of the migratory instinct of the park's wild bison. At some point they will remain wild no longer, but simply obey the human-instilled response of station-keeping at all times, instead of migration, for it is the station keeper that survives now in Yellowstone National Park.

Migration is the opposite of staying put. It may sound simplistic to say that, but the mechanisms releasing the expression of migration are complex, not well understood and under genetic control. Biologists call the converse of migration "station keeping."

Hugh Dingle in *The Biology of Life on the Move*, has a good discussion about station keeping. An understanding of that term will help us understand migration. He wrote:

> Activities and movements that keep an organism in a home range have been called *station keeping*, and this seems a useful term to include a number of behaviors that can also be described as "here and now" movements. These include an array of interactions with both biotic and abiotic environmental inputs, all of which can be characterized as "vegetative functions," a term used by J.S. Kennedy for activities that proximately exploit resources to promote growth and reproduction, in contrast to migration when growth and reproduction are temporarily suspended. These resources include not only food but also shelter, mates, nest sites, landmarks, enemy free space, microclimate and any other requirements of maintenance and survival of one's self and offspring. These are usually incorporated within the home range, but on occasion resource acquisition may require considerable forays with subsequent return to the home range (station) as with *commuting*. A salient feature of station keeping is that movements cease when a resource is located. A predator stops hunting when it kills its prey, a female cockatoo stops searching when it finds a suitable nest cavity in a tree, and a male moth stops flying and orienting to female sex pheromones when it locates a mate. As we shall see, cessation of movement in the presence of suitable resource is not characteristic of migration (Dingle, 2014, p. 4).

On the other hand, Dingle noted that:

> Migration is different. It involves suppression and thus postponement of responses to resources; this facilitates travel to different habitats before response to resources again become evident. Migrants leave habitats when resources are deteriorating or their availability is otherwise reduced to colonize or take refuge in habitats where resources are available at least for maintenance. This relationship to resources drives the behavioral and life-history characteristic of migration (p. 13).

One can look at migration as the inhibition of the urge to stay put. In Dingle and V. Alistair Drake's essay "What Is Migration?" they state that migration can be viewed as an adaptation to changes in habitat quality in different regions at different times so that movement allows a succession of temporary resources to be exploited as they arise. They note:

> It thus involves both escape and colonization.

Survival as an animal passes through the various habitats to its final destination is critical, for it allows for adaptation via natural selection.

> At a minimum, a habitat must enable survival; better quality habitats will allow development, physiological sequestering of resources, and breeding. Individuals unable to locate a sequence of such habitats will fail to produce offspring. The members of a migrant population are therefore directly subject to natural selection by the arena through which they travel (Dingle, 2007).

In the case of wild bison, it is not natural selection that is at play, but instead artificial selection by the lethal actions of the IBMP. But regardless of whether it is natural or artificial selection, selection is going on. What is being selected? By default, what has been left behind. If one picks up all the red marbles in a bowl of red and blue marbles, one has a bowl of blue marbles only. But let us say that all the red marbles are also oblong. By selecting out the red marbles, one has also taken out the oblong marbles. Such may be the case in principle with wild bison. By eliminating migratory wild bison, not only the migratory impulse, but most likely whatever traits are associated with migratory behavior have been eliminated also.

When escape is not allowed, there is no colonization. A habitat that cannot be occupied—such as the Gardiner Basin, because the wild bison seeking to occupy it via migration are killed before they get there—is an arena where those migrating fail to produce offspring. Animals that fail to produce offspring fail to pass on their migratory genes. This has the potential for profound genetic and behavioral consequences.

A 2011 study of the Blackcap warbler titled "Identification of a gene associated with avian migratory behaviour," headed by Jakob C. Mueller, Department of Behavioral Ecology and Evolutionary Genetics, Max Planck Institute of Ornithology, noted that:

> Personality traits have also been discussed in the context of variation in migratory behaviour. For example, it has been suggested that initiation of migration behaviour and migration distance are related to individual competitive ability or dominance, which in turn may be linked to aggression and anxiety-related behaviour. Furthermore, migratory and non-migratory birds may differ in exploratory behaviour.

His team noted that:

> High genetic correlations among incidence, amount, intensity and timing of migratory activity in blackcaps suggest that these components of migratory behaviour are influenced by common genetic mechanisms. As a consequence, we would expect that phenotypic variation of correlated migratory traits is linked to genetic variation at a single closely linked gene cluster or a few 'regulatory genes' with multiple pleiotropic effects.

Pleiotropy occurs when one gene influences multiple, seemingly unrelated phenotypic traits. An example is phenylketonuria (PKU), a human disease caused by one gene defect that affects multiple systems (whereby protein-rich foods, or the sweetener aspartame, act as poisons to people with the disease). Consequently, a mutation in a pleiotropic gene may have an effect on some or all traits simultaneously.

What gene could be affecting migratory behavior? Tests indicate that the ADCYAP1 gene, which is involved in stress responses, is "associated with high migratory activity in blackcaps, either measured as migratory restlessness of individuals in the laboratory or assessed as the proportion of migrants and migration distance in natural populations." They conclude that:

> The consistency of results among different populations and levels of analysis suggests that ADCYAP1 is one of the genes controlling the expression of migratory behaviour. Moreover, the multiple described functions of the gene product indicate that this gene might act at multiple levels modifying the shift between migratory and non-migratory states (Mueller, 2011).

What can we learn from these findings regarding the migratory wild bison? When a system, a habitat, is altered either naturally or artificially, the inter-connectivity of life with its environment can have an avalanche of effects. Putting invasive trout into a system can cause the system to collapse. Such tinkering with the environment can also have genetic effects downstream. Apparently the trophic cascade operates molecularly, also.

As noted previously, the word trophic comes from the Greek meaning nourishment, specifically, trophikos, from trophe food, from trephein to feed. Thus a trophic cascade in ecology would be a sequence of events stemming from nutrition, i.e., wolves eating elk, fewer elk eating willows, resulting in more willows. Trophic also applies to the molecular level, as in the sense of relating to maintenance or regulation of a bodily organ or function, especially by a hormone, such as in "gonadotrophic," any of a group of hormones secreted by the pituitary that stimulate the activity of the gonads. The basic sense here is something that stimulates. Thus, trophic cascade loosely could be construed as the causative effect of a gene on multiple phenotypes, that is, the set of observable characteristics of an individual resulting from the interaction of its genotype with the environment.

When one plays with something as significant as migratory genes, one is potentially playing with a cascade of genetic modifications. What might they be?

Let us look specifically at the actions of the IBMP. By killing the aggressive and adventuresome members of the wild bison herds, that is, the migratory herd, one is selecting in favor of the more docile and tame. The problem with this is that the selection going on vis-à-vis the IBMP is not natural selection, but artificial selection, and the trouble with that in a wilderness community is that the evolving traits are not adaptive to the environment.

In such an instance, survival of the fittest is not allowed to operate. The result can be less fit animals and the result of that is reduced survival, especially in the case of a changed environment, such as a severe winter. By weeding out that trait, the mechanisms that normally are put into play would no longer be operating, meaning reduced survival of wild bison. Given a severe enough change in the environment, it could cascade into the collapse of the entire wild herd.

**Domestication syndrome**

Charles Darwin noticed that in addition to domestic species being more tame than their wild ancestors, they also tended to have a number of physical features in common. These characteristics often included floppy ears, patches of white fur, curly tails and more juvenile faces with smaller jaws. They have been termed the "domestication syndrome." But how could selecting for tameness cause changes in such diverse traits?

It is interesting to note that not only do animals migrate, but their cells do also. The migratory impulse pervades the biosphere. It thus must be fundamentally important to life. Remarkably similar to the macro-migratory movement of animals such as bison and elk is the micro-migratory movement of embryonic cells called the neural crest cells, which form in the region of the developing embryonic spine. This population of cells collectively leaves its original territory and migrates throughout the embryo to colonize a myriad of tissues and organs where they settle and differentiate into various tissue types. Just as migratory animals pick up cues from one another as they head out in their migratory journey, the social interaction of cells leads to cell cooperation, eventually generating an overall polarity to the population, leading to directional collective cell migration (Theveneau, 2012).

The underlying cause of the features attributed to the "domestication syndrome" could be the group of embryonic stem cells called the neural crest, suggests Adam Wilkins, from the Humboldt University of Berlin, in a paper titled "The 'Domestication Syndrome' in Mammals: A Unified Explanation Based on Neural Crest Cell Behavior and Genetics," published in *Genetics.*

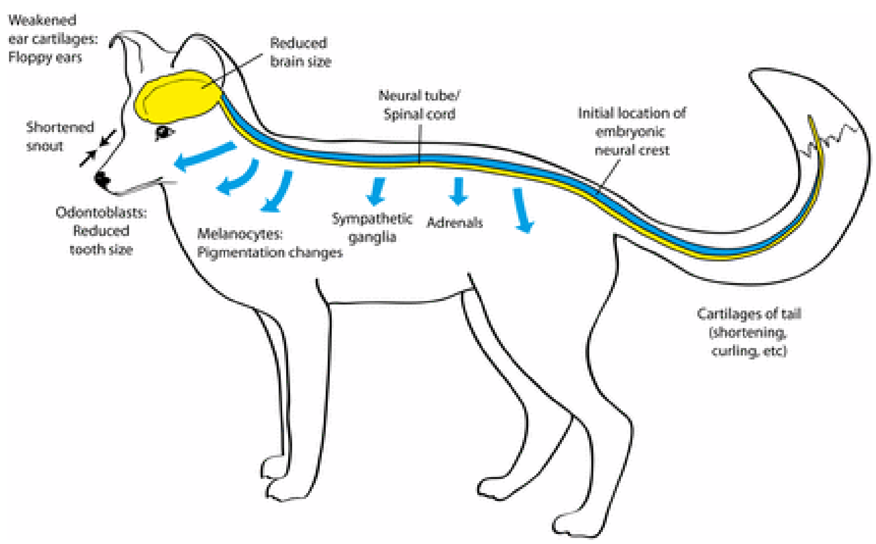


**Figure 43. DOMESTICATION SYNDROME in dogs, livestock and other tame animals is thought to be caused by defective neural crest cells migrating down the spine during embryonic development. The blue tube indicates the approximate position of the neural crest in the early embryo and the blue arrows indicate pathways of neural crest cell migration *(Wilkins, 2014)*.**

Neural crest cells give rise to such tissues as pigment cells and parts of the skull, jaws, teeth and ears—as well as the adrenal glands, which are the center of the "fight-or-flight" response. Neural crest cells also indirectly affect brain development. ScienceDaily reported the findings in "Domestication syndrome: White patches, baby faces and tameness explained by mild neural crest deficits:"

> In the hypothesis proposed by Wilkins and co-authors Richard Wrangham of Harvard University and Tecumseh Fitch of the University of Vienna, domesticated mammals may show impaired development or migration of neural crest cells compared to their wild ancestors.
>
> "When humans bred these animals for tameness, they may have inadvertently selected those with mild neural crest deficits, resulting in smaller or slow-maturing adrenal glands," Wilkins says. "So, these animals were less fearful."
>
> But the neural crest influences more than adrenal glands. Among other effects, neural crest deficits can cause depigmentation in some areas of skin (e.g. white patches), malformed ear cartilage, tooth anomalies, and jaw development changes, all of which are seen in the domestication syndrome. The authors also suggest that the reduced forebrain size of most domestic mammals could be an indirect effect of neural crest changes, because a chemical signal sent by these cells is critical for proper brain development (Genetics Society of America, 2014).

When Yellowstone National Park becomes inhabited by bison that look like the animal pictured below, a stupid, floppy-eared, juvenile-faced, small-jawed, curly-tailed animal with white patches, members of the IBMP may scratch their heads and say to themselves, "maybe we have gone too far."

Maybe.

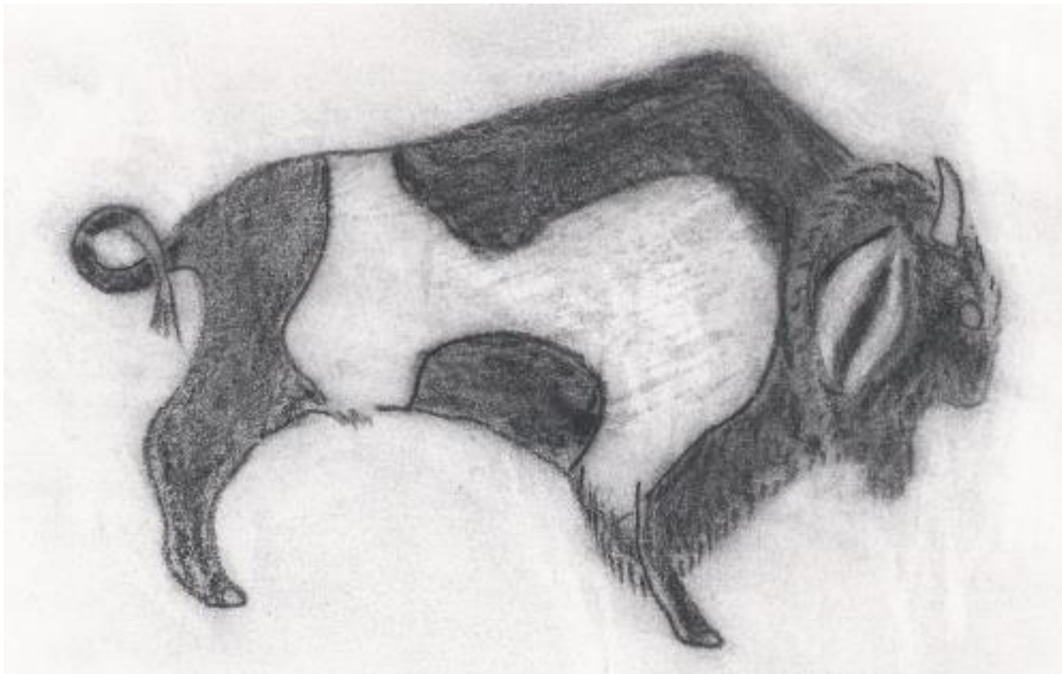

**Figure 44. "DOMESTICATION SYNDROME" OF YELLOWSTONE BISON may be the genetic outcome of the IBMP's policy of lethal removal of only those bison that express the migratory instinct. Selection for docility and tameness can result in a shorter snout, smaller jaws, white patches, floppy ears and a curly tail.** ***Image released to the public domain by its author James Horsley.***

**The central controversy**

At the center of this controversy regarding wild bison is the free movement of this native ungulate. They must respect property boundaries or off with their heads. Even public land is out of bounds because that public land is being used for livestock. Key to the Montana DOL's management plan for keeping the wild bison off public and private land used by cattle in this ecosystem is to erase their instinct to migrate. Its stated objective is to lethally remove from this wild species those animals expressing the philopatric instinct to migrate.

"It's a no-second-chances plan, so there's no herd memory of getting out," Christian Mackay, executive director of the Montana DOL, said in 2011 concerning a proposal to keep bison from migrating beyond Yankee Jim Canyon in the Gardiner Basin (Flandro, 2011).

As mentioned, by targeting and killing only bison attempting to leave the park to survive, the interagency group is using methods of artificial selection to control their unwanted behavior. This is having and will increasingly have deleterious repercussions. Such methods inevitably will lead to the domestication of these wild animals by eliminating those with the instinct to migrate.

Whether wild bison end up looking different or still the same, they will have lost the instinct that enabled them to survive in the wild and that led them from the Old World to this continent in the first place. With the loss or impairment of that instinct, they will be wild no longer.

Since migratory behavior is a complex of traits such as aggressiveness, learned behavior and a sense of fear, these traits will be weeded out also. With the loss of these characteristics, this nation will also lose an important connection with prehistoric man, for it was in concert with these animals that the first human inhabitants populated this continent 10 millennia ago.

**An impossible mission**

When a group of people, such as those participating in carrying out the goals of the IBMP, attempt to carry out a plan that is impossible to carry out, we have a problem. The stated goals of the IBMP are to:

- Maintain a wild, free-ranging bison population;
- Reduce the risk of brucellosis transmission from bison to cattle;
- Manage bison that leave Yellowstone National Park and enter the State of Montana;
- Maintain Montana's brucellosis-free status for domestic livestock (Interagency Bison Management Plan, 2014).

Question: how can one carry out a goal that allows bison to be wild and free-ranging, yet have a stipulation in a mandated agreement that if they exercise free-ranging behavior by attempting to leave the park they must be killed? The answer is that it cannot be done. It would be similar to telling a prisoner "you are free to leave this prison, but when you do, you will be shot."

The goals of the IBMP are irrational. They are irrational because the purpose of the goals is to sound good but get their own way regardless. They are irrational because they are duplicitous. They are meant to deceive the public into thinking that the essential character of wild bison—their roaming, migratory nature—is being protected, when in fact it is being annihilated.

By insisting that a relatively few cattle graze on federal land adjacent to the Yellowstone National Park, land that comprises essential habitat for bison migration, these goals cannot be accomplished and thereby, as experience has proven, will continue to result in large herd reductions of wild bison. Such lethal actions represent a threat to the genetic vitality of wild bison and the maintenance of learned behavior.

A major defense by the FWS of this culling policy is that since wild bison are still trying to migrate, the plan has not harmed their migratory instinct and therefore the plan is working. The only empirical way to prove their position wrong is:

> 1. to find that one winter the entire herd, lacking a migratory instinct, collapses in the park because none retained the capacity to escape an especially severe winter, and/or
>
> 2. that along with eliminating those with migratory behavior, such associated traits as aggression, herd leadership and fear have been rooted out, leaving behind a form of domestic bison.

In other words, *only* the extinction of wild bison will suffice for the government as proof of the need to protect them from extinction. And then it will be too late.

**What must be done**

To prevent the extinction of wild bison, the ecosystem in which it lives must be reset back to its original condition by creating an environment that will allow wilderness to stand on its own, as it has in the past, instead of being managed, that is, enslaved. The Greater Yellowstone Ecosystem is a wilderness laboratory in which we can learn much, if allowed to function. By putting it under the management leadership of the Montana Department of Livestock, which literally and figuratively calls the shots, what we will end up with is livestock, not wildlife—and because of the proximity of caged and fenced livestock bordering the park and within the ecosystem, wildlife with livestock diseases.

Bison are a symbol of what is free. Yes, bison can be dangerous, can destroy private property, can pose a threat to automotive traffic and may spread a disease that is a threat to caged animals. But it was the cow that brought brucellosis to Yellowstone in the first place and experiments have shown that it is enclosure that is a major cause of wildlife diseases and interspecies transmission. It is the cage that is the threat, for in crowding disease is incubated. Further, it is the cage and the fence that civilize. Fencing of wildlife in an ecosystem that restricts the available habitat necessary for survival of any species destroys the operation of that system and thus deprives us of the increasingly rare opportunity to learn from what is wild.

To a large extent, what makes us different from Europe is the way we treat wildlife. This is particularly true of the American Indian. The Plains tribes lived with the wild buffalo and depended on it for their livelihood, instead of exterminating it. They co-existed with bison as a free-roaming, migratory animal. While wild bison of Yellowstone are an example of that will to be free, the wild bison in Europe has been extirpated. We can learn from what happened to that animal.

**Wisent**

It is called the wisent. Historically, wisent inhabited much of Europe and were most abundant on the plains between the Carpathian and Caucasus mountains in the region of the Black Sea. However, hunting and displacement due to growing agricultural practices increasingly led to range contraction and fragmentation. By the end of the 18th century wisent had disappeared throughout most of their former range. During World War I, German troops occupying Poland killed 600 of the European bison in the Bialowieza Forest for sport, meat, hides and horns. A German scientist informed army officers that the European bison were facing imminent extinction, but at the end of the war, retreating German soldiers shot all but nine of the animals there.

After the Russian revolution of 1917, portions of the Caucasus were overrun by cattle herders, lumbermen, army deserters and hunters armed with triple-barreled rifles who destroyed nearly all the Caucasian bison in that area. In 1919 an epizootic disease, probably endemic to domestic cattle grazing in the mountains, broke out among the remaining bison and killed virtually all those left in the wild (Vereshchagin, 1967).

The last wild European bison in the world was killed by poachers in 1927 in the western Caucasus mountains. Fewer than 50 then remained, all held by zoos.

Attempts now are being made to re-introduce wisent to various European landscapes. But none have occupied continuously the landscape they once freely roamed. We are fast headed in that direction by simply not allowing our wild bison to migrate to habitat they once occupied as a species.

But the extinction this time will be the elimination of wildness from the wild bison and its iconic, phenotypic trait, the migratory syndrome. Genetically, we are playing a form of Russian roulette, but with a slight twist: with each spin of the cylinder, we add another shell. It will only be a matter of time before we blow the migratory urge and its associated traits from the brains of the Yellowstone bison.

Opposing interests can overcome this short-sightedness by working together and concentrating on preserving the treasure that exists in the ability of the Greater Yellowstone Ecosystem to function on its own.

As mentioned, part of the problem is allowing caged or fenced animals in the GYE, for it is fencing that restricts movement, it is fencing that promotes the transfer of disease by crowding, it is fencing that disrupts wilderness and it is fencing that domesticates—all in opposition to wildness.

By providing a lethal barrier to bison around Yellowstone National Park, the IBMP is fencing in the park. Elk, which pose a higher threat than do bison for spreading brucellosis to cattle grazing on land adjacent to the park, most probably will be next on the anti-wildlife docket. It is already happening in Paradise Valley.

**The necessity of migratory behavior**

By restricting movement in an ecosystem, the animals' "house," one makes it a prison. The iconic trait of wild bison is that they still migrate, unlike all other bison in the nation, traveling from high altitudes to lower altitudes to seek forage in severe winter months and to calve in the spring. Movement is necessary for survival in such a climate as the Rocky Mountains.

Most of Yellowstone National Park is above 7,500 feet. Winter temperatures often range from zero to 20 degrees Fahrenheit during the day. Sub-zero temperatures overnight are common. The lowest temperature recorded in Yellowstone was -66 degrees near West Yellowstone February 9, 1933. While the average snowfall is 13 feet per year, higher elevations can get twice that amount—33 feet has been recorded.

Occasionally, warm winds will raise daytime temperatures into the 40-degree range, causing melting of the snowpack. When the snow melts and later refreezes, it forms ice sheets that can make foraging impossible (Weather, 2014; Uhler, 2014).

It is during these severe winter weather conditions that bison migrate to lower levels. This migratory behavior—an instinctive response to seasonal changes in weather and feed conditions, a behavior that brought them to this continent—is being selectively rooted out by means of the collaboration of government agencies that have been given the legal authority to lethally remove any bison that migrate or stray beyond the boundaries of the park.

The government's defense of this systematic killing is that there is still an abundance of buffalo and they are still migrating from the higher altitudes in Yellowstone.

**Aurochs**

True, but here in Montana there is also an abundance of the descendants of aurochs, a fierce wild bovine almost the size of an elephant once found throughout Europe and Asia. An account of their observation in the Hercynian Forest, an ancient forest which included a part of the Black Forest in Germany today, is given in Caesar's *Gallic War*s, written somewhat prior to 46 B.C.:

> There is a third kind, consisting of those animals which are called uri. These are a little below the elephant in size, and of the appearance, color, and shape of a bull. Their strength and speed are extraordinary; they spare neither man nor wild beast which they have espied. These the Germans take with much pains in pits and kill them.

Due to conflict of aurochs with farming and their over-hunting, only their protected domesticated progeny exist today: beef cattle and milk cows. The aurochs are extinct. None exist—not even in zoos.

**Figure 45. AUROCHS DRAWN BY PREHISTOIC MAN 10,000 to 15,000 years ago, found in the Lascaux Cave, France.** *Image by Peter80, Creative Commons license. (Lascaux, 2014).*

Wild bison are being driven down the same path to extinction as the aurochs via domestication by the IBMP's elimination of the most fit, the migratory.

**A lesson from the wisent**

A lesson can be learned from the historical range of the European bison, the wisent. Two subspecies are recognized, namely, the Lowland bison (*Bison bonasus bonasus*) and the Caucasian bison (*Bison bonasus caucasicus*).

**Figure 46. EUROPEAN BISON OR WISENT, which share the same ancestral line as the American bison, at the Bison bonasus nursery of the Russian Academy of Sciences in Shebalinsky District, Republic of Altai, Russia.** ***Photo by Alexandr frolov. From Wikimedia Commons.***

One species inhabited the lowlands of the European plains and the other species the mountains. Roughly speaking, these species compare to the American plains bison and those bison that now inhabit the mountain regions, such as in Yellowstone. What is of interest is that the Caucasian bison's habitat did not overlap the habitat of the Lowland bison.

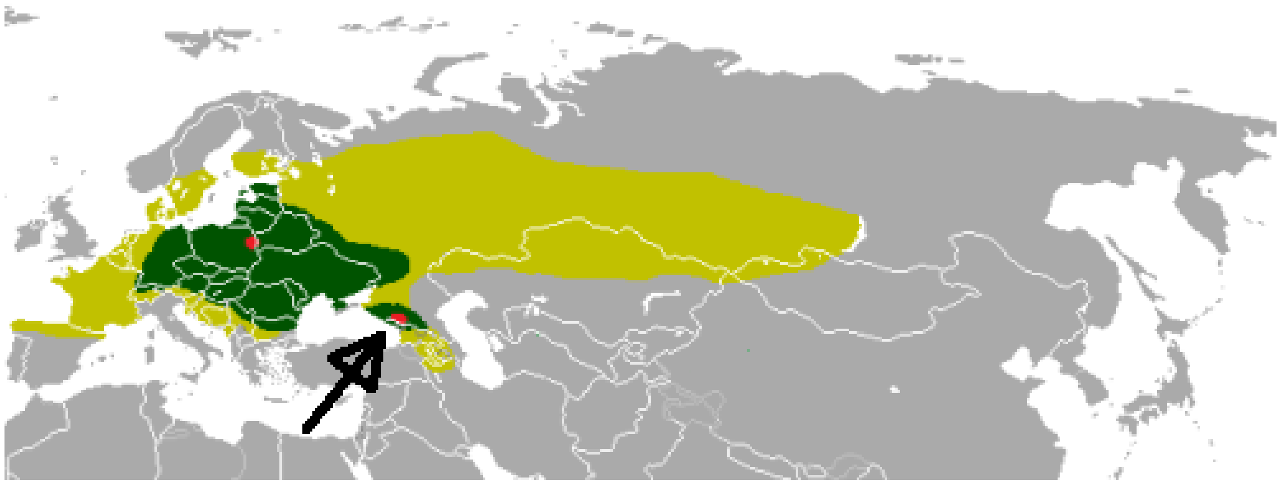

**Figure 47. WISENT HISTORIC RANGE. This map of the historic habitat of the European bison (Bison bonasus) shows its Holocene range 10,000 years ago in light green, its range in the high middle ages in dark green and relict populations in the 20th century in red (European bison, 2014). The arrow marks the habitat of the Caucasian bison.** ***From Wikimedia Commons. Author: Altaileopard.***

The Holocene epoch began at the end of the last ice age 11,700 years BP (before present). The high middle ages were from 1001 to 1300. Relict populations are those that survived from an earlier period. Notice on the above map that the bison were separated into two herds that were not contiguous during the high middle ages—the northern European herd and the herd in the Caucasus Mountains (the green splotch with the red spot at the end of the arrow).

Some instructive parallels between the Yellowstone bison and the Caucasian bison are found in a description of the history of mountain wisent restoration in the northwest Caucasus region titled "Bringing wisents back to the Caucasus mountains: 70 years of a grand mission" by authors Taras Sipko and Ivan Mizin, Institute of Problems Ecology and Evolution RAS, Moscow, Russia; Sergei Trepet, Caucasian Biosphere Reserve, Maikop, Russia, and Peter J. P. Gogan, USGS—Northern Rocky Mountain Science Center, Bozeman, Montana. The study makes this observation:

> But let us return to the subsequent fate of the mountain wisent, saved from absurd administrative decisions. Their population continued flourishing in the western Caucasus, reaching close to 1,500 animals (in 1991 year) and having dispersed throughout the territory of the reserve and beyond its borders. The external phenotype and the behavior of the wisent became identical to those of their exterminated ancestors. Yet, the circumstances changed again in the early 1990s . Funding of nature conservation efforts practically stopped and the social and economic structures of the region collapsed. Poaching, even with the use of helicopters, the sound of which still causes panic among wisent, spun out of control and eradicated mountain wisent throughout most of their former range. Only due to the difficult mountain terrain and unprecedented efforts of the Caucasian Reserve staff that the animals were not exterminated completely. Zoologists estimated that only 150 wisent had survived and these were in the hard-to-reach Umpir depression! Surviving wisent even changed their behavior. Previously, prior to the onset of winter, mountain wisent migrated down into the

> foothill forests where snow was usually less abundant and wisent could still find food. These forests, however, were most accessible to poachers. Surviving wisent started migrating upward to the wind-blown, snow-free mountain tops, where they now spend the entire winter season. Currently the conservation status of Caucasian wisent is improving, with numbers exceeding five hundred (Sipko, 2010).

**Figure 48. CAUCASIAN BISON have changed their migratory habits due to human interference and now spend the winter on the mountain tops to avoid poachers. They used to descend in the winter to lower altitudes. *Photo from Sipko, 2010.***

The poachers who brought the restored Caucasian bison to the brink of extermination are equivalent to the interagency collaborators operating under the acronym IBMP. Terrorized (like the Yellowstone bison) by helicopters, driven from their migratory habitat (like the Yellowstone bison), they now survive on the snow-free mountain tops of the Caucasus region. If their migratory habits can be changed by lethal removal means, how can one justify similar actions brought against the migrating Yellowstone bison as harmless, as did the FWS evaluating my first petition?

Hopefully, Georg Wilhelm Friedrich Hegel will be proven wrong when he wrote in *The Philosophy of History* that "What experience and history teaches us is that people and governments have never learned anything from history, or acted on principles deduced from it" (Hegel, 1956, p. 7).

What could we learn? Notice on the above map that bison disappeared from much of Eurasia prior to the high middle ages, while in North America, there were vast populations of bison up until the late $19^{th}$ Century. What could be the cause of this differential? Cormack Gates et al. in "Wood Bison Recovery: Restoring Grazing Systems in Canada, Alaska and Eastern Siberia" wrote:

> The relationships between bison, human populations and other environmental factors have been diverse, with no single defining pattern. Nevertheless, it is clear that during the last

> millennium bison populations were dramatically reduced in Eurasia and much of North America in areas where the amount and distribution of suitable late Holocene habitat were more limited than on the Great Plains. Wood bison were extirpated from most of their original range in northern Canada, and rapidly approached extinction following over-hunting during the 19th century. European bison also declined during the Holocene, with less than 100 wisent (B. bonasus) persisting in the forests of eastern Europe in the early 1900s. Habitat reduction and overhunting were key factors causing their near extinction. Bison persisted in northern Eurasia into the middle or late Holocene but apparently disappeared earlier than in Alaska or adjacent parts of Canada. Plains bison persisted in a large region in North America despite being hunted extensively before the introduction of firearms. Annual long-range migration was likely a key factor accounting for the relative abundance of plains bison, similar to some African ungulates (Gates, 2014).

The observation that "Plains bison persisted in a large region in North America, despite being hunted extensively before the introduction of firearms," gives us a clue as to the cause of the differential. The people of Europe and the North American plains interacted with bison in dramatically different ways spanning multiple millennia. For thousands of years, bison on the American plains persisted, while bison on the Eurasian plains were extirpated.

**Old World view of wildlife**

What was behind this decimation in the Old World? Listen to a description of how animals were hunted near the Caucasus by N. K. Vereshchagin in *The Mammals of the Caucasus: A History of the Evolution of the Fauna*. Vereshchagin writes:

> The sharp decrease in the large-animal population on the Caucasus undoubtedly occurred during the Middle Ages when the techniques of bow-manufacturing and forest and mountain hunting were at a very high level.
>
> Large-scale hunting into late medieval time was made possibly by the conditions of a feudal society and by the existence of large bands of free armed men which provided the necessary manpower.

Quoting an Iranian historian of the 14th century named Rashid ad-Din, he relates how Ghazan-Khan, a Mongolian ruler of Iran described as "the king of Islam," hunted in the mountains of the southern Caucasus.

> "Ghazan-Khan ordered the construction of two wooden fences in the mountains, each fence the length of one day's travel, which together would form a wedge fifty gyaz [about 100 feet] wide at the narrow end and one day's travel apart at the wide end. At the dead end the fences were to be closed off as a corral. After this the warriors drove the game–mountain buffalos, dzhurs [apparently, some kind of wild mammal], wild goats and asses, jackals, foxes, wolves, bears and other various wild and predatory beasts—between the fences until all were in the corral. The king of Islam was seated with Bulugan-Khatun [a Mongol princess] on the stage which was built in the middle, and enjoyed the sight of the animals. Some were killed and some set free."

Ghazan-Khan's method of capturing animals is hauntingly similar to that used at the Stephens Creek capture facility, which as has been noted employs a design that directs animals into a corral using a system of fencing fanning out from the enclosure of the facility.

But there was an even more effective method of killing wild animals. In the 16th and 17th centuries in Iran, "often as many as ten thousand or more" peasants were called for hunting duty by order of the Shah. They formed a gigantic oval around a forested area to prevent the animals from escaping. As the hunters converged toward each other into the area, the enclosure got smaller and smaller. The ring surrounding the animals at the beginning was about 12 miles long and 3 miles wide.

> Before the beginning of the big hunt, the animals were driven for several days into the encircling ring. Hundreds and even thousands of large animals were killed during such hunting. In addition to the mounted warriors, foot soldiers were used to drive the animals.

Perhaps a reason for this war against wildlife in the Eurasian plains and mountains was the need to clear the way for cattle. As Vereshchagin states:

> . . . the disappearance and displacement of wild horse, kulan, saiga, tur and bison from the Ciscaucasian steppes were well advanced as early as the Middle Ages, brought about by domestic cattle herding and game drives by thousands of mounted Khazars, Polovtsy [Cumans] and Mongolians (Vereshchagin, 1967, pp. 520-524).

A similar drive to eliminate wildlife occurred when Europeans migrated to America, taking with them their prejudices toward ungulate competitors to cattle. For instance, to make way for cattle on the prairie and the railroad across it, the bison had to go. As just one example of the extent of the level of extermination, to supply workers for the Kansas Pacific Railroad with buffalo meat after the Civil War, William Frederick Cody (Buffalo Bill) killed over 4,200 bison in 18 months. Our government today is even more efficient, killing in a few months during the winter of 2008 over 1,700 bison as they migrated—either on Yellowstone National Park land or just beyond its boundary.

On the other hand, I remember reading about how Sitting Bull with his warriors would come upon the skull of a buffalo as they were riding across the plains. He would stop his horse and offer a prayer of thanks to the Great Spirit for the sustenance of his people provided by the bison. A simple act, but so disparate from the industrial killing of bison that is now being conducted by members of the Montana Department of Livestock and their cohorts in the IBMP. Wildlife treated as a commodity to be depleted by the most efficient methods of killing—as conducted by early Eurasian populations against various wildlife species, by European settlers of this nation against such species as bison and passenger pigeons, and now by our own government against bison and the wolf—demonstrates a lack of respect for wildlife and perpetuates an early Eurasian anti-wildlife attitude.

Behind that disrespect was avarice and a desire to control. That attitude persists to this day. Migratory animals cannot be easily controlled. Migratory bison jeopardize the exclusive use of public grasslands for private profit. This viewed encroachment is anathema to the cattle industry, for grazing fees are considerably less on federal and state lands than on privately-owned land. With breath-taking arrogance, the cattle industry wants the pubic to pay for the protection of their use of public grasslands for grazing cows to the tune of $3 million dollars annually. Why do they not simply take their cattle out of these areas instead, in order to provide the most affordable means of disease protection for the herds in their state? And if they are unable to make this rational decision, why does the government not withdraw their cattle grazing permits from these critical areas?

What must be done if we are going to save Yellowstone National Park and the Greater Yellowstone Ecosystem for future generations as a wildlife reserve is to allow it to function on its own without malicious human intrusion and decimation. That can best be done by bringing to bear an attitude of reverence and respect toward wildlife, including bison and wolves, as gifts not to be squandered. It is this attitude—one that existed prior to European settlement among Indian tribes on this continent and still exists among them as well as among conservationists—that for the good of our nation must prevail.

**Why the IBMP will never work**

The IBMP has demonstrated one thing: you cannot eradicate brucellosis in an ecological setting by their methods.

The reason the plan is not working is because it is duplicitous, internally contradictory and thus irrational. Only a magician could make it work.

In 2008 the Interagency's plan was reviewed by the Government Accountability Office. The GAO found the plan lacking, criticizing it in a report entitled "Yellowstone bison: Interagency plan and agencies' management need improvement to better address bison-cattle brucellosis controversy." The GAO report stated:

> The plan has two broadly stated goals: to "maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission." The plan, however, contains no clearly defined, measurable objectives as to how these goals will be achieved, and the partner agencies have no common view of the objectives (Yellowstone bison, 2008).

In response to that critical review, a report was prepared in 2008 and updated in 2014 by P. J. White, Chief, Wildlife and Aquatic Resources; Rick Wallen, Bison Ecology and Management Program and John Treanor, Yellowstone Wildlife Health Program, entitled "Yellowstone National Park: Monitoring and Research on Bison and Brucellosis."

Contained in that report is a flowchart summarizing the conditions desired and the means by which those conditions would be achieved. That chart is reproduced below:

| DESIRED CONDITIONS |
|---|
| Bison abundance averages 3,000-3,500 per decade, while maintaining 95% of existing genetic diversity.<br><br>Increased tolerance for bison outside Yellowstone, while maintaining separation between bison and cattle.<br><br>Decrease in brucellosis prevalence in bison to levels similar to sympatric elk (5-10%). |

| **Manage Brucellosis Transmission Risk** | **Conserve a Wild Bison Population** | **Brucellosis Suppression** |
|---|---|---|
| Separation to prevent bison-cattle mixing<br><br>Cattle management<br><br>Management culls and harvests of bison<br><br>Adaptive management<br><br>Research: disease dynamics/transmission | Migratory behavior<br><br>Ecological role and function in ecosystem<br><br>Natural selection/ evolutionary potential<br><br>Demographic health | Vaccination/Fertility Control<br><br>Culling infectious bison<br><br>Disease surveillance<br><br>Socioeconomics<br><br>Brucellosis research |

**Figure 49. PRESENT CONCEPTUAL MODEL of "conservation and brucellosis management for Yellowstone bison."**

Upon inspection, the report is disappointingly Janus-faced. Out of one side of their mouths the authors espouse high-sounding bison conservation concerns such as preserving their migratory behavior, ecological role and function in an ecosystem, the role of natural selection and evolutionary potential as well as their demographic health—of which a key promoter is availability of habitat. To control brucellosis transmission they indicate the need for the separation of cattle from bison. This is all fine and dandy.

But out of the other side of their mouths they list the need for culling and harvesting bison to achieve this separation, as opposed to the permanent removal of cattle from critical migratory habitat historically occupied by bison. Further, by setting a goal of 95 percent retention of genetic diversity, IBMP is expecting its plan *at best* will have at least a 5 percent reduction of that diversity. This is unacceptable ecologically, especially when you consider that no identification has been made of which genes may be expected to be lost, that this reduction is biased toward certain traits expressed behaviorally and that lethal selections will be progressively incremental toward that bias.

When one reads through the document to find ecological justification for such culling, one finds the opposite.

Lethal removal of large numbers of mammals from a population has the potential of reducing the genetic fitness of that group. If a subpopulation of a group of animals (such as wild bison) is genetically rich, it would stand to reason that one would do everything possible to preserve that strength—namely, adaptive capabilities with relatively high genetic diversity—instead of depleting it.

In fact, this is the conclusion some of the authors of the above report came to in a 2010 study, "Management of Yellowstone bison and brucellosis transmission risk: Implications for conservation and restoration." In this study, P. J. White, Rick L. Wallen, Chris Geremia, John J. Treanor and Douglas W. Blanton concluded:

> In summary, the risk of disease transmission from migratory ungulates to livestock near reserve boundaries often restricts ungulates to areas that do not contain all the seasonal habitats necessary for their survival. Even relatively large reserves such as Yellowstone National Park generally contain only a subcomponent of the habitat needed by migratory ungulates. Long-term conservation of plains bison requires restoring populations to other locations. Yellowstone bison provide the wild state and adaptive capabilities needed for restoration but, to date, the brucellosis issue has prevented their use in restoration efforts. Thus, management plans should incorporate a conservation component that does not limit wildlife to isolated reserves, but facilitates responsible restoration efforts for long-term conservation (White, 2010).

Yellowstone bison genetically have what it takes. They are a genetic treasure trove. They have "the wild state and adaptive capabilities" essential for the genetic restoration of other bison herds because of their genetic strength and fitness, an attribute of their wildness. And wildness means being left alone to evolve through natural selection and survival of the fittest. And that means not fencing such wild animals, for fencing is the primary tool of domestication. It is used to selectively separate the wilder animals from the more tame.

However, while the government acknowledges that fencing is not compatible with wilderness, the government, under the auspices of the IBMP, is not only fencing in wild bison by restricting their migratory movements, but is killing those very animals that in effect touch that "fence," that imaginary boundary that, if crossed, means death.

This is not wilderness. Again, this is domestication. Wilderness is where animals are free from enclosure and are unrestricted in movement. Wilderness and domesticaton do not mix. Domesticated animals do not have what it takes to survive in a wilderness. They lack fitness.

**Fitness indicators**

So, what indicators would one look for to measure fitness? What does one want to preserve? Such factors as heterozygosity are key indicators of fitness. As noted previously, low genetic heterozygosity is associated with loss of fitness in many natural populations. High heterozygosity means lots of genetic variability. Low heterozygosity means little genetic variability and can be attributed to forces such as inbreeding (McDonald, 2008).

But just what is heterozygosity? Let us pause for a glimpse into population genetics, for it will help us appreciate what is going on with the wild bison at Yellowstone.

The word heterozygosity comes from the word heterozygote, whose etymology is from Greek "heteros," meaning different, and "zygotos," meaning yoked (from zygon "yoke"). A yoke, of course, is a wooden crosspiece that is fastened over the necks of two animals and attached to the plow or cart they are to pull. Synonyms are harness, collar or coupling.

Biologists, who love Greek words, thus define a heterozygote as "an organism whose somatic cells have two different allelomorphic genes on the same locus of each pair of chromosomes. It can produce two different types of gametes."

Well, of course.

This is a case where the definition is more complicated then the word itself. A heterozygote is an individual, such as a human, a fly, a goat, a bison, that genetically has differently coupled genes, that is, dissimilar pairs of genes for any hereditary characteristic. What is important is that a heterozygote can produce two different types of gametes. Gametes are reproductive cells (sex cells) that unite during sexual reproduction (mating by two individuals) to form a new cell called a zygote, that is, a somatic cell, a body cell. In humans, male gametes are sperm and female gametes are ova (eggs). Heterozygous refers to having two different forms or alleles for a single trait.

So, what does this mean? Let us take a look at pea plants. A gene is composed of a pair of alleles. The gene for seed shape in pea plants exists in two forms, one form or allele for round seed shape (R) and the other for wrinkled seed shape (r). A heterozygous plant would contain the following alleles for seed shape: (Rr). One of the pairs is dominant and the other is recessive. In the case of peas, the round seed shape (R) is dominant and wrinkled seed shape (r) is recessive.

When these forms are combined following pollination and fertilization the following plant can be produced: a plant with round seeds by means of this combination: (RR) or (Rr), or wrinkled seeds: (rr).

A heterozygous plant would contain the alleles for seed shape (Rr). This quality is valuable because it promotes genetic variation. Here is why.

When an (Rr) individual produces a gamete it splits R from r. Shifting from the plant metaphor to animals, in male mammals it makes either a sperm with R or r and in females either an egg of R or r. When mating occurs, this can thus produce an offspring that is either (RR), (Rr) or (rr).

Thus, high heterozygosity means a population with the potential for lots of genetic variation. Lots of genetic variation is important because it provides for the production of lots of potentially adaptive traits.

As an example of what this can mean, let us take a look at fruit flies feeding on the landscape of an apple. Fruit flies are attracted to rotten fruit because it contains yeast on which their maggot progeny feed. As we all know, over-ripe apples are often not uniformly rotten, but instead have rotten spots. These are the favorite grazing plots for fruit fly larvae.

Fruit flies have a particular gene that controls foraging behavior. It governs whether a maggot will be a sitter or a rover, whether it will stay put or migrate to another nutritional source, say another rotten spot.

Researchers found that when the fruit fly larvae were competing for food, those that did best had a version of the foraging gene that was rarest in a particular population. For example, rovers did better when there were lots of sitters, and sitters did better when there were more rovers.

"If you're a rover surrounded by many sitters, then the sitters are going to use up that patch and you're going to do better by moving out into a new patch," says Professor Marla Sokolowski, a biologist at the University of Toronto Mississauga, who discovered the gene. "So you'll have an advantage because you're not competing with the sitters who stay close to the initial resource. On the other hand, if you're a sitter and you're mostly with rovers, the rovers are going to move out and you'll be left on the patch to feed without competition" (University of Toronto, 2007).

But what would happen if one were to selectively destroy all the fruit fly maggots that were rovers? Let us take a look.

(RR) and (Rr) are those that display the rover behavior and R is dominant; (rr) are the sitters. If one destroys all the rovers, then only the sitters will be left. Once the rotten spot is eaten up, since none will have looked for alternative food sources, fewer of this sitting group of maggots will survive due to competition compared to a group consisting of both rovers and sitters, for the rovers would have migrated to another rotten spot. By the rovers leaving, it would take the competitive pressure off the sitters and by migrating the rovers will have more food.

The (Rr) maggots are of particular value because they enable a population to adjust to whether more or fewer rovers or sitters are needed to adapt to environmental changes.

**An apology for the Interagency Bison Management Plan**

With this in mind, let us look at a sampling of the findings of the report "Yellowstone National Park: Monitoring and Research on Bison and Brucellosis."

What follows are passages from the government-prepared report in justification of the Interagency Bison Management Plan, an apology that relies on what may be variously termed dissimulation, taqiyya, kitman or doublethink. It reminds one of an addictive response to advice on what needs to be done to achieve reform but regardless of what the addict learns about the danger of his destructive behavior, or his statements about his recognized need to reform, he still continues that behavior. What follows is a collection of contradictions, when one matches words (assessments) with actions. Important elements of the quoted passages will be in bold. Petitioner's observations of IBMP's contradictory actions will follow each passage. Self-assessment by White et al. 2008/2014 follows.

> *Page 6:* **Overarching principles for conserving bison** were to (1) **maximize the number of bison in a population** (i.e., 'maximum sustainable' rather than a 'minimum viable' population size) to better retain natural variation and provide more resiliency to 'surprises' or catastrophic events, (2) support and **promote 'wild' conditions and behaviors** in an environment where bison are integral to community and ecosystem processes, exposed to natural selection, and active management interventions are minimized, (3) **preserve genetic integrity and health** by maintaining bison lineages and carefully evaluating all movements of bison between populations, and (4) conducting routine monitoring and evaluation of demographic processes, herd composition, habitat, and associated ecological processes that are central to evaluating herd health and management efficacy.

- *Contradictory actions being taken*: 1. scheduling a reduction of the number of wild bison by a factor of 900 animals in 2015 and another 900 animals in 2016; 2. discouraging wild behavior by culling those obeying the instinct to migrate; 3. depleting the genetic integrity and health by these actions. The term "overarching principles" as used here is lip service.

> *Page 8:* Bison from the central herd were **partially migratory**, with **a portion of the animals migrating** to the lower-elevation Madison headwaters area during winter **while some remained year-round** in or near the Hayden and Pelican valleys.

- *Contradictory action being taken*: targeting for culling the migratory herd, favoring survival of the non-migratory herd.

> *Page 9:* **Simulations of migrations over the next decade suggest that a strategy of sliding tolerance where more bison are allowed beyond park boundaries during severe climate conditions may be the only means of avoiding episodic, large-scale reductions to the Yellowstone bison population in the foreseeable future.**

- *Contradictory action being taken*: scheduling a large-scale reduction this winter of 900 wild bison, 900 the next.

> *Page 10:* Based on mitochondrial DNA analyses, there was **significant genetic differentiation between bison sampled from the northern and central breeding herds**, likely due to strong female fidelity to breeding areas (Gardipee 2007).

- *Contradictory action being taken:* scheduling culling this winter that will diminish the genetic health of the central herd, which in turn will diminish the health of both the central herd and the northern herd due to the increased potential for inbreeding and less gene flow.

*Page 10:* **Yellowstone bison have relatively high allelic richness and heterozygosity** compared to other populations managed by the Department of Interior.

- *Contradictory action being taken:* Depopulating this valuable source of heterozygosity by means of the culling of 900 bison scheduled for this winter, 900 the next.

*Page 10:* Yellowstone bison are the only population with no molecular evidence (i.e., microsatellite markers) or suggestion (i.e., SNPs) of potential cattle ancestry (i.e., introgression of cattle genes). Thus, **this population constitutes a genetic resource that must be protected from inadvertent introgression**.

- *Contradictory action being taken:* Insisting that cattle spatially occupy the same migratory habitat as wild bison, increasing the probability of the "inadvertent introgression" of cattle genes to bison.

*Page 11:* NPS staff collaborated with colleagues at the University of Montana to conduct a **mathematical modeling assessment that provided predictive estimates of the probability of preserving 90 and 95% of the current level of genetic diversity values** (both heterozygosity and allele diversity) in Yellowstone bison (**Pérez-Figueroa et al. 2012**).

Findings suggested that variation in male reproductive success had the strongest influence on the loss of genetic variation, while the number of alleles per locus also had a strong influence on the loss of allelic diversity.

**Fluctuations in population size did not substantially increase the loss of genetic variation when there were more than 3,000 bison in the population. Conservation of 95% of the current level of allelic diversity was likely during the first 100 years under most scenarios considered in the model**, including moderate-to-high variations in male reproductive success, population sizes greater than 2,000 bison, and approximately five alleles per locus, **regardless of whether culling strategies resulted in high or low fluctuations in abundance.**

However, a stable population abundance of about 2,000 bison was not likely to maintain 95% of initial allele diversity over 200 years, even with only moderate variation in male reproductive success. Rather, maintenance of 95% of allelic diversity is likely to be achieved with a fluctuating population size that increases to greater than 3,500 bison and averages around 3,000 bison.

- *Contradictory action being taken:* None, for what is being said in both the White et al. report and the Pérez-Figueroa et al. study appears to support the actions being taken by the IBMP regarding its herd reduction program or culling strategy. However, while both documents may agree with each other, what both the report and the study say is not a correct analysis of what is happening at the borders of the park. Therefore the study, the report and the planned actions of the IBMP based on these findings are in error.

Yes, the actions of IBMP are consistent with the findings of the Pérez-Figueroa study, which investigated three culling strategies: random, juvenile and adult animals. The IBMP-planned lethal removal of 900 animals is claimed to be on a random basis. The study found that population fluctuation for all of the culling strategies studied also preserved more than 95 percent of initial heterozygosity over 200 years (Pérez-Figueroa et al., 2012).

So it would appear that the IBMP's stated plan to randomly remove wild bison lethally will still retain heterozygosity at 95 percent of the initial values.

However, this is an example of governmental sleight of hand. The IBMP's plan in fact does not involve random culling, but instead is aimed squarely at migrating bison. The study does not simulate what is actually going on at the border of Yellowstone National Park vis-à-vis culling strategies. The *in silico* model is not relevant. The computer simulated bison populations study simulates the wrong populations. The culling transpiring at the park's border is not random, juvenile, or adult, but instead limited to those bison that are migratory.

Therefore the study is utterly useless as a predictive model regarding the loss of genetic variation by the population reduction methods being used at the park. It is an example of garbage-in, garbage-out.

In point of fact, the park service knows that the large-scale culling removals are *not* random. As "Estimating probabilities of active brucellosis infection in Yellowstone bison through quantitative serology and tissue culture," by John J. Treanor, Chris Geremia1, Philip H. Crowley, John J. Cox, Patrick J. White, Rick L. Wallen and Douglas W. Blanton (some of the very same authors as the report "Yellowstone National Park: Monitoring and Research on Bison and Brucellosis"), explains:

> These large-scale bison removals have not been random, because bison social structure and the reproductive demands of pregnancy predispose female bison and their recent offspring (i.e. male and female calves and yearlings) to culling as they move onto low-elevation winter ranges outside the park. The effects of several large, nonrandom culls during the past decade have contributed to a skewed sex ratio in favour of male bison, gaps in the population's age structure and reduced productivity that, if continued over time, could reduce the potential of Yellowstone bison to respond to future challenges (White et al. 2011) (Treanor, 2011).

Further, the Pérez-Figueroa study makes the following claim, which has produced a misunderstanding:

> . . . conservation geneticists have suggested that a reasonable management goal for maintenance of genetic variation is to retain approximately 95% of $H_e$ [heterozygosity] over 100–200 years.

This statement, upon which the White report is based, contains a conceptual error. A 2002 paper by F.W. Allendorf and N. Ryman titled "The role of genetics in population viability analysis" is cited as an authority for this claim. Yes, that paper says that "We recommend retaining a least 95% of heterozygosity in a population over 100 years." But it also stresses that this is a worst-case scenario:

> The population size required to meet this genetic criterion should not be considered a goal, but rather a lower limit below which genetic considerations are likely to reduce the probability of population persistence (Allendorf, 2002, p. 51).

*Page 12:* **Allowing the bison to migrate and disperse between breeding herds would be in the best interest of the bison population for the long term.**

**The NPS will continue to allow ecological processes such as natural selection, migration, and dispersal to prevail and influence how population and genetic substructure is maintained in the future rather than actively managing to perpetuate an artificially created substructure.** The existing population and genetic substructure may be sustained over time through natural selection or it may not.

- *Contradictory action being taken:* Slaughtering migrating animals and killing a disproportionate number in the central herd, reducing breeding opportunities, coupled with artificial selection biased toward non-migratory herd members, discouraging natural selection forces and promoting an artificially created substructure.

*Page 14-15: B. abortus* isolates from bison, elk and cattle . . . [were collected to] test which wildlife species was the likely origin of recent outbreaks of brucellosis in cattle in the greater Yellowstone area (Beja-Pereira et al. 2009).

Findings suggested that isolates from cattle and elk were nearly identical, but highly divergent from bison isolates. **Thus, elk, not bison, were the reservoir species of origin for these cattle infections.**

- *Contradictory action being taken:* Continue to target only bison for slaughter as a means of controlling brucellosis that tests show is being spread by elk, not bison.

*Page 15:* The risk of transmission of brucellosis from bison to cattle is likely to be a relatively rare event, even under a 'no plan' (no management of bison) strategy.

The risk of transmission of brucellosis from bison to cattle will increase with increasing bison numbers and severe snow fall or thawing and freezing events.
**As the area bison occupy outside Yellowstone in the winter is enlarged and overlaps cattle grazing locations, the risk of transmission will increase.** Thus, adaptive management measures to minimize risk of transmission will be most effective.

- *Contradictory action being taken:* Refusing to take the most cost-effective and most disease-preventive adaptive management measure, namely, ban cattle from the public federal forest land adjacent to the park so that their ranges do not overlap.

  So far "adaptive management" is management heavily biased toward the cattle industry and against wildlife and conservation interests in the middle of one of the world's largest and most valued ecosystems.

*Pages 16:* **Allowing bison to occupy public lands outside the park where cattle are never present (e.g. Horse Butte peninsula) until most bison calving is completed (late May or early June) is not expected to significantly increase the risk of brucellosis transmission from bison to cattle because**: 1) bison parturition is essentially completed weeks before cattle occupy nearby ranges; 2) female bison consume many birthing tissues; 3) ultraviolet light and heat degrade *B. abortus* on tissues, vegetation, and soil; 4) scavengers remove fetuses and remaining birth tissues; and 5) management maintains separation between bison and cattle on nearby ranges.

**Allowing bison to occupy public lands outside the park through their calving season will help conserve bison migratory behavior and reduce stress on pregnant females and their newborn calves.** The risk of brucellosis transmission to cattle can still be minimized through effective management of bison distribution.

- *Contradictory action being taken:* Hazing all bison off these public lands outside the park by the target date of May 15, including Horse Butte peninsula, during calving season.

**There was a reproductive cost of diminished birth rates following brucellosis infection**, with only 59% of seropositive and recently seroconverting females with calves compared to 79% of seronegative females with calves.

- *Contradictory action being taken:* Culling of female bison showing signs of past infection with brucellosis, thereby increasing the proportion of more fertile bison, a status contrary to the expressed goal of a reduced bison population.

*Page 17:* **Population size and winter severity were major determinants influencing bison movements to lower elevation winter grazing areas that overlapped with private ranches and federally-regulated cattle grazing allotments.** Increasing population size resulted in higher bison densities and increased bacterial shedding . . .

**Natural bison migration patterns and boundary management operations were important** for minimizing brucellosis exposure risk to cattle from bison, which supports continued boundary management operations for separation between bison and cattle.

- *Contradictory action being taken:* The passage is self-contradictory. "Natural bison migration patterns" do not "minimize brucellosis exposure risk to cattle from bison," they cause it, nor do migration patterns support "continued boundary management operations for separation between bison and cattle" (unless, of course what is meant is that they support the *need* of such operations). Effective, realistic, cost-effective separation without harming the ecosystem can only be achieved by removing cattle from the park environs.

***B. abortus* field strain persisted up to 43 days** on soil and vegetation at naturally contaminated bison birth or abortion sites.

- *Contradictory action being taken:* Cattle are trucked onto grazing allotments either without sufficient temporal separation or just barely sufficient, providing no "fudge factor" for the prevention of potential disease transmission. According to the "Draft Joint Environmental Assessment Year-round Habitat for Yellowstone Bison" for 2013, three active grazing allotments are within the existing bison-tolerant zone within the GNF. Use of the allotments range from mid-June until mid-October. Untested bison are tolerated outside the west boundary Nov. 1 to May 15 and outside the northern boundary Nov. 1 to May 1.

*Page 18:* **This study [by APHIS] indicates that elk play a predominant role in the transmission of *B. abortus* to cattle located in the greater Yellowstone area.**

- *Contradictory action being taken:* Continue to target only bison for slaughter as a means of controlling brucellosis that tests show is being spread by elk, not bison.

*Pages 19-20:* Removing brucellosis-infected bison is expected to reduce the level of population infection**, but test and slaughter practices may instead be removing mainly recovered bison. Recovered animals could provide protection to the overall population through the effect of herd immunity, thereby reducing the spread of disease.**

- *Contradictory action being taken:* Continued and sometimes accelerated bison culling.

  Further, the statement that "Removing brucellosis-infected bison is expected to reduce the level of population infection" is in error. Such culling has not reduced the level of brucellosis in bison. The study "Estimating probabilities of active brucellosis infection in Yellowstone bison through quantitative serology and tissue culture," led by Treanor of Yellowstone National Park, points out that:

  > Additionally, boundary culling has not contributed to a measurable reduction in brucellosis infection in the bison population. The proportion of seropositive

> adult female bison has increased slightly since 1985 or remained constant at c. 60% (Hobbs et al. 2009).

In fact, as the study states, such culling may be counter-productive. As noted:

> Removing brucellosis-infected bison is expected to reduce the level of population infection, but test and slaughter practices may instead be removing mainly recovered bison. Recovered animals provide protection to the overall population through the effect of herd immunity (John & Samuel 2000), thereby reducing the spread of disease (Treanor, 2011).

*Pages 20-21:* Intensive management near conservation area boundaries maintained separation between bison and cattle, **with no transmission of brucellosis**.

- *Contradictory action being taken:* This statement is not contradictory but instead taking credit where credit is not due. No transmission from bison to cattle in the field has ever been documented.

However, **brucellosis prevalence in the bison population was not reduced** and the management plan underestimated bison abundance, distribution, and migration, which contributed to larger risk management culls (total >3,000 bison) than anticipated.

- *Contradictory action being taken:* Continued culling, despite evidence that it has not reduced the disease among bison and despite evidence that such culling may be increasing productivity of bison.

**Culls differentially affected breeding herds**, altered gender structure, created reduced female cohorts, and temporarily dampened productivity.

- *Contradictory action being taken:* The announcement that Yellowstone National Park will *randomly* cull 900 bison this winter, directly contradicting findings that such culls differentially affect the herds.

This assessment was used to develop adaptive management adjustments to the IBMP in 2008 (USDI et al. 2008) and similar **future assessments will be essential for effective management to conserve the largest free-ranging population of this iconic native species**, while reducing brucellosis transmission risk to cattle.

- *Contradictory action being taken:* Plans to continue massive culls to (wink wink nudge nudge) “conserve the largest free-ranging population of this iconic native species.”

A conceptualization of why the Interagency Bison Management Plan is not working and what would be a more realistic and thus more workable flowchart is as follows—one that bans cattle from the migratory habitat of bison and elk:

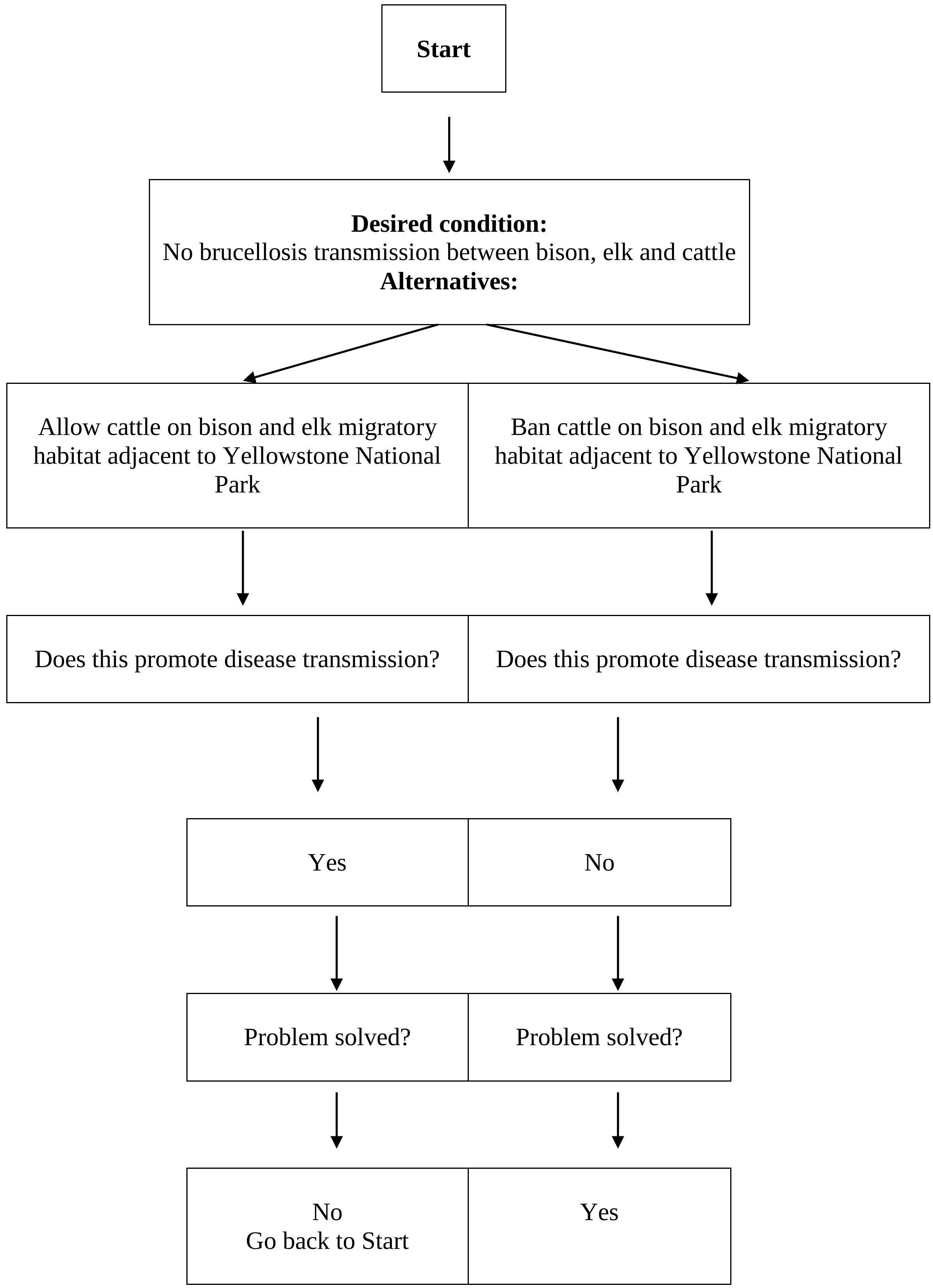


**Figure 50. PROPOSED REALISTIC CONCEPTUAL MODEL of brucellosis management.**

**Speculations on why the wild bison controversy**

Why should the rather obvious solution to this problem be so assiduously resisted, that is, not grazing near a wildlife reserve where zoonotic disease is prevalent? The real problem with wild bison may possibly be that they are a public animal that can compete with cattle as a basic nutritive resource. The cattle industry loves cattle because cattle can be privately owned. Wild bison cannot, both for legal reasons and because of their large size and migratory habits.

When bison come on either private or public property, they dominate. They can infect cattle back with the disease of brucellosis they got from cattle, which over the course of time is relatively harmless to most bison, but can mean that if one cow contracts the disease, an entire herd of cattle can be subject to lethal actions as a means of preventing the spread of the disease to other cattle.

Try as they might, the IBMP has not been able to eradicate brucellosis from bison. And if bison remain wild, they never will. Even though there is no record of bison spreading brucellosis to cattle in the wild, as the IBMP has stated, that risk is not zero, so in their minds the wild bison must remain enclosed in the park forever.

However, if the disease of brucellosis was really the problem, the cattle industry would have long ago seen the wisdom of not grazing cattle in a wilderness where disease-carrying bison and elk also graze. Possibly the cattle grazing on public lands here give the IBMP a good excuse to kill wild bison and they don't want to give up this ruse because wild bison represent a major economic, cultural and philosophical threat to their industry.

The word capital comes from the Latin word "caput," meaning head, as in a head of cattle, livestock, or chattel, a personal possession. In capitalism, money takes the place of cattle as the unit of wealth. Wealth entails ownership. Cattle do not migrate. Cattle stay behind fences. Cattle can be owned. Cattle can be sold to acquire wealth. Wild bison, on the other hand, migrate, cannot be owned, do not stay behind fences and cannot be sold.

At the heart of the matter is that bison can wander anywhere because they are wild, roaming and migratory and when that animal comes into range, merely by taking that animal via hunting the hunter becomes a capitalist, that is, that person has acquired capital, livestock, i.e., wealth. Such an event can be viewed by the property owner as a threat because wild bison cannot be owned and thus it is thought that no profit can be made by a third party from its acquisition.

But the threat is illusory. Private property owners can still make money from bison killed on their land via proceeds from hunting licenses or by means of fees charged for taking such bison on their land. Bison outfitters could be just as big a business as elk outfitters and hunting guides. Government also can obtain funds from the killing of such bison via hunting licenses. There are ways to make wild bison profitable.

However, by not allowing bison out of Yellowstone National Park, the common person has been excluded from his or her traditional right to hunt wild animals, traditional in that the plains bison were the common property of the American Indian and the European settlers. But by legislative fiat, wild bison have been partitioned off their historic migratory haunts in the Greater Yellowstone Ecosystem just outside the park. Wild bison, the very same animal that once fed tribes of Indians and European settlers simply by their taking—that is, they were common property just like deer and elk. Now privately-owned cattle, instead of bison, have been given priority on public property. Here private cattle interests preempt public interests in wildlife.

The un-wilding of the Greater Yellowstone Ecosystem is in effect the disarming of the American hunter, for without wilderness there is no hunting. Cattle have no business in a wilderness because the business of cattle ranching denies wilderness.

Recall Bozeman Daily Chronicle Staff Writer Laura Lundquist's comment in the story announcing the culling of 900 wild bison this winter. She reported in "Yellowstone proposes to eliminate more bison" that:

> The livestock department and FWP concurred with the proposal, but tribal representatives from the CSKT, Nez Perce and InterTribal Buffalo Council questioned the increase.

Why did these tribal members object to the increased culling? They objected, according to Lundquist, because they believed:

> Smaller herds could mean fewer bison leaving the park during winter, which would reduce the hunting opportunities.

Further, Lundquist wrote:

> Opening public lands west of the park to bison year-round could improve hunting opportunity, but the Board of Livestock is sitting on the environmental assessment that could lead to that (Lundquist, 2014).

Recall that the National Park Service on its website "Frequently Asked Questions: Bison Management" states this:

- Federal, state, and tribal members involved with the management of Yellowstone bison agreed to use hunting as the primary method for removing bison from the population. However, logistical and social challenges currently limit the effectiveness of hunting to a maximum of several hundred bison annually.

- During the winter of 2015, it is anticipated public and tribal treaty hunting in Montana will remove 300 to 400 bison, while another 500 to 600 bison could be shipped to meat processing or research facilities following capture at the Stephens Creek facility. Congress has specifically prohibited hunting within Yellowstone National Park.

- The plan is to capture and ship at least 50 to 100 bison per week from mid-January through mid-February without regard for age, sex, or disease status. Another 200 to 400 females (8 months to 5 years of age) could be shipped during the last two weeks of February and first week of March.

Reducing the bison population by hunting inside the park is out because, as NPS notes, "Congress has specifically prohibited hunting within Yellowstone National Park." But the NPS winks at what Congress also specifically prohibited with regard to the park, namely, "their capture or destruction for the purposes of merchandise or profit" (Yellowstone Act, 1872). The Stephens Creek capture facility is on park property and the captures are specifically for the profit of the cattle industry.

Why can't bison be harvested outside the park solely through hunting instead of shipping them to meat processing facilities? Apparently, because not enough bison can be killed by hunting only due to "logistical and social challenges," so a more efficient method of slaughter must be employed, namely, that method used at stockyards: capture in a corral, load onto a cattle truck, ship and slaughter. As NPS explained in its website referenced above:

- Hunting outside Yellowstone's park boundaries in Montana generally removes less than 300 bison each winter due to variable and often infrequent migration of bison outside the park until late winter when females are late in pregnancy and hunting of these females is considered undesirable. Also, there appears to be a social tolerance that will limit substantial increases in bison hunting and associated gut piles in places near the park boundary.

This passage is a tribute to governmental doublespeak. What the NPS is saying is that it must destroy 900 bison by mass slaughter that will include females (most of which will be pregnant) because hunting these migrating females "is considered undesirable." Making that kind of statement demonstrates that the writer of that passage and those approving that passage are either suffering from some kind of logical processing disorder or are being duplicitous.

The NPS doesn't give up in its quest to defend its rejection of hunting as a major bison limiting action. If hunting is substantially increased there may be "associated gut piles in places near the park boundary." Oh, horrors! Remedy: kill 900 bison in remote slaughter houses. Apparently, putting a pile of guts in a slaughter-house barrel is more acceptable.

This aesthetic qualm is surprising from the National Park Service, when the presence of gut piles serves to feed numerous scavengers, such as coyotes, grizzly bears and other bears, magpies, crows, ravens, wolves and vultures, not to mention species of fungus and bacteria. If some sensitive individual were to question the NPS or YNP officials concerning these bison gut piles, such officials could respond by explaining the ecological benefits.

Bison have been spilling their guts due to man since man began to hunt them. The image below, one of the first to depict a human being, shows a dead hunter next to a bison with its entrails flowing out from it. It was drawn over 10,000 years ago.

**Figure 51. A WOUNDED BISON. Pre-historic painting (c.15,000-10,000 B.C.) in Lascaux Cave, France. A wounded bison, intestines spilling out, stands over an apparently dead human figure. The scene has been interpreted as an appeal to supernatural forces rather than as a simple record of a hunting incident.** ***This image, "An Appeal to Supernatural Force" is free to use under the Creative Commons license (Hajar, 2015).***

However, there may be more than just an esthetic dislike of gut piles going on. Most likely the NPS reservation about having park visitors view bison gut piles is because in winter most female bison are pregnant. When killed at that time of year, their gut piles often contain a fully-developed calf fetus. Most likely, the public relations strategy employed by the NPS and the rationale for off-site slaughter is to prevent the public from seeing the result of their winter lethal removal of migratory bison. It is a case of "out of sight, out of mind," the idea being that no one will know and thus no one will care what goes on behind the closed doors of a slaughter house. Regardless, the result is often the discarding of fully-developed calves just weeks from birth. Rather than being left lying in a field, under IBMP management they are dumped in waste containers. As P.J. White, chief of aquatic and wildlife resources in Yellowstone National Park, notes, this way you get two with one kill. It is all a numbers game and when it comes to Yellowstone bison the government's game is population reduction.

**Figure 52. BISON CALF FETUS with umbilical cord and placenta intact in gut pile discarded by hunters north of Yellowstone National Park (Stachowski, 2014).** ***Photo courtesy of Buffalo Field Campaign.***

But something tells us something is wrong with this numbers-only perspective. For one thing, it lacks heart. Further, wilderness has a dignity similar to mankind. Wild animals resist domination. They thrive on freedom. We humans identify with wildlife in that regard and can find clues to our own nature by studying them, not only concerning their organic and chemical reactions, but also their emotional and behavioral components. We identify with animals, and wonder at the family relationships displayed by animals such as bison, that will not leave fallen members of the herd, as though in mourning, and will nudge and try to revive them.

But why should we care? Do we have moral obligations to animals? Emmanuel Kant in *Lectures on Ethics* thinks we do, at least indirectly. He reasons that if a dog has served his master long and faithfully, when the dog has grown too old to serve, his master ought to keep him until he dies. However, Kant states:

> If a man shoots his dog because the animal is no longer capable of service, he does not fail in his duty to the dog, for the dog cannot judge, but his act is inhuman and damages in himself that humanity which it is his duty to show towards mankind. If he is not to stifle his human feelings, he must practice kindness towards animals, for he who is cruel to animals becomes hard also in his dealings with men. We can judge the heart of a man by his treatment of animals (Kant, 1930, p. 240).

However, science can be used to justify inhumanity. The annual slaughter regimen is deemed necessary because, as the NPS website continues in its public relations effort:

- A panel of expert scientists reviewing bison and brucellosis issues in 2013 concluded that culling or removals of bison, along with hunting, would be necessary to limit the size of the bison population (Frequently Asked Questions: Bison Management, 2014).

What "panel of expert scientists" the NPS is referring to is not mentioned. But surely, this scientific panel would know what the word "culling' means. In biology, culling has been defined as the process of segregating organisms from a group according to desired or undesired characteristics. In animal breeding, culling is the process of removing or segregating animals from a breeding stock based on specific criteria. This is done either to reinforce or exaggerate desirable characteristics, or to remove undesirable characteristics from the group. For livestock and wildlife, culling often refers to the act of killing removed animals.

Central to the idea of culling is that it is used to achieve an objective. What is the objective here stated? NPS has a simple answer: "to limit the size of the bison population." That is it. Whether the culled animals are the most fit, the least fit, old, young, diseased, healthy is not a criteria. Whatever is headed toward the park boundary is a candidate for this limiting action. This is an example of IDIOTIC culling.

**The enclosure acts**

What is going on in the Greater Yellowstone Ecosystem is similar to the "enclosure acts" of the 18th and 19th centuries in England where a series of acts of Parliament enclosed open fields and common land in the country, creating legal property rights to land that was previously considered common.

An ecosystem is common property, like the village green and the common land in England. By providing to the cattle industry the legal muscle to control the usage of these common lands, they are robbing the public of their prior common right. What happened in England during the Industrial Revolution is happening here just outside Yellowstone National Park.

Back then, many landowners became rich through the enclosure of the commons, while many ordinary folk had a centuries-old right taken away. Land enclosure has been condemned as a gigantic swindle on the part of large landowners. In 1770 Oliver Goldsmith wrote *The Deserted Village*, deploring rural depopulation due to enclosure. An anonymous protest poem from the 17th century summed up the anti-enclosure feeling:

> The law locks up the man or woman
> Who steals the goose from off the common
> But lets the greater felon loose
> Who steals the common from off the goose.

George Orwell wrote in 1944:

> Stop to consider how the so-called owners of the land got hold of it. They simply seized it by force, afterwards hiring lawyers to provide them with title-deeds. In the case of the enclosure of the common lands, which was going on from about 1600 to 1850, the land-grabbers did not even have the excuse of being foreign conquerors; they were quite frankly taking the

> heritage of their own countrymen, upon no sort of pretext except that they had the power to do so (Enclosure, 2014).

Enclosing the land led to a number of revolts. One of the most famous was Kett's Rebellion, a revolt in the county of Norfolk, England during the reign of Edward VI in1549. It began when a group of peasants destroyed hedges that had been put up by wealthy landowners to fence off the common land for their own use. The rebel forces grew to 16,000, but eventually failed with 3,000 rebels being killed by the king’s army (Kett’s Rebellion, 2015).

**Figure 53. FENCING OFF THE COMMONS was accomplished by acts of enclosure, by law taking public land for private use. Here are the remnants of a hedge planted to fence the commoner out and sheep in, sheep owned by the nobility. These decaying hedges mark the lines of the straight field boundaries created by the "Plan and Apportionment for the 1768 Parliamentary Act of Enclosure of Boldron Moor" (Durham County Record Office) (Enclosure, 2015).** ***Creative Commons Attribution-Share Alike 2.0 Generic license. Attribution: Andy Waddington***

The heritage of hunting bison here in America has been going on for 10,000 years, but only in these latter years have hunting and harvesting this most valuable of wild ungulates been dominated by government forces. By law the Montana Department of Livestock can sell captured bison. By law the livestock industry can have cattle raised in a biohazardous environment under government protection. By law it can keep wild bison from leaving the park and entering public grasslands. By law, it can have wolves killed that might prey on cattle in a wildlife ecosystem and by law it is entitled to keep the profits for itself from the sale of cattle that graze on these public grasslands and from bison barred from these grasslands.

**A sensible solution**

The rationale for the massive culling by the government is, of course, the threat of brucellosis. Being that this is indeed the case, the key to insuring that interspecies transmission does not occur between various wild species in the park, such as bison and elk, and domestic cattle, plus increase the probability that this risk will more closely approach zero, is to create a livestock-free habitat around the park. To preserve the genetic diversity of wild bison, no culling by any entity, including the IBMP, should be permitted. To keep the bison herd at range capacity and to maintain the balance of nature, only wolf predation and the hunting of bison as migratory animals, just like elk, should be allowed to remove bison from the Yellowstone habitat, while hunting of the wolf should be banned in the GYE.

The idea is to separate such wild animals as bison from cattle and other livestock spatially and temporally so they cannot occupy the same space at the same time. Caged, fenced and free-range livestock promote zoonotic diseases and should not occupy a wildlife ecosystem. Hunting and wolf predation have a better chance of operating within the parameters of natural selection, where the less physically fit or the least fearful are easier prey. Such practices would help restore the wildlife integrity of the Greater Yellowstone Ecosystem as well as most efficiently and most economically promote the national security with regard to the transmission of such diseases as brucellosis, both in the same species and between species. Using bison to generate income via hunting and other fees would appear to be more profitable than cattle and other livestock here in the GYE. What should be studied is just how to do this so that it would be fair to the public, private property owners, business operators and their employees.

Such a plan should be given time to develop so that data can be collected. With the potential of highly positive outcomes, both for wildlife and for the people either living in, near or visiting the Greater Yellowstone Ecosystem, patience in monitoring the outcome of allowing wild bison to migrate into such areas as Gardiner Basin and the Hebgen Lake region should be exercised so that adjustments could be made.

Such adjustments could mean compensation of persons who have suffered property loss or damage by migratory wild bison, lethal removal of specific individual animals that pose a risk or the fencing of property to prevent damage. Where needed, the idea would be to protect or fence individual properties from bison damage, instead of the entire denial of bison from their migratory habitat by such methods as lethal removal or hazing. Dividing wild bison migratory habitat, either public or private, into various zones and sectors where bison can or cannot occupy within this or that space of time has proven not only unworkable, but harmful to the wildlife of the ecosystem.

Recall that in a report written in 2008 and updated this year, the National Park Service wrote:

> Simulations of migrations over the next decade suggest that a strategy of sliding tolerance where more bison are allowed beyond park boundaries during severe climate conditions may be the only means of avoiding episodic, large-scale reductions to the Yellowstone bison population in the foreseeable future (White, 2008 and 2014).

Many members of the community have been working toward these objectives. Such bison range expansion efforts have been ongoing.

By means of government and private efforts to increase grazing habitat for bison outside the park in these regions, land has been acquired, creating a patchwork of areas where bison can and cannot be. However, the complexity of such land-use designations is hard for humans to understand and control. And of course it is incomprehensible to bison, who do not have the capacity to recognize invisible property lines.

Recently, because a number of factors have changed since adoption of the IBMP, increasing year-round habitat has been studied for the Gardiner Basin and portions of Gallatin National Forest near West Yellowstone in the Hebgen Lake region. Alternatives included using mountain crests as a dividing line for the Gardiner Basin area, with the only way out other than crossing over the mountains being Yankee Jim Canyon, where fencing and a cattle guard discourage further migration. In the Hebgen Lake region, terrain habitually used by bison is being considered.

Modifications to the presently existing plan (IBMP) were under study by Montana's Department of Livestock and Department of Fish, Wildlife and Parks because some of the contested habitat areas were no longer occupied by cattle and because some grazing allotments had been closed to cattle. Further, APHIS has adopted changes to longstanding brucellosis regulations so that if an outbreak occurred, a cattle producer is no longer required to depopulate an entire herd nor would a state be automatically downgraded from a Brucellosis Class Free status (Draft Joint Environmental Assessment: Year-round Habitat for Yellowstone Bison, 2013).

**Stonewalling by the DOL**

But proposed alternatives to the plan were not "just right" for Montana's DOL Goldilocks. The joint proposal by the Montana FWP and the Montana DOL to expand the tolerance zone for bison outside of Yellowstone National Park was tabled indefinitely by the Montana Board of Livestock (BOL) May, 2014. It would have enabled bison to roam on as much as 421,000 acres of federal, state and private lands west and north of the park (Rice, 2014; Forrest, 2014). The status quo, lethal removal, by default remains the policy.

Over 100,000 comments from the public were received concerning the new plan. Apparently, the public's voice means nothing. Dr. Ralph Maughan, professor emeritus of political science at Idaho State University and president of the Wolf Recovery Foundation, commented in general about the conflict:

> It is the Montana Department of Livestock and certain politicians pushing us around and showing us their power by killing the bison that leave Yellowstone. It is a clash of cultural values and they kill bison to show who is really in charge in this area (Hudak, 2011).

Those who thought that the conflict between cattle and bison could be solved by more habitat are learning that the central issue is a numerical one: the acceptable number of bison in the park. That number, according to the wild bison population gurus, is about 3,000. The balance of nature, which would limit bison populations by weather (such as winter kill), range capacity and predation (such as by wolves and disease), has been discounted. Instead, government has placed itself in the role of Mother Nature. It will have tragic consequences. It is just a matter of time.

At stake is not only the health of the herds, but also their unique identity and composition as distinct species. What is troubling is that the government, via its interagency coalition, has launched a culling program without knowing specifically what it is doing or its effects downstream. All it knows and all it cares about is what it wants: no bison on cattle grazing lands outside the park.

**Herd composition**

For instance, some herds are affected more than others with mitochondrial disease. In bison, the disease is characterized by lethargy, lack of endurance and inability to "crater" in deep snow to obtain forage. Because of the policy to cull bison randomly, the government does not know if it is killing the relatively disease-free animals or the less fit ones.

Further, evidence indicates that the bison herds are a mixture of both plains bison and mountain buffalo. Pure mountain buffalo have been thought to be extinct in the United States. However, there is a possibility that some YNP herds in fact do not interbreed with other herds and that a pure mountain buffalo species may still exist in the remote recesses of the park. Reports of sightings of this animal, noted for its fear of humans, have been made. However, current park officials claim that mountain bison no longer exist in the park. Their claim is a fact-free statement. What is a fact is that this issue has never been studied by park scientists. It should be.

It is an urgent concern. Guide operations by outfitters leading pack trains into the remote regions of the park are thought by some to possibly be spooking mountain buffalo into joining other bison herds for protection. Killing bison solely because they migrate is indiscriminate slaughter. Government agents are in effect functioning as "loose cannons." Such stochastically administered culling this winter could not only include mountain buffalo, but remove genetic and behavioral traits contributory to survival of the wild bison.

Artificially limiting bison abundance to lower numbers could "hamper the conservation of this unique population of wild, free-ranging bison by adversely affecting the population's resiliency to respond to environmental challenges and genetic diversity," according to a joint study conducted by Yellowstone Center for Resources, National Park Service, Yellowstone National Park, Watershed Institute, California State University Monterey Bay; Department of Mathematical Sciences, Montana State University; Yellowstone Ecological Research Centre and Ames Research Center (Geremia, 2011).

As mentioned, the instinct to migrate consists of a complex of traits, including aggressiveness and learned behavior. Prohibiting migration tends to isolate herds. Isolated herds reduce individual and population fitness via inbreeding depression. Reduction of the size of one herd in the YNP will reduce the opportunity to cross-breed and hence the ability to restore genetic diversity for other herds.

What is going on at the borders of Yellowstone National Park is a form of genetic drift. Genetic drift—along with natural selection, mutation, and migration—is one of the basic mechanisms of evolution.

It can be credited for explaining how species evolved to have the traits they have, aside from natural selection and survival of the fittest. It is why the European wisent is a different species than bison on the North American continent. It did not evolve to become a different species because it was more fit than the American bison. Instead, because of the closure of the Bering Land Bridge by the rising sea the two groups did not have a chance to interbreed and thus diverged.

The present American bison in turn experienced another profound isolation from its historical main herd when that herd was reduced during the great buffalo slaughter of the late 1800s from millions to a few individuals inhabiting the Yellowstone region. Lost with those millions were an indeterminate number of genes, reducing the reservoir from which adaptive traits could be drawn.

The Yellowstone herd most likely survived because of the presence of thermal pools in their habitat. Buffalo hunters, and later poaches, shot every bison they could find at any season, but because of the deep winter snows, the Yellowstone bison were able to survive the winters high in the mountains by gathering around the thermal pools and on the warm thermally heated ground where forage was available, free from snow.

And now a programmed genetic depletion is being orchestrated by the IBMP. This is genetic drift with a triple whammy. What is important to understand is that genetic drift has nothing to do with natural selection and survival of the fittest. In fact, in the case of the IBMP's removal of bison from the breeding pool by means of culling, it is probable that the most fit are among those killed and the least fit survive, that is, those that do not cross the invisible line of the park's boundaries—those that stay behind, the non-migratory, those that stay put, which could include the aged, the diseased, the more docile, the less wild.

Once they are gone there is no getting them back. "They" not only refers to the bison killed, but also to the genes lost with them. It is not just that the migratory behavior has been weeded out by such lethal actions, but that those traits associated with such behavior are also being destroyed.

The experience gained by past management of the wild herd of bison in the park, by park, state and federal agencies, has demonstrated that the various conflicting interests in this wildlife species have defaulted to cattle interests. They are now running the show. Their economic interests in the wilderness region preempt all others. This is demonstrated by their ability to have their livestock remain in the ecosystem and by their ability to dictate the removal of any migratory bison from their government-subsidized and protected grazing plots adjacent to the park.

Bison are naturally migratory in the wild. That is a biological fact. That instinct, due to governmental over-reach, has become the wild bison's death sentence. The winter of 1996–1997 was one of the three harshest winters of the 1900s, with abundant snow, cold temperatures, and a thick ice layer in the snowpack. Unable to access the forage under the ice, more than 1,000 bison left the park and were shot or shipped to slaughter amid concerns they could transmit brucellosis to cattle in Montana (Yost, 2014).

It is a travesty of wildlife management that the park's wild population of bison is not allowed to migrate. There is no good reason why cattle should be allowed to graze near a wildlife sanctuary inside a national forest if there is a concern regarding brucellosis, which cannot be controlled in the wild by stockyard methods without obliterating wilderness. Formation of the IBMP, which was supposed to rectify this bias, only perpetuated it. By not withdrawing grazing permits in these areas of the GYE in the face of a wildlife brucellosis threat to cattle, the government has been derelict.

Further, since cattle are the main reservoir of brucellosis in the first place and since cattle infected bison to begin with, wildlife sanctuaries such as the GYE should be protected from those pathogens known to be transmitted by cattle. This means creating space between cattle and the GYE wilderness, including Yellowstone National Park.

This is important when one considers the number of wildlife species susceptible to brucellosis. Records of susceptibility to brucellosis has been documented in a multitude of wild animals, including rats, rabbits, mink, foxes, coyotes, sparrows, magpies, crows, pigeons, pheasants, turkeys, geese, fleas, house flies, mosquitoes and bedbugs (Hayes, 1977).

Bias among wildlife managers and in brucellosis epidemiological studies can be seen in such statements as the following:

> Disease management at the wildlife-livestock interface is hampered by the challenge of balancing wildlife conservation with the livelihoods and traditions of livestock producers. The potential for disease transmission between wildlife and livestock exacerbates conflicts between natural resource managers and cattlemen, reduces tolerance for wildlife near livestock operations, and negatively impacts conservation. *Therefore*, diseases that affect both wildlife and livestock are important in resource management, *regardless* of their direct impact to the wild animal populations which may serve as their reservoirs (emphasis added) (Schumaker, 2010).

This statement is found in the 2010 study "A Risk Analysis of *B. abortus* Transmission among Bison, Elk, and Cattle in the Northern Greater Yellowstone Area" produced by the Center for Animal Disease Modeling and Surveillance (CADMS), the Wildlife Health Center and the California Department of Medicine and Epidemiology—all the latter affiliated with the University of California, Davis—as well as Yellowstone National Park and the Montana Department of Livestock. Authors are Brant A. Schumaker, Jonna A.K. Mazet, John Treanor, Rick Wallen, Ian A. Gardner, Martin Zaluski, and Tim E. Carpenter.

The "therefore" statement in the above quote is revealing. It concludes that the methods used to manage diseases such as brucellosis are important "*regardless* of their direct impact to the wild animal populations which may serve as their reservoirs" (emphasis added).

By the use of the word "regardless," this is saying, in effect, that even if the obliteration of certain segments of a wildlife population is necessary to control such a disease as brucellosis in a captive population of domesticated animals such as livestock grazing near that wildlife source, go for it.

Carrying this philosophy to its logical conclusion, one can justify what is going on in Yellowstone National Park. Under this "regardless" mindset, the vast majority of bison migrating down from the high altitudes of the park are routinely diverted into capture facilities such as the Stephens Creek corral. From there they are transported for slaughter.

When bison migrate today in the park, without exaggeration, they migrate into a slaughter house. This practice is the industrialization of their killing. What is being done is tantamount to driving all bison migrating out of the park over a cliff, year in and year out, for the last several decades. It will have a catastrophic effect on the genetics and behavior of America's last wild bison, animals deemed necessary to preserve because of their high level of genetic diversity.

Their destruction as wildlife is easy enough to accomplish and can be done by riders on horseback and in vehicles because in the bison's migratory determination to get to a destination (in migratory lingo called "persistent and straightened out movement") they lose all fear.

Such lethal removal of wildlife is deemed necessary in the case of bison to prevent the spread of disease, reports claim. As the Schumaker report states, billions of dollars have been spent eradicating brucellosis from livestock in nearly every state, but multiple recurrences of bovine brucellosis, caused by the bacterium *B. abortus* in the states surrounding the greater Yellowstone area "have greatly complicated the eradication effort." Wild, free-ranging bison and elk in the GYA persist as the last known reservoir of *B. abortus*-caused brucellosis in the US, the study states.

The big problem is the overlap of the range of bison and elk with cattle. "The proximity of cattle-grazing to wildlife populations makes interspecies disease transmission a concern," the report observes.

There is another problem, too, namely the size of the wildlife populations of elk and bison. But, the study asks, what is the bigger contributor to this problem—elk or bison? The answer: elk:

> In addition to overlap, the major contributors to risk were wildlife population size and the number of elk that were shedding Brucella bacteria. While elk currently have a lower density of shedding events throughout their range, they have a larger spatio-temporal overlap with cattle and are more tolerated by managers and livestock keepers on public grazing allotments. Thus, the predominant source of risk to cattle in the northern portion of the greater Yellowstone area is from elk. With increased disease prevalence due to increased winter densities or other factors, elk are likely to contribute greatly to the overall level of bacterial shedding on the northern GYA landscape (Fig. . . . [54]) and will continue to represent the vast majority of risk of *B. abortus* exposure to cattle grazing in the northern portion of the GYA. Therefore, brucellosis management efforts should focus more on the comingling of cattle and elk during the critical abortion period to more effectively decrease risk of transmission (Schumaker, 2010, pp. 53-54)

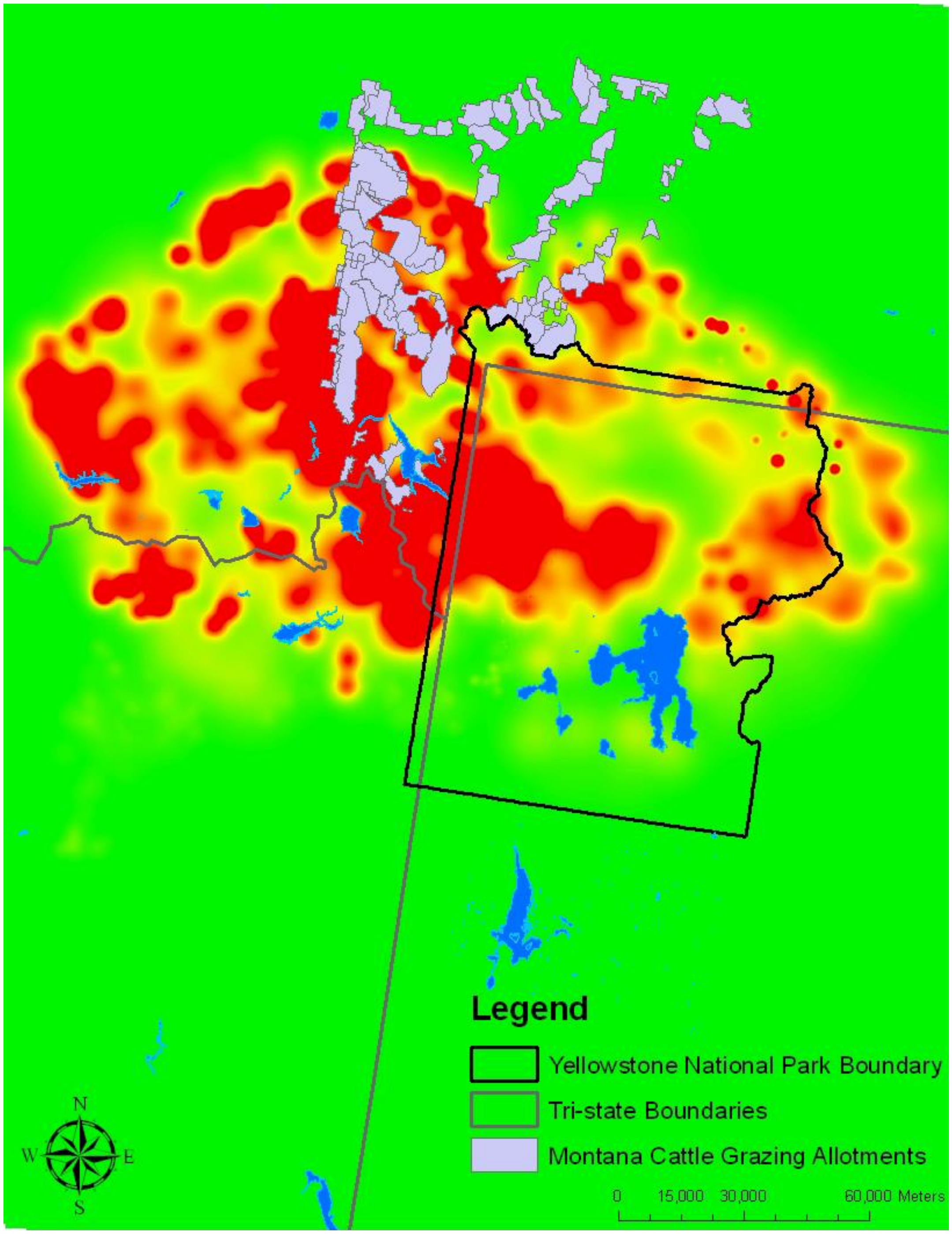


**Figure 54. MAP OF TOTAL *B. ABORTUS* SHEDDING EVENTS from bison and elk populations during June in the northern portion of the greater Yellowstone area based on an average winter. Red areas indicate higher levels of shedding while yellow areas indicate lower levels of shedding. Montana cattle grazing allotments are in grey (Schumaker, 2010, p. 69).**

This map graphically pictures the problem—Montana cattle grazing allotments in the middle of a wildlife ecosystem of both bison and elk rampant with brucellosis shedding events.

There are two ways to eliminate comingling—either remove the elk and bison from the range or remove the cattle. There are no other solutions except the delusion that there are other alternatives.

Regions other than the northern portion of the greater Yellowstone area have chosen to handle this problem differently. Take, for instance, the southern greater Yellowstone area—the Grand Teton National Park region.

In a 1992 article headed "Ruling could restrict bison, elk movement" in the magazine *Feedstuffs*, it reported that:

> A federal judge has ruled that two U.S. agencies were at fault in not restricting movement of brucellosis-infected bison and elk herds roaming the Grand Teton and Yellowstone National Parks in northwestern Wyoming. The ruling, handed down here by Judge Clarence Brimmer, found that the National Park Service and U.S. Fish & Wildlife Service did not sufficiently limit the herds' sizes. He explained that the herds grew larger than the parks could support, forcing infected bison and elk outside the parks in search of food. Brimmer's ruling came on a suit brought by the Parker Land & Cattle Co., which claimed the bison and elk infected its cattle, causing them to abort fetuses and requiring their destruction. However, Brimmer did not award damages to Parker, saying the ranch, which grazes on adjacent forest service land, did not prove the cattle were infected by the wildlife.

This ruling was not to the liking of either the public land ranchers or the park and wildlife services, for it meant that either bison and elk must go, or cattle must go. The article continues:

> The ruling also could turn out to be contrary to Parker's and other ranchers' interests, according to government officials and public lands ranchers who submitted supporting briefs or testified in the case. The park and wildlife services suggested that the ruling means they either must destroy bison and elk because brucellosis vaccines effective for cattle are not proven to work for bison and elk, or they must withdraw public grazing permits on nearby land (Anon., 1992).

Oh, goodness gracious, what have we gotten into, all wondered after the decision. We can't destroy the bison and the elk for they are a big part of the park's income as well as the state of Wyoming's, with funds being generated from tourism and elk hunting. Worse was the alternative facing the wildlife services: withdraw public grazing permits on nearby land.

Maybe we can forget all this brouhaha, they in effect said, and that is just what all concerned in this conflict did. Wyoming, unlike Montana, has not made it illegal for bison to cross park lines. They can migrate into Wyoming.

Since it has proven impossible and unrealistic to attempt to eradicate brucellosis from such a vast wildlife ecosystem, the most sensible and the most economical solution to reduce spillover of brucellosis from bison and elk to cattle is to contain that disease within the Greater Yellowstone Ecosystem. The only way to do this is to prohibit cattle from grazing on these plots bordering the park.

The reason for the immense complexity and controversy surrounding the seasonal movements of wild bison, and now elk, is solely the fear of the spread of brucellosis to cattle. With cattle removed, that fear is gone. The various plans proposed over the years, usually dubbed alternatives A, B, C, etc., with boundaries drawn here and there and everywhere, and then subdivided into zones, will all fail because the demarcations and restrictions need the interpretation of lawyers to understand and obey, and bison can't afford lawyers.

Historically, wild bison followed the Madison River and the Yellowstone River down from the higher altitudes in winter to obtain forage, then migrated back again after calving in the spring. With the Hebgen dam along the Madison and the bottleneck at Yankee Jim Canyon on the Yellowstone River, natural restrictions exist that discourage bison from following these river courses to the full extent of their original historical range.

It would be of great value to let bison migrate naturally over a period of time, exploring with them how their population grows, where they travel, when they return—with wolves, weather, disease, range-capacity governing them, that is, Mother Nature, instead of the IBMP. Problems arising from this experiment could then be studied and addressed. The data would be invaluable and give field biologists something to go on beside assumptions.

Further, having government agencies provide the slaughtered Yellowstone bison to American Indian tribes and tribal organizations, as proposed by the NPS, is insulting for historical reasons and economically wasteful. Instead of ship and slaughter by the government, only American Indian tribes, tribal organizations and non-tribal hunters should be utilized in the harvest of wild bison.

**At the "deliberative table" of the IBMP**

At a meeting of the Interagency Bison Management Plan partners July 30, 2014, which established the lethal removal of 900 bison this winter (2014-2015), the pros and con of hunting versus ship and slaughter was debated.

The nine partners attending the meeting were Don Herriott (APHIS), Leonard Gray (CSKT), Ervin Carlson (ITBC), Christian Mackay (MBOL), Martin Zaluski (MDOL), Pat Flowers (MFWP), McCoy Oatmann (NPT), Daniel Wenk (NPS-YNP), and Mary Erickson (USFS-GNF). In addition to those at the "deliberative table" were about 20 staff members from across IBMP organizations and about 25 members of the public.

The meeting provides a window into some of the thinking within the IBMP. According to a summary of the report, the meeting opened accordingly:

> Germaine White, CSKT Information and Education Specialist, introduced Tony Incashola who offered an opening prayer and invocation, including some words in his native tongue. Tony introduced the drumming group Yamncut, who provided two songs, one of which was the *Calling Buffalo Song*. Ron Trahan, current CSKT Tribal Council Chair, next welcomed the IBMP Partners on behalf of the Tribe. Ron said that the drumming was a good way for good people—as all those assembled here were—to start the day. It is also good, he said, to work to bring back bison, the animal that has always protected and fed us.

The last sentence is key, that is, that it is good "to work to bring back bison, the animal that has always protected and fed us." Here in America, prior to European settlement, millions of bison on the plain fed the human population here and provided the basic elements of life. While wild bison here in the New World were utilized, in the old world they were exterminated.

Being that there are now 500,000 bison on the plains, what could be meant by "work to bring back bison, the animal that has always protected and fed us"? The half-million bison referred to are privately-owned animals behind fences raised for commercial purposes, for meat production and docility. They are not wild. They do not migrate. They are not publicly-owned animals as are ungulates such as elk that migrate and can be hunted. One can obviously not go onto a bison ranch and shoot a bison to gain possession of it, just as one cannot go onto a cattle ranch and by shooting a cow take possession of it, yet this can be done with wild bison coming out of YNP.

This is a fundamental difference and central to the conflict between the cattle industry and the bison culture.

The meeting summary reported answers to a number of questions related to the harvesting of 900 wild bison. Some questions and answers follow:

**Is the recommended harvest of 900 animals realistic?**

> PF [Pat Flowers] agreed that 900 seemed reasonable. He said that in addition, he believed that 300-400 animals allowed in the Gardiner Basin was about the limit of what was possible before conflict, public safety, and social stress issues snowballed.
>
> NPS reminded the Partners that it is not only the overall number of bison harvested, but the sex ratio that matters in population control . . . Several Partners argued that (a) the population should not be allowed to spike upward, the swings and resulting need for huge harvests some years is socially unacceptable, and (b) that while we might not be able to get there all at once we should year-by-year design the harvest plan to continuously lower the bison population toward . . . [sentence not finished].

**What is the IBMP population goal for bison in YELL [Yellowstone National Park]?**

> This discussion went in circles, with numbers ranging from 3000 to no limit. Some said that the forage base is not sufficient for the current number, others said that the bison harvested even given last year's high population and hard winter were in excellent health. Comments were made that improving habitat through range restoration, and expanding habitat such as available through the West Side EA [Environmental Assessment] . . . would allow for more bison. Statements were made that the Partners are currently operating under the mandates of the 2000 ROD [*Record of Decision*], meaning a goal of 3000, and that to change it meant going through an AM [Adaptive Management] change. For a longer term goal, many said that such a discussion will happen under the new EIS [Environmental Impact Statement] . . .

Some Partners said that they were not clear what the long term trend for YELL [Yellowstone National Park] bison population should be: decreasing, stable, or increasing.

This discussion had no resolution. In the end, there appeared to be agreement on only three numbers: the 2000 ROD indicates a goal of 3000; the average number of bison in YELL since the 2000 ROD has hovered around 4000; and the current number of bison in the Park is roughly 4800.

**What if there are not 900 animals that come out of the Park?**

Partners recognized that if the upcoming winter is mild, it is possible not as many bison will come out of the Park. RW [Rick Wallen] stated that after ~ [about] 30 years of data, NPS can predict that with numbers alone (2500 central herd, 3500 northern herd) that animals will migrate out of the Park.

Notwithstanding that comment, Partners asked, is it possible that there will not be enough out-migration to harvest (hunt, ship and slaughter) 900 animals? What then? Won't we then potentially risk having huge numbers the next year and thus a potentially huge outmigration two years hence?

This same question was asked in many different ways. And over the course of the discussion, multiple responses were presented. Those answers are captured below, though with the recognition that these ideas were presented in what was effectively a brainstorming session and none of these ideas had 100% Partner consensus:

- Hunt inside the Park. DW [Dan Wenk] stated that this activity would be outside NPS mandate, plus would result in large public opposition. EC [Ervin Carlson] stated that if allowed, the tribes would carry this activity out in a respectful way.
- Animals move on their own away from the northern boundary. A Partner asked if there is any possibility that members of the Northern Herd might move to the Central Herd, thus decreasing pressure on bison to migrate into the Gardner Basin. NPS responded that while anything was possible, in fact in recent years the trend has been for the Central Herd animals to move into the Northern Herd. PJ [P.J. White] noted that NPS does not understand why, that's just what they have observed.
- Drive animals out of the Park (i.e., "haze to trap"). Those bison, then, would be available for hunting and/or ship and slaughter. Comments were provided that this activity would result in large public opposition. Also, hazing animals to push them outside the Park required a bigger conversation, DW [Dan Wenk] noted, for example because of the interplay with animals being pushed back into the park by hunting. The two management efforts do not stand in isolation.

- Allow the bison population to spike again and deal with it in the following years. Many spoke to the concern that large population swings ultimately lead to a large out migration at some point, with subsequent need for large ship and slaughter operations (plus public safety and other concerns) that are socially unacceptable to many in the public.
- Is an increase in winter kill possible? One Partner asked if a harsh winter might increase calf mortality, thus lowering the bison population. DaveH [David Hallac] said not likely, that current survival rate for bison calves over winter is high even in harsh winters—0.6 for bison calves versus 0.3 for elk fawns.
- Is use of operational quarantine and then translocation of live bison to tribes possible? No because (a) the two pastures at Corwin Springs are not available, and (b) the operational quarantine facility concept is just starting into an EA review now, so surely not available this year (the only possible streamlining of the process would come if an existing facility is found rather than starting from scratch . . . ). ITBC stated their support of transfer of live bison to tribes as a goal that should be prioritized over ship and slaughter once operational quarantine is available.

**How many animals can be taken by hunting?**

And if insufficient animals come out of the Park, how do we prioritize hunting versus ship and slaughter? A discussion, again without resolution, proceeded regarding the maximum number of animals that could be reasonably harvested by hunting, and whether hunting should be considered the priority. Some noted that 400 seemed to be the capacity that could currently be met both with hunters available, and for social acceptance in park boundary areas. PF stated that even 400 might be ambitious. RW agreed. MO [McCoy Oatman] noted that the NPT have met their hunting goal and want to maximize the hunt as a priority. He and TM [Tom McDonald] disagreed that we are at the maximum hunt harvest since tribal hunts are new since 2007, and that their hunters are becoming more and more efficient. JH [John Harrison] noted that the tribes don't think of hunting as a tool whose goal is for population control. Instead they would like to hunt to replace ship and slaughter.

RW stated that hunters take 2-3% of animals that migrate into the Gardiner Basin. The rest often go back until pushed back out by pressure from other bison, or pulled back out by bison who have not been out and been hunted yet.

Opinions of equal fervor were put forward championing hunting (e.g., treaty rights, not yet maximized, more socially accepted) over ship and slaughter (efficiency, ability to handle higher numbers of bison) as a priority. No resolution was reached. But several ideas were mentioned for possible consideration:

- Allow capture for ship and slaughter early in the season—assuming animals come out—before the hunt moves into full swing.

- Can more tribal groups be allowed—whether via currently unused treaty rights or otherwise—to hunt?
- Can we haze animal to, for example, Cutler Meadows to make them more accessible to hunters?
- Can we stagger the hunts (tribal and state) to say hunt 3 days, then rest 4 days, to allow the bison more time to move out of the Park, feel less harassed, and thus be more available?
- What if for the north side we did an AM change similar to the west side; i.e., with time and number targets? For example:
- Dec – Jan 1: all bison that come out of the Park are allowed to pass. Hunt allowed only in Cutler Meadows and Eagle Creek, nowhere else, to allow animals to better disburse away from the Park.
- Jan 2 – Mar 31: Capture and ship some animals. Let some pass for the hunt, which is allowed in all areas. Use the guideline of 300-400 animals as the maximum allowed in the Gardiner Basin (includes Eagle Creek) to begin stopping all animals at the Park boundary. The 300-400 animal guideline is used as sufficient to serve the needs of hunters, while minimizing safety issues and bison-associated social conflicts in the Gardiner Basin. (It was noted during the discussion that based on last year, shipments to slaughter are only expected to occur in February and/or March.)
- April 1 on: If there are greater than 400 animals in the Gardiner Basin, capture and hold the animals until May 1, then release them back into the Park.

**How do we distribute the animals destined for ship and slaughter?**

DaveH noted that the logistics of ship and slaughter may be the biggest issue that the Partners face. To date, only ITBC and CSKT have been takers for animals in the ship and slaughter program. NPS can capture the animals. From there, NPS needs Partners to provide transportation, security, processing, and distribution.

**How do we accomplish harvesting 900 animals?**

The Partners expressed some concern about the how the harvest might break out, even given that enough animals come out. CM led a discussion to come up with a potential breakdown, based on last year's results and this year's expectations. The numbers that follow were the Partners best guesses, and only that—they do not reflect commitment at this stage by any Partner:

- 300 Hunt (combined state and tribal, recall NPS goal of focus on cows)
- 150 Ship and slaughter (ITBC, funding concerns noted)
- 450 Ship and slaughter (CSKT; popular program; likely could increase their take of these animals from last year; Tribal Council has stated that it is critical not to take pregnant females)
- 35 Research (APHIS)
- ? Ship and slaughter (NPT, uncertain pending tribal council allocation)

[Total:] 900+ animals

> JS [Jim Stone] noted that bison ship, slaughter, and package came to ~$330 per animal. Several Partners stated that this cost seemed reasonable, and might open up other avenues for final bison disposition, including (no order of preference intended): other tribes (e.g., other treaty hunting tribes or 26 affiliate tribes of YNP), Montana food bank networks, USDA food programs for tribes, contacts available from APHIS from when they managed the ship and slaughter program, and/or the general public.

In my opinion as the petitioner, of all the statements made, the two succinct comments that make the most ecological sense were by John Harrison, who said that:

1. ". . . the tribes don't think of hunting as a tool whose goal is for population control. Instead they would like to hunt to replace ship and slaughter,"

and by the Tribal Council that stated:

2. ". . . it is critical not to take pregnant females."

The second point is in direct opposition to the goal stated at the meeting by White, Yellowstone National Park, who

> . . . explained that the key for population control is the number of cows removed. Since one bull can mate with many cows, removal of one bull results in only one animal gone; removal of one cow is the equivalent of removing two animals—the cow and its calf of the next year (p. 4).

Hunting was used instead of ship and slaughter in the past and it can be used again if structured and regulated properly.

Recall that the report mentioned:

> Opinions of equal fervor were put forward championing hunting (e.g., treaty rights, not yet maximized, more socially accepted) over ship and slaughter (efficiency, ability to handle higher numbers of bison) as a priority. No resolution was reached (Bischke, 2014).

That no resolution was reached time and again in the meeting set to establish the parameters for the culling of 900 bison is indicative that the IBMP is in over its head. They should defer to Mother Nature. As mentioned, trying to run nature as a centrally-controlled administrative effort will fail just as communism failed. Something as complex as an economy must run on its own. The same goes for nature.

The only resolution that makes sense is not allowing cattle and other livestock on private and public properties near the park, for such invasive species, under the protection of humans, promotes an artificial environment that can never be self-controlled and thus will always be out of control. As mentioned, the only way to economically and effectively control the interspecies transmission of diseases between cattle, elk, bison and other wildlife, as well as maintain a balance of species populations without doing harm to the ecosystem, is to leave things alone and let nature function. By doing so there would be no need for the IBMP's "efficiency" and "ability to handle high numbers of bison" by means of ship and slaughter. By such a ban, hunting and wolf predation by default become the most effective method of restoring the balance of nature within the Greater Yellowstone Ecosystem. In doing so, the public will once again be able to observe wild bison that are truly wild, as well as put meat on the table without it being a government handout, or have it stolen by the government via ship and slaughter.

**A question**

In retrospect, the NPS should post the answer to another question on its "Frequently Asked Questions: Bison Management" website. That question is this:

> **How do you propose to reduce to zero the risk of transmission of brucellosis from wildlife in Yellowstone National Park to cattle just outside the park by lethally removing only migratory bison, when migratory and resident elk pose the greatest threat of brucellosis transmission?**

I challenge the agency to answer that question. If it cannot, it should allow bison to migrate from the park just like elk, ban cattle from the Greater Yellowstone Ecosystem to promote the national security regarding disease control and participate in disbanding the IBMP or withdraw from it.

Further, the FWS should grant this petition for the listing of Yellowstone's wild bison as endangered if its biologists, epidemiologists or anyone else cannot provide an answer to that question. The lack of an answer would show the IBMP for what it is, an interagency whose actions are based on wishful thinking, united in its opposition to reason, merely performing illusionary brucellosis containment instead of science, with the net result of its continued actions being the extinction of the wild Yellowstone bison.

Only listing Yellowstone wild bison as an endangered species or population segment will protect this iconic animal from the bureaucratic extermination program mounted by the various governmental agencies involved in the IBMP, a program that left unchecked will lead to the extinction of the last of the wild bison.

**Value of bison to the nation and its people**

Under the Endangered Species Act of 1972 Congress declared that:

> (1) various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation;
>
> (2) other species of fish, wildlife, and plants have been so depleted in numbers that they are in danger of or threatened with extinction;
>
> (3) these species of fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people;

(4) the United States has pledged itself as a sovereign state in the international community to conserve to the extent practicable the various species of fish or wildlife and plants facing extinction . . . (Endangered Species Act, 1972).

Let us examine more closely item number three.

**Ecological history of megafauna and humans**

One of the stated objectives of the ESA is to protect species from extinction that have ecological, historical and cultural relevance to the people of our nation. We have looked at this issue briefly. Let us look at it more closely. With regard to megafauna, our relationship to these large animals has been recorded by humans as far back as 30,000 years ago, first on the Eurasian continent, then here on this continent, beginning 10,000 years ago when people came here across the Bering Land Bridge.

We, the human species, once lived in a land of monsters. We were the hunters, the hunted and often the haunted. We lived in fear of some of these huge creatures. Some claimed our lives. We depended on others for our survival. We know about this past because it has been recorded on the walls of caves and cliffs by our ancestors. Pictographs have provided us a historical record of our relationship to these large beasts.

On a wall in the end chamber in the Chauvet Cave, its entrance located high up on a limestone cliff in Southern France, is a drawing of a bison. Its massive hump, its head, horns, body and legs are outlined in charcoal on the smooth surface of the ochre walls. The wall also shows claw marks presumably made by a giant bear that also inhabited the cave. Bear bones are strewn on the floor.

Here paintings abound. There are images on the walls of horses, lions, rhinoceroses, ibex, reindeer, red deer, musk oxen, panthers, owls, hyenas, cave bears (which are much larger than grizzlies) and aurochs (huge, wild cattle, the ancestors of domestic cattle). There are human palm prints, looking like large red dots, and red hand stencils.

The cave was discovered on December 18, 1994 by Jean-Marie Chauvet and his two friends Eliette Brunel and Christian Hillaire, all speleologists. As they were leaving, Brunel looked up and saw on a rocky spur hanging from the ceiling a drawing in red ochre of a small mammoth. She exclaimed to her companions on seeing the figure: "They were here!"

And indeed, they were here—both man and animals were here together in this ancient world. These paintings are the first human record of man's encounter with such creatures, often described because of their large size as "megafauna." Many of the images are of extinct species, including the mammoth, cave bears and aurochs. The images, according to radiocarbon dating, were drawn up to 30,000 years ago (The Chauvet Cave, 2015), (Chauvet Cave: France's Magical Ice Age Art, 2009).

Nearby, in a cave in Lascaux, France are the silhouettes of four hunters facing a herd of eight deer. Their bows are drawn. They seem to be almost dancing as they shoot. Several arrows are sticking out from the chests of two deer. The drawings were done between 15,000 and 17,000 years ago.

On the canyon walls in Horseshow Canyon, Canyonlands National Park, Utah, is a drawing of what appears to be a huge bison and behind it, two deer. A stick figure with a bow is aiming an arrow at it. It is estimated to have been drawn between 2,000 BC and 500 AD. Pictographs such as these have been found throughout the world.

But there is more than pictographic evidence of megafauna. Frozen mammoths have been found intact on the Arctic coast in Siberia. One can get the sense of the actual presence of megafauna by the vivid descriptions of their discovery. In *The Mammoth and mammoth-hunting in North-east Siberia* by Bassett Digby, the finding of one such mammoth was recounted in a letter by a Russian surveyor named Benkendorf, writing in 1846. He and his associate had come across a form in a river at flood stage that they could not quite make out.

> At last, however, a huge black horrible mass bobbed up out of the water. We beheld a colossal elephant's head, armed with mighty tusks, its long trunk waving uncannily in the water, as though seeking something it has lost. Breathless with astonishment, I beheld the monster hardly twelve feet away, with the white of his half-open eyes showing.
>
> "A mammoth! A mammoth!" someone shouted…
>
> Picture to yourself an elephant with a body covered with thick fur, about 13 ft. in height and 15 ft. in length, with tusks 8 ft. long, thick and curving outward at their ends. A stout trunk 6 ft. long, colossal legs 1-1/2 ft. thick, and a tail bare up to the tip, which was covered with thick tufty hair.
>
> The beast was fat and well grown. Death had overwhelmed him in the fullness of his powers. His large, parchment-like, naked ears lay turned up over the head. About the shoulders and back he had stiff hair about a foot long, like a mane. The long outer hair was deep brown and coarsely rooted. The top of the head looked so wild and so steeped in mud that it resembled the ragged bark of an old oak. On the sides it was cleaner, and under the outer hair there appeared everywhere a wool, very soft, warm and thick, of a fallow brown tint. The giant was well protected against the cold.
>
> The whole appearance of the great beast was fearfully strange and wild . . .
>
> In the teeth and stomachs of frozen Siberian mammoths have been found remains of fir cones and branches of fir, larch and pine, sedges, wild thyme, Alpine poppy, buttercup, two kinds of moss (Hypnum fluitan and Aula comnium turgidum), and also the following plants: Beckmannia cruciformis, Agropyrum cristatum, Horedeum violaceum and Oxytropis sordida. All these later plants, traces of which were found in the teeth and stomach of the Beresovka mammoth, grow in the region today, indicating that the climate was neither colder nor warmer than it is now (Digby, 1926, pp. 99, 101, 148).

But now, that wild creature is gone. If it had managed to exist to the present, it most likely would be under the control of the Interagency Mammoth Management Plan.

Mammoths inhabited the upper Great Plains. Mammoth bones have been found at a site about 400 miles from Yellowstone National Park in Glendive, Montana.

In July 1966 a farmer was operating a combine along a road near Glendive following a heavy rain. He noticed a whitish substance that had been exposed by road construction. Examining it, it appeared to be a large tusk. A team headed by Lee Davis, a pre-doctoral student in North American archaeology at the University of Calgary, excavated the site, finding beneath the road the fossil skeleton of a mammoth that had died 11,500 years ago. It was a mature bull about 45 years of age at death, towering 14 feet at the top of it skull. The 150-pound right tusk measured nine feet in length along the outside of the curve and eight inches in diameter where it joined the skull.

Some of the bones appeared to be stacked in a pile. Eight sandstone blocks were found beneath the skeleton. Some of the bones had been smashed. But what caused its death could not be determined (Davis, 2012).

At another site near Indian Creek in the Elkhorn Mountains west of Townsend, Montana, about 150 miles from the park, a Clovis point, channel flakes, and numerous cutting and scraping tools were excavated 24 feet below the present ground surface, left there 11,000 years ago.

Near the South Fork of Deer Creek, north of the Yellowstone River, silts containing mammoth remains have been found dating back to 12,300 radio carbon years before the present (about 14,000 years ago) (Hill, 2015).

Along Shields River, a tributary of Yellowstone River, near Wilsall, Montana, about 80 miles north of the Gardiner Basin and just outside Paradise Valley, is a Clovis burial site called the Wilsall-Anzick site. Here, ocher-covered bones and the cranium of a child, along with other artifacts, were discovered (Davis, 2012).

Artifacts included large bifacial flake cores, smaller bifaces, Clovis points, Clovis point blanks, flaked stone items, and polished and beveled cylindrical bone tools or tool parts. The assemblage was located at the base of an escarpment in what appeared to be a collapsed rock shelter at the end of a long hogback. Overlying deposits contained many bison bones and apparently document use of the escarpment as a bison jump in late prehistoric times (Wilke, 1991).

The human bones of the male infant recovered from the Anzick burial were found to be about 12,500 years old and were directly associated with Clovis tools. The infant's genome was sequenced by a team led by Morten Rasmussen of the Centre for GeoGenetics, Natural History Museum of Denmark, University of Copenhagen. As reported in *Nature* in "The genome of a Late Pleistocene human from a Clovis burial site in western Montana," the study showed that the gene flow from the Siberian Upper Palaeolithic Mal'ta population into Native American ancestors is also shared by the infant. It also showed that the infant is more closely related to all indigenous American populations than to any other group and most probably belonged to a population directly ancestral to many contemporary Native Americans (Rasmussen, 2014).

**Figure 55. BONES OF A CLOVIS INFANT were discovered buried at the base of this escarpment near Wilsall, Montana by the Shields River, a tributary of the Yellowstone River. Bones of bison were also found at the base, indicating this was an ancient bison jump over which Clovis people stampeded bison so as to trap and kill them. Man with horse at top for perspective.** ***Release to public domain by author James Horsley.***

Throughout North America the fossil record tells an intriguing, yet disturbing story. At the La Brea Tar Pits in Los Angeles the fossilized bones of a wide array of now extinct herbivores have been recovered, such as the Imperial mammoth, Columbian mammoth, American mastodon, three species of ground sloth, Giant bison (bison latifrons), Ancient bison (bison antiquus), American camel, stilt-legged llama, Western horse, Mexican horse and California tapir. There were also carnivores such as the American lion, scimitar cat, sabre-toothed cat, jaguar, American cheetah and dire wolf. (La Brea Tar Pits, 2015).

We have drawings of them. We have their frozen bodies. We have their fossilized remains. But we do not have them. They had lived for millions of years as species larger than most life—and then for reasons as yet not fully understood, all went extinct about 10,000 years ago, coincidentally at the same time people came onto the North American continent for the first time.

We know these people were here and that they preyed on much of the megafauna because of the numerous sites that contain their artifacts and the remnants of species they killed. But what caused the extinction of the largest of the animals they preyed upon, all except bison? Even the largest species of bison went extinct at that time, the Giant bison and the Ancient bison. Theories abound.

In the time around the last ice age, a number of catastrophic events occurred. The glaciers melted that had barred travel between Asia and North America. With the opening of an ice corridor, humans as well as other animals began to mix with the animal population already in North America. Then the sea waters began to rise, cutting off further animal and human travel between the two continents.

The warm period that melted the glaciers is referred to as the Allerød period, running from about 14,700 to 12,700 years before the present. It ended abruptly with the onset of the Younger Dryas, a cold period that reduced temperatures back to near-glacial levels within a decade. Referred to as the Big Freeze, it lasted about 1,300 years, characterized by periods of cold climatic conditions and drought. It occurred about 12,800 to 11,500 years ago.

The Younger Dryas period is thought to have occurred when the North American ice sheets that had dammed Lake Agassiz collapsed, flooding the North Atlantic with fresh water and shutting down the oceanic circulation of warm tropical water northward (Younger Dryas, 2015; Bølling-Allerød, 2015).

Vance Haynes, Jr., Departments of Anthropology and Geosciences, University of Arizona, speculated on what possibly caused this massive extinction. He noted that the sole survivor among the largest animals was the bison:

> The fact remains that the existence of mammoths, mastodons, horses, camels, dire wolves, American lions, short-faced bears, sloths, and tapirs terminated abruptly at the Allerød-Younger Dryas boundary . . . Only bison survived to the Younger Dryas, probably because they vastly outnumbered other species.

He reviewed the various theories related to the megafaunal extinctions (citation numbers omitted):

> Martin's overkill hypothesis posits humans as the sole cause, but could they do it everywhere in the same instant? Lundelius and Graham invoke climate change, but this, like overkill, would seem to require more time than the evidence for stratigraphic abruptness allows. MacPhee and Marx believe hyper disease caused extinction of the megafauna, but natural selection would have left survivors. Perhaps the incredible coincidence of drought, rise of the Clovis population, and extinction at the onset of the glacial cold of the YD indicates multiple causes of extinction. In the San Pedro Valley of Arizona animals under stress gathered at dwindling water sources only to be annihilated by Clovis hunters. However, many relatively young, tender mammoths in the San Pedro Valley died without Clovis impact. Did a long-lasting deep freeze deny water to them? Considering the abruptness and magnitude of the termination, a major environmental and biotic disturbance took place at 10,900 B.P. that requires interpretation.

Or possibly an ET did it. He states:

> Should an extraterrestrial (ET) cause be considered? Brakenridge and Berger suggest there may be an ET explanation for YD in the form of a supernova. Brakenridge points out that supernova Vela occurred sometime between 11,300 and 8,400 years ago. Firestone et al. proposed that a comet impact 12,900 years ago (˜10.9 radiocarbon years ago) caused the megafauna extinction and triggered the onset of YD cooling.

He noted that the Clovis culture is the first well defined culture that employed a specific technology, namely, fluted projectile points. These people occupied North America from 11,500 to 10,900 years ago. At Clovis sites people interacted with the last of the megafauna at spring heads, along spring-fed streams, or around ponds as the Pleistocene climate became drier and warmer (Haynes, Jr, 2008).

But just how cold was this “Big Freeze”? David J. Meltzer and Vance T. Holliday co-authored a paper asking “Would North American Paleoindians have Noticed Younger Dryas Age Climate Changes?”

That assessment of the nature, severity and abruptness of Younger Dryas changes is largely based on ice core records from the Greenland ice sheet where changes were indeed dramatic. Recorded there is a mean annual Younger Dryas air temperature about 15–16 °C colder than present, they noted.

Today, some weather stations in the center of Greenland's ice cap record mean annual temperatures below -27 °C (-16.6 °F). This would mean that mean temperatures at Greenland during the Younger Dryas could be as low as -43 °C or -45 °F. That is the mean temperature. That is cold. The coldest day in Greenland ever recorded during this present time was –66 °C or –87 °F in Northice, Greenland on Jan. 9, 1954 (Lowest Recorded Temperatures, 2015).

However, while there was cooling across northeastern North America during this period, it was far less than in Greenland, the authors found. Estimates of Younger Dryas mean annual temperature based on data from a variety of proxies (e.g., chronomids, pollen, oxygen isotopes) indicate that mean annual temperatures were no more than 5 °C cooler than at present, and often of the order of just 3–4 °C cooler, the authors noted. In passing, they said (citations omitted):

> Physical conditions during Younger Dryas times were thus, arguably, unique, unlike what occurred even in previous deglaciations. Although beyond the scope of this paper, we would note that this putative uniqueness could be relevant to the question of why a suite of mammals that had previously survived multiple glacial-interglacial cycles failed to survive this one.

What was characteristic of the Big Freeze was its abrupt changes. Given large swings in temperature, anything could happen, including mass extinctions. Anthony Watts concluded in “The Intriguing Problem Of The Younger Dryas—What Does It Mean And What Caused It?”:

> The climatic fluctuations before and after the Younger Dryas, as well as the fluctuations within it, and the duration of these changes are not consistent with a single event cause of the YD. Neither cosmic impact or volcanic eruptions could produce the abrupt, multiple climatic changes that occurred during the late Pleistocene (Watts, 2012).

Meltzer and Holliday concluded:

> Even were they in regions where YDC climatic and ecological changes were occurring on a scale of multiple decades or centuries, they still might not have noticed, since people respond more directly to daily, weekly, and seasonal conditions. Besides, adapting to changing climatic and environmental conditions was nothing new to them. It was what they did (Meltzer, 2010).

As the Clovis people came on the scene in North America, they came in contact with megafauna. Their camp sites and unique fluted projectile points that they used to kill game, often megafauna, are a record of where they hunted, for that is what they did to survive.

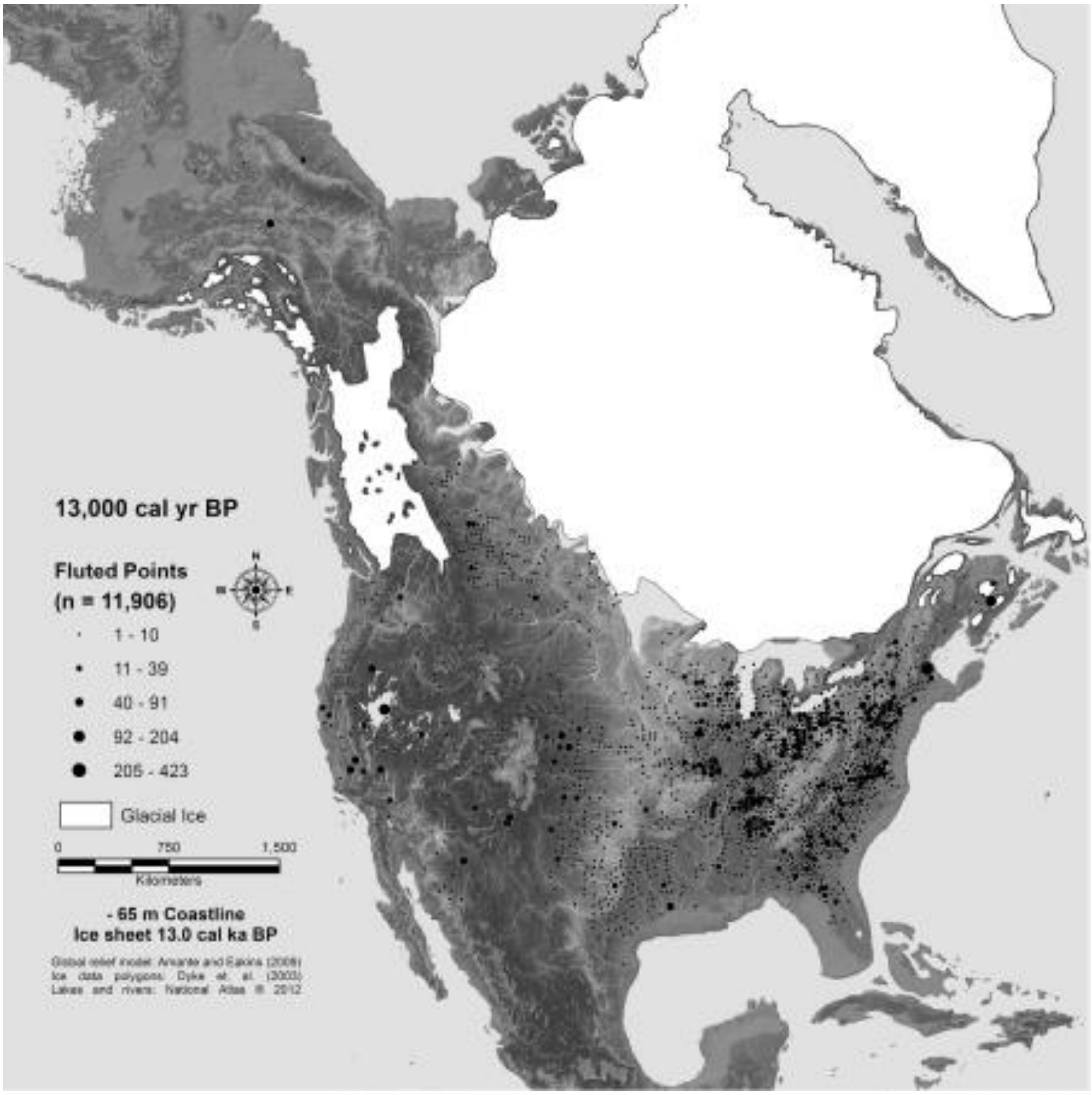


**Figure 56. SITES OF FLUTED PROJECTILE POINTS characteristic of Clovis man dating 13,000 years ago are represented by black dots. All are assumed to be of late-Pleistocene age. The white regions represent glacial ice of that time period (Anderson, 2014).**

These people encountered, in real life, monsters that modern man only has nightmares about. Take, for instance, the saber-tooth cat with its huge fangs. Recent studies suggest it used its canines and lower jaw to open its prey like one would open a can with an old school opener, that is, with a leverage action, administering a downward thrust while holding its prey to the ground (Zielinski, 2014).

**Figure 57. SABER-TOOTHED CATS roamed the North American continent and were encountered by early man (Smilodon, 2015).** ***Author: Rom-diz. Used under the Creative Commons Attribution-Share Alike license.}***

**Figure 58. A MAMMOTH WRAPS ITS TRUNK around an early hunter to dash him to the ground. After living on earth millions of years, they became extinct at about the same time as early man arrived on this continent.** ***Frontispiece of the book "Children's Stories in American History," by Henrietta Christian Wright. Pub. Charles Scribner's Sons., New York, NY*****.**

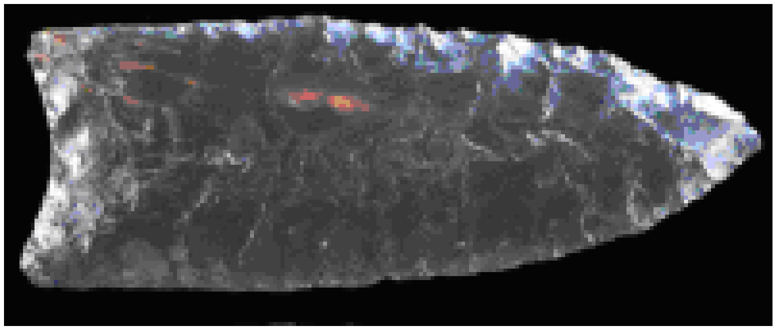

**Figure 59. FOUND AT GARDINER, Montana, during the construction of a post office in the 1950s is this obsidian projectile point dating from approximately 11,000 years ago, made by Paleo-Indians of the Clovis culture.**

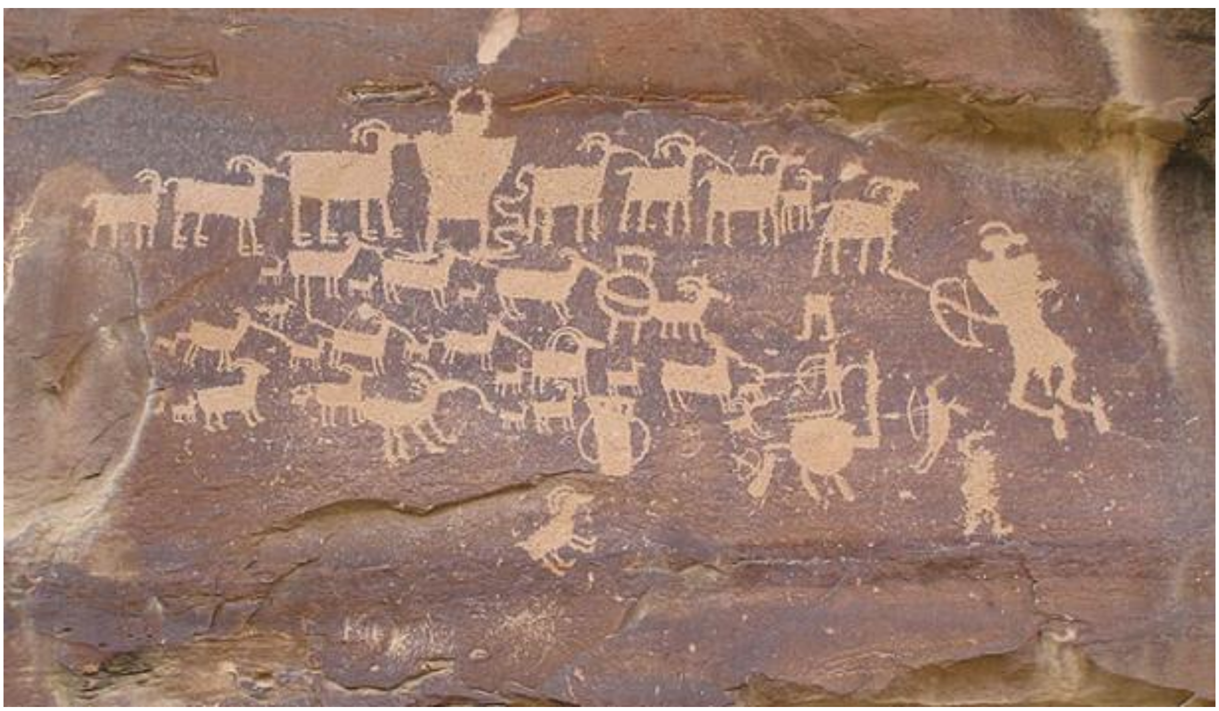

**Figure 60. HUNT SCENE OF POSSIBLY MIGRATING UNGULATES drawn on a rock wall in Nine-Mile Canyon National Backcountry Byway, near Price, Utah. Tongues appear to connect one animal to another. Could that connection symbolically represent herd unity or migration? *By Scott Catron via Wikimedia Commons.***

**Figure 61. BISON'S IMPORTANCE to early man is evident in this petroglyph of a hunter with a bow aiming at a bison, followed by two deer, drawn on a canyon wall in the Horseshoe Canyon Unit, Maze District, Canyonlands National Park, Utah (Photo from Todd's Desert Hiking Guide, 2015).**

Ripple, writing in “Linking Top-down Forces to the Pleistocene Megafaunal Extinctions,” makes an interesting observation, namely that the extinctions were caused by the addition of human hunters to the predator-prey relationship, a relationship in which the predators, being much more abundant than the humans, most likely killed the vast majority of the megafauna. He argues in his paper, co-authored by Blaire Van Valkenburgh, that:

> Humans, in conjunction with natural top-down processes and through a sequence of cascading trophic interactions, may have contributed to the Pleistocene megafaunal extinctions. The arrival of the first humans, as hunters and scavengers, through top-down forcing, could have triggered a population collapse of large herbivores and their predators. We present evidence that the large mammalian herbivores of the North American Pleistocene were primarily predator limited and at low densities, and therefore highly susceptible to extinction when humans were added to the predator guild. Our empirical evidence comes from data on carnivore dental attrition, proboscidean age structure, life history, tusk growth rates, and stable isotopes from the fossil record. We suggest a research agenda for further testing of this hypothesis that will provide a more detailed comprehension

> of late Pleistocene megafaunal ecology, and thereby allow us to better understand and manage remaining megafauna.

That last sentence is key: how to "manage remaining megafauna." The authors elaborate later on:

> In the terrestrial realm, it is important that we have a better understanding of how Pleistocene ecosystems were structured as we proceed in maintaining and restoring today's ecosystems.

One of the restorative elements to consider is bringing back migration among ungulates. The authors make this observation (citations omitted):

> Current ecological literature contains compelling empirical support for the limiting effect of large carnivores on their prey. Numerous studies have found that predation by large mammalian carnivores, especially by sympatric wolves and bears (Ursus arctos, Ursus americanus), limits the densities of large mammalian herbivores in the Northern Hemisphere, thus demonstrating widespread and strong top-down forcing by large carnivores on large herbivores. When predators are removed, herbivore populations irrupt and these dense herbivore populations most likely become limited by resources or human hunting.
>
> An exception to the above pattern is that some migrating ungulates are not limited by predation and can cycle over a wide range of abundance. Migration creates an advantage for prey species because it significantly reduces predation, as most predators are confined to a specific area for at least part of the year, usually when denning or caring for dependent offspring. Evidence exists that Pleistocene megafauna, such as equids and mastodons (Mammut americanum), may have undertaken migrations of at least 120 to 300 kilometers, whereas mammoths (Mammuthus spp.) appear to have ranged more locally. Nevertheless, all three of these species became extinct, suggesting migratory habits (or the lack thereof) did not guarantee survival (Ripple, 2010).

While migration may not guarantee survival, in the case of bison it nevertheless may have been the key to its survival, especially the Yellowstone wild bison's trait of altitudinal migration. Yellowstone National Park may contain one of the most unique survivalist regions on earth: geothermal pools high in the mountains. Possibly it was here that bison gathered to escape extreme downswings in the earth's temperature characterized by the Younger Dryas, as well as later on. And here is where they gathered to escape the destruction of bison out on the plains in the 1870s. If the habitat around the thermal pools became too crowded, or the pressure of wolf predation too heavy, bison could migrate down to the Gardiner Basin or near Hebgen Lake. And if that became too crowded, to decrease density bison could migrate down the Yellowstone or Madison rivers to the Madison Valley or Paradise Valley. If wolf predation became too intense in the lowlands, they could go back up into the mountains in the spring where there was nutritionally higher forage. It was a system of movement key to their evolutionary survival.

But all this is being prohibited by the IBMP's slaughter of wild migrating bison. Not only are we destroying wild bison, but we as a nation are severing our link with early man and the last and biggest remaining wild ancestor of these large mammal species. Particularly tragic is the loss of this wild megafauna species that is so closely related to the life history of Native American tribes stemming back to the Clovis people over a span of 10 millenniums. Along with this nation's ecological and cultural legacy, our connection with wildness is being lost.

**What does it mean to be "wild?"**

With the destruction of the wild bison herds on the plains and the introduction of the plow and cattle, the Great Plains as a wilderness steppe vanished. Along with this extirpation came the loss of a part of our national character, including elements of esthetic, ecological, educational, historical, recreational and scientific value to our nation and its people. We lost part of our world. It is our obligation to preserve as much of it as we can. As Henry D. Thoreau said in his essay, "Walking":

> The West of which I speak is but another name for the Wild; and what I have been preparing to say is, that in Wildness is the preservation of the world . . .

Part of the reason for this is that the seeds of instinct and the genetics for survival are preserved in what is wild. Wilderness is the raw material of life. Thoreau mused in "Walking":

> Ben Jonson exclaims, –
> "How near to good is what is fair!"
>
> So I would say, –
> "How near to good is what is WILD!"
>
> Life consists with wildness. The most alive is the wildest. Not yet subdued to man, its presence refreshes him. One who pressed forward incessantly and never rested from his labors, who grew fast and made infinite demands on life, would always find himself in a new country or wilderness, and surrounded by the raw material of life . . .
> To preserve wild animals implies generally the creation of a forest for them to dwell in or resort to. So it is with man . . .
> In literature it is only the wild that attracts us. Dullness is but another name for tameness. It is the uncivilized free and wild thinking in Hamlet and the Iliad, in all the scriptures and mythologies, not learned in the schools, that delights us. As the wild duck is more swift and beautiful than the tame, so is the wild—the mallard—thought, which 'mid falling dews wings its way above the fens . . .
>
> I love even to see the domestic animals reassert their native rights—any evidence that they have not wholly lost their original wild habits and vigor; as when my neighbor's cow breaks out of her pasture early in the spring and boldly swims the river, a cold, gray tide, twenty-five or thirty rods wide, swollen by the melted snow. It is the buffalo crossing the Mississippi. This exploit confers some dignity on the herd in my eyes—already dignified. The seeds of instinct are preserved under the thick hides of cattle and horses, like seeds in the bowels of the earth, an indefinite period.

Note that Thoreau equates wild character with the bison crossing the Mississippi. What is wild is not merely in and of itself. It is not just genetics or instinct. It is something more. It is an expression of the relationship between a life form that possesses certain instincts and its environment or, as Thoreau says: “It is the buffalo crossing the Mississippi.” It is not the buffalo crossing the Mississippi being shipped by boat, but rather by means of its own unrestricted volition. Bison and their ability to roam and migrate are the iconic symbol of what it means to be wild. And to be wild means to be free.

In 2005, Steven Rinella won a lottery permit to hunt for a wild buffalo in the Alaskan wilderness. After killing one on a snow-covered mountainside, he wondered, “How can I claim to love the very thing that I worked so hard to kill?” In *American Buffalo: In search of a lost icon*, he summed up the actual and symbolic relationship that bison have to our land and its people:

> In a historical sense, I suppose that my confused and convoluted relationship to the buffalo is nothing new. For the entirety of man’s existence in North America, we’ve struggled with the meaning of this animal, with the ways in which its life is intertwined with our own. I think of the first hunters who walked through some long ago gap between glaciers and stumbled onto a landscape populated with strange and massive creatures. The buffalo was just one of many then, a giant among a host of other giants, but over time these many animals were whittled away by the forces of man and nature. Eventually the buffalo stood alone, the continent’s greatest beast, like the winning contestant in a game show.
>
> Its prize was humanity’s never-ending attention, which was ultimately a bittersweet award.

The American Indian co-existed in the wilderness with this animal. Rinella wrote:

> For thousands of years, the first people of North America fed on the buffalo’s meat and wore the buffalo’s skin…

The Sioux believed that the greatest power was Wakan Tanka, or Great Spirit, because Wakan Tanka had sent them buffalo (Lakota Sioux, 2001). But then came the European immigrants. Rinella said:

> My own European ancestors came to the New World and scoffed at the heathen nature of the Indian’s ideas, then stood by as the buffalo nearly vanished from the earth beneath their notion that the animal was an expendable gift of their own God, a commodity meant to get them started before stepping aside and letting “civilization” bloom in the wilderness.

After exterminating the vast herds, they attempted to revive them. But why? he asks.

> I sometimes imagine that we saved the buffalo from the brink of extinction for the simple reason that the animals provided a handy mirror in which we could see our innermost desires and failures, and our most confounding contradictions. Our efforts to use the buffalo as a looking glass have rendered the animal almost inscrutable. At once it is a symbol of the tenacity of wilderness and the destruction of wilderness; it’s a symbol of Native American culture and the death of Native American culture; it’s a symbol of the strength and vitality of America and the pettiness and greed of America; it represents a frontier both forgotten and

> remembered; it stands for freedom and captivity, extinction and salvation (Rinella, 2008, pp. 254-6).

Caught in this mirror are the wild, free-roaming herds of buffalo that graze within and sometimes outside Yellowstone National Park. They are, perhaps, America's most emblematic image of wilderness.

One of the defining characteristics of "wilderness" is that it is a region not enclosed by fencing. It is not owned by an individual, but is set aside for public enjoyment. Indian tribes originally lived in wilderness. They did not own bison herds, but instead, ownership of an individual bison was conferred on the tribe which killed the buffalo.

Wilderness is lost with domestication. Domestication is gained by control of one's environment. It brings with it private property rights and fences. Not only do fences demark the boundaries of a person's property, but they also keep owned livestock such as cattle in, and non-owned out.

The term "wild" generally refers to:

- Wildlife, all non-domesticated plants, animals, and other organisms.
- Wilderness or wilderness area, a natural environment on earth.
- Wildness, the quality of being wild or untamed (Wild, 2011).

The opposite of "wild" is "domestic."

The following meanings are given according to the *Concise Oxford dictionary of ecology*:

> **Wildlife** Any undomesticated organisms, although the term is sometimes restricted to wild animals, excluding plants.
>
> **Wilderness** An extensive area of land which has never been permanently occupied by humans or subjected to their intensive use (e.g. for mineral extraction or cultivation) and which exists in a natural or nearly natural state.
>
> **Domestication** The selective breeding by humans of species in order to accommodate human needs. Domestication also requires considerable modification of natural ecosystems to ensure the survival of, and optimum production from, the domesticated species (e.g. the removal of competing weeds species when growing cereal crops) (Allaby, 1994).

According to Noah Webster's 1828 dictionary, "wild" means:

> 1. Roving; wandering; inhabiting the forest or open field; hence, not tamed or domesticated; as a wild boar; a wild ox; a wild cat; a wild bee.
> 2. Growing without culture; as wild parsnip; wild cherry; wild tansy. Wild rice, a palatable and nutritious food, grows spontaneously in the lakes and ponds of the North West territory.
> 3. Desert; not inhabited; as a wild forest.
> 4. Savage; uncivilized; not refined by culture; as the wild natives of Africa or America.

5. Turbulent; tempestuous; irregular; as a wild tumult.

According to The Oxford dictionary of English etymology, the word "wild" comes from the Old English word of "wilde," (Onions, 1966) meaning "wild, untamed, uncontrolled; uncultivated, desert" (Wilde, 2011).

Given these meanings, it is easy to see that there would be a conflict of interest between a domesticated (controlled, tamed) environment and a wilderness (uncontrolled, untamed) environment, for wilderness would be viewed as something noxious, such as a weed, to be rooted out and controlled. Logically speaking, the only way such a conflict could be dealt with, without destroying one or the other, would be to create a buffer of separation, a kind of "no man's land."

"No man's land" is a term used for land that is unoccupied or is under dispute between parties that leave it unoccupied due to fear or uncertainty. The term was originally used to define a contested territory or a dumping ground for refuse between fiefdoms. It is most commonly associated with the First World War to describe the area of land between two enemy trenches that neither side wished to openly move on or take control of due to fear of being attacked by the enemy in the process. The Oxford English Dictionary contains a reference to the term dating back to 1320, and was spelled "nonesmanneslond." The term was used to describe a disputed territory or one over which there was legal disagreement. The same term was later used as the name for the piece of land outside the north wall of London that was assigned as the place of execution (No man's land, 2011).

There is a certain undefined passion associated with what is wild. The fence and cultivation kill wilderness. Ditto cage bars and putting plants in rows. What is domesticated is tamed. With that docility, something is lost.

William Stolzenburg, in *Where the wild things were: life, death, and ecological wreckage in a land of vanishing predators,* wrote:

> And I can only believe, from somewhere deeper than any logic center of the brain, that a life of incomprehensible loneliness awaits a world where the wild things were, but are never to be again (Stolzenburg, 2008).

Americans have given their lives to remain free and thus identify with what is wild. Our country was founded by the collective desire to be independent and a refusal to be subjugated, as demonstrated by the Declaration of Independence. The Revolutionary War and the World Wars were fought to remain free. The American Indians fought to preserve their freedom and independence in the face of the European settlement of this nation, but were subjugated via the systematic elimination of their habitat resources, which included the great herds of bison by means of their exclusion from them by confinement to reservations, as well as the concurrent destruction of the herds.

Key to subjugation is ownership. What refuses to be owned is often killed. When something, say an animal or a plant, is subjugated, is penned in, is put in rows to form a crop, what was once free is put into a kind of slavery for the service of its owner. That is, the animal or the plant is put to commercial use. It can be bought and sold. Commercialization is facilitated by capture. What is caught and controlled can be used to gain profit.

Thus, commercialization is an attribute of domestication. But the opposite of commercialization is not wilderness. A zoo can be for non-commercial purposes, but no one would consider animals there as living in the wild. A tiger in the Bronx Zoo may have the same genetic structure as a similar species in India, but the tiger in the zoo is not wild. Taken from its habitat, it loses its wildness. One of the principle reasons is that captured animals have had their movements restricted—they cannot search for prey, they cannot roam in search of food, they cannot migrate. Instead, they are fed. Raised in a cage, an animal can forget how to survive on its own. If released, it may not have the ability to forage or stalk. It may not know where to get food or how to escape winter—and will die. Movement and migration are essential to survival. One of the hallmarks of wilderness is the ability to move about freely, either to range or to facilitate migration.

**The migratory syndrome**

Migration means to move from one region or climate to another, usually periodically for feeding or breeding. Permeating the concept of migration is the meaning of ecology. According to the Oxford Dictionary, "ecology" is the branch of biology that deals with the relationships of organisms to one another and to their physical surroundings. As mentioned previously, it is a word derived from the Greek "oikos," meaning house, and "-logia," meaning "study of." Thus the ecology of migration would be the study of the movement of an organism going from room to room.

Migration is not a stand-alone trait. It involves the entire organism, its evolution and its ability to adapt to the environment. Biologist Hugh Dingle noted in "Animal migration: is there a common migratory syndrome?":

> It is a truism in evolutionary biology that traits do not evolve in isolation. Rather, they evolve in a coordinated way with other characters that may include behavior, physiology, morphology, and life histories; it is these correlated suites of traits or syndromes that are the targets of natural selection. Frazzetta (1975) called such suites of characters "complex adaptations," and likened them to the parts of a machine all of which must function together to make the machine work (Dingle, 2006).

Dingle himself called this complex of traits the "migratory syndrome." Like the domestication syndrome, it has profound implications. Domesticated animals usually cannot survive in a wilderness. They do not have the necessary fitness. By prohibiting migration, one is tinkering with not just migratory movements, but the entire, collective genetics of an animal. Take out a gear in a watch and one is not merely removing a part, but stopping the ability of the watch to keep time. Targeting for removal from the bison gene pool only those animals that express the migratory syndrome has the potential of reducing the species' ability to adapt and could lead to extinction.

For instance, in one area alone, that of disease prevention, ungulates such as elk that do not migrate have higher rates of brucellosis infection, for not migrating crowds animals, and crowding promotes disease. Ironically, IBMP's disease prevention policy would stand to exacerbate disease in bison by restricting movement. But it goes beyond that immediate effect to genetic ramifications that can be known only with the unfolding of time, for by playing with the migratory syndrome one is playing with a cascade of traits that in one form or another could lead to the collapse of that species via its inability to adapt to changes in the ecosystem.

Dingle identified five characteristics that apply to migration:

> The first characteristic of migrants is persistent movement. This actively carries the migrant beyond its original habitat where it obtained resources [such as food] to a new one in which it also gathers resources [such as food or nesting materials]; … An insect or bird, for example, may both feed and reproduce at the termination of a migration flight (the site of egg laying or nesting being a new resource) whereas it only fed at the site of origin. A habitat can thus be considered "the area that provides the resource requirements for a discrete phase of an [organism's] life."
>
> These migratory movements between habitats are quite different from movements within a single habitat. As noted…the within-habitat movements of station keeping and ranging [obtaining and defending resources within a home range or territory] are focused on the available resources and cease when a resource of a particular kind is encountered. Migratory movements are characterized by the temporary suppression of responses to resources. In the course of movement to a new habitat, an organism usually covers much greater distances than it does while performing station keeping or ranging activities. Many of these can be impressive indeed. The arctic tern may travel nearly 20,000 kilometers between Arctic breeding grounds and Antarctic feeding areas, and even tiny aphids may traverse 1,000 km or more migrating to a new host plant.
>
> The second characteristic of migratory behavior is that it is straightened out, in contrast to station keeping in particular in which there may be much turning or backtracking. In self-powered animals such as birds, fish, or whales, which make one or more round-trip journeys within a lifetime, this straightening may take a specific direction whose maintenance requires sophisticated orientation and navigation mechanisms…
>
> Third, migrant organisms are undistracted by those stimuli that would arrest their movements were they station keeping or ranging. Responses to inputs arising from resources promoting growth and maintenance are evidently inhibited or suppressed during migration. Except when they have depleted fat resources, migrant birds will not stop and feed even when they could easily do so.
>
> Fourth, distinct behaviors of leaving and arriving are characteristic of migrants. Most migrant birds, for example, become hyperphagic [exhibit excessive hunger and abnormally large intake of food] before departure and may increase food intake by as much as 40% above normal, with the excess stored as lipid fuel…
>
> Firth, migrants reallocate energy specifically to support movement. Thus birds may double their body weight in subcutaneous fat, insects vastly increase their size of the fat body, and plants allocate fat to the embryo in a departing seed (Dingle, 1995, pp 24, 25).

In sum, the movement of migrants is persistent and straight ahead, instead of wandering. They prepare for the trip by such activity as overeating and putting on weight. And when they leave they are totally devoted to getting there—they cannot be distracted from their mission.

David Quammen, writing for National Geographic in *Mysteries of great migrations: what guides them into the unknown?* points out that central to the migratory responses in animals is what Dingle terms the "undistractibility" of migrants.

> Migrating animals maintain a fervid attentiveness to the greater mission, which keeps them undistracted by temptations and undeterred by challenges that would turn other animals aside.
>
> An arctic tern on its way from Tierra del Fuego to Alaska, for instance, will ignore a nice smelly herring offered from a bird-watcher's boat in Monterey Bay. Local gulls will dive voraciously for such handouts, while the tern flies on. Why? "Animal migrants do not respond to sensory inputs from resources that would readily elicit responses in other circumstances," is the dry, careful way Dingle describes it. In plainer words: These critters are hell-for-leather, flat-out just *gonna get there.* Another way, less scientific, would be to say that the arctic tern resists distraction because it is driven at that moment by an instinctive sense of something we humans find admirable: larger purpose.
>
> The arctic tern senses that it can eat later. It can rest later. It can mate later. Right now its implacable focus is the journey; its undivided intent is arrival. Reaching some gravelly coastline in the Arctic, upon which other arctic terns have converged, will serve its larger purpose, as shaped by evolution: finding a place, a time, and a set of circumstances in which it can successfully hatch and rear offspring (Quammen, 2010).

**Hindered migration**

Ecologically speaking, for the survival of many species, the ability of unrestricted movement is requisite for survival. But, what happens when migration is hindered?

For instance, what happens when road construction bisects the feeding grounds of reptiles from breeding and egg-laying locations? Because of a migrating animal's "undistractibility," they head across busy roadways, without regard to the apparent danger of barren spaces and objects moving over those spaces. Thousands of turtles, snakes and salamanders are crushed under the tires of automobiles each year.

In Africa, herds of wildebeests migrated from southern Botswana in long, single-file lines to the northern grasslands of the Central Kalahari Game Reserve. With the introduction of beef cattle, livestock owners feared that hoof and mouth disease, endemic in wild ungulates such as the African buffalo, might spread to domestic livestock. Hundreds of miles of fences were constructed to separate the wildebeests, oryx, gazelles and other wild ungulates from cattle. The result was an ecological disaster. Greta Nilsson, writing in the *Endangered Species Handbook*, told the story:

> The water and grasslands crucial to the survival of the herds were blocked by the fences. The wildebeests walked for days along the fences, hungrier and thirstier every day; they were joined by giraffe, gemsbok and zebras whose masses measured 3 miles wide and 5 miles long (Owens and Owens 1984). In 1961 and 1964, 80,000 wildebeests died near the fence, and during these years, an observer estimated that 10 percent of their population died every

five days; in 1970, a massive die-off decimated the herds (Owens and Owens 1984). By the early 1990s, the once great southern wildebeest herd had been reduced to fewer than 30,000 animals (Nowak 1999). At least 250,000 wildebeests were killed between 1970 and 1984 (Owens and Owens 1984). The deaths of at least 1.5 million large animals have been called the worst wildlife slaughter of the 20th century (Owens and Owens 1992)… Along with the wildebeests and other ungulates went the once large populations of lions, leopards, and brown hyenas. (Nilsson, 2005).

All this fencing and range fragmentation of indigenous animals to satisfy the global preference to eat beef, while the meat of native African ungulates is under utilized. It is puzzling, for the meat of such migratory African animals as wildebeests (which belong to the family *Bovidae* and include antelopes, cattle, goats and sheep), is described as being "tender and extremely flavorful," or that of the oryx, an antelope, whose meat "tastes quite similar to beef but obviously leaner and just as juicy and succulent" (Eating My Way Through Africa's Game, 2014). One species, the scimitar oryx, was once migratory and widely distributed across North Africa, but now extinct in the wild and found only on reserves (Scimitar oryx, 2015).

In general, large mammal migrations are in decline. "Nowhere is this more evident than at the Greater Yellowstone Ecosystem, where 58%, 78%, and 100% of the historic long-distance migrations of elk (Cervus elaphus), pronghorn antelope (Antilocapra americana), and bison (Bison bison bison) respectively, have been lost," notes David N. Cherney, in "Securing the free movement of wildlife: lessons from the American West's longest land mammal migration." "Despite the truncated movements of these species, the region is still home to the longest bison, elk, pronghorn, and mule deer (Odocoileus hemionus) migrations in the United States" (Cherney, 2011).

The seasonal migration of pronghorn antelope, *Antilocapra americana*, between Grand Teton National Park and the Upper Green River Valley in northwestern Wyoming is the longest remaining migration of any land mammal in the lower 48 states. Archaeological evidence indicates that pronghorn have traveled this same ancient migration route, which is less than 150 yards wide in some places, for at least 6,000 years.

However, the habitat covered by the 150-mile round trip is being fragmented and degraded by a ten-fold increase in vehicular traffic stemming from the proliferation of natural gas field operations. Animals are starting to avoid areas they formerly relied on to make it through the winter, according to Dr. Joel Berger, senior scientist with the Wildlife Conservation Society's North America Program who studies pronghorn from his base at the WCS Teton Field Office (Ancient Pronghorn Path Becomes First U.S. Wildlife Migration Corridor, 2008).

**Partially migratory species**

Migration is often variable, with some groups of some species migrating, while others do not. As mentioned earlier, the larva of fruit flies have two different types of behavior—most are "rovers," that is, they crawl around looking for food, but some are "sitters," that is, they stay in one place. In her research Professor Marla Sokolowski, a biologist at the University of Toronto Mississauga, found that a particular gene controlled this variable behavior, a gene that is found in many organisms, including humans. When the fruit fly larvae were competing for food, those that did best had a version of the foraging gene that was rarest in a particular population. For example, rovers did better when there were lots of sitters, and sitters did better when there were more rovers. Sokolowski explained:

> If you're a rover surrounded by many sitters, then the sitters are going to use up that patch and you're going to do better by moving out into a new patch. So you'll have an advantage because you're not competing with the sitters who stay close to the initial resource. On the other hand, if you're a sitter and you're mostly with rovers, the rovers are going to move out and you'll be left on the patch to feed without competition (Survival of the rarest, 2007).

Migration in many species is conditional, whereby an individual's genetic makeup allows for the adoption of a range of behaviors based on such factors as age, sex, experience and position of dominance, as well as an assessment of the risk of predation and the availability of resources, such as forage, as reported in "Partial migration and philopatry of Yellowstone pronghorn" by P.J. White and Troy L. Davis of the National Park Service, and their research colleagues, Kerey K. Barnowe-Meyer, Department of Biological Sciences, University of Idaho, Robert L. Crabtree, Yellowstone Ecological Research Center, and Robert A. Garrott, Ecology Department, Montana State University.

**Yellowstone pronghorns**

Populations in which some, but not all, individuals migrate are known as partially migratory. As a result of genetic makeup, some individuals alter their behavior from year to year between migrant and non-migrant strategies. Take, for instance, the Yellowstone pronghorn. Most of the migration routes for bison, elk, and pronghorn have been lost in the greater Yellowstone region. The researchers studied two migration corridors still being used, linking the pronghorns' summer ranges in the mountains to their winter ranges in the valleys:

> Only two long distance migrations by pronghorn remain in this region, one of which occurs in western Wyoming where pronghorn migrate 116–258 km (one-way) [72-160 miles] annually between Grand Teton National Park and the Green River Basin . . . This invariant migration corridor has been used for at least 6000 years, but is threatened by impediments (e.g., fences, highways, housing subdivisions, petroleum development) and several bottlenecks as narrow as 121m [about 400 feet].
>
> The other remaining long distance migration by pronghorn occurs in the upper Yellowstone River drainage of Montana and Wyoming. Pronghorn were once numerous (1000–1500 animals) and migrated 80–130 km [50-81 miles] down the Yellowstone River from higher-elevation summer ranges in Yellowstone National Park to lower-elevation winter ranges in the Paradise Valley and near Livingston, MT, USA . . . However, human settlement reduced pronghorn abundance and effectively eliminated their migration north from the park sometime before 1920 . . . Feeding, irrigation, and fencing efforts until 1934 further reduced their distribution and apparently reinforced the tendency for some pronghorn to remain on the winter range year-round.

Additionally, the researchers were concerned that:

> Increasing recreation, fencing, residential and concessionaire developments, bison management operations on critical winter range, and other anthropogenic effects could also differentially influence the migratory and resident components of the population.

They concluded that:

> . . . it is conceivable that any further range restriction from natural or human-induced barriers to the relatively narrow, open pathways within this corridor could reduce the survival and reproductive success of migrant pronghorn.

Increased density of an animal population has often been cited as a cause for increased migratory behavior. However, the opposite turns out to be true for the Yellowstone pronghorn. As White and his team observed:

> The proportion of migrants changed from approximately 80% during 1967–1969 when densities on the winter range were low (5–7/km2; Barmore, 2003), to 20% during 1988–1993 when densities were high (20–25/$km^2$ . . . and back to 70% during 1999–2005 when densities decreased to 10/$km^2$. The factors influencing these changes in migration patterns are unknown and difficult to infer because, contrary to theoretical expectations, a smaller proportion of the population migrated at higher density . . .

Migration can be a costly strategy, exposing animals as they journey from habitat to habitat to a numbers of risks or impediments, such as mortality due to collision with vehicles when crossing a road, predators, hunters or fencing. On the other hand, remaining over the winter in mountainous country can also be a costly strategy if snow levels are high and temperatures cold, increasing the death rate due to starvation and freezing.

In Yellowstone, the long term viability of pronghorn is a concern because low abundance (fewer than 150) has increased their susceptibility to random, naturally-occurring catastrophes. Their migration had been truncated by up to 80 km outside the park due to development and habitat fragmentation.

Whether animals migrate or stay put may be governed by philopatry, a term from animal behavior and ecology derived from the Greek for 'home-loving'. In his 1963 book *Animal Species and Evolution*, Ernst Mayr defined philopatry as the drive or tendency of an individual to return to, or stay in, its home area, birthplace, or another adopted locality. Simply put, philopatry is choosing to go to, or stay in, a specific geographic location.

Philopatry may be behind the variable migrating populations in the Yellowstone pronghorn. Poor juvenile survival within either migrant or non-migrant groups due to philopratic behavior may significantly decrease the proportion of individuals adopting this strategy. These findings suggest changes in the proportion of migrant Yellowstone pronghorn may reflect changes in adult survival and reproductive success between areas of use. Individual differences in the costs and benefits of migration may promote a broad range of migratory strategies within a population, the White et al. researchers suggested.

The research team recommended protection of the migratory corridor for the Yellowstone pronghorn:

> This behavioral flexibility is consistent with the hypothesis that migration in Yellowstone pronghorn is a conditional strategy and likely contributed to dynamic and rapid changes in the proportion of migrants from 80% to 20% and back to 70% during 1967–2005. All migrant pronghorn traveled 10 km over a topographic bottleneck (Mt. Everts) separating the winter and summer ranges, primarily using grassland—sagebrush pathways through conifer forest. We recommend continued protection of this corridor because increased mortality and a decreasing proportion of migrants may be as important a threat to the persistence of partially migratory populations as habitat fragmentation, especially when local resources for non-migrants are inadequate to sustain the entire population (White, et al., 2007, pp. 502-510).

**Remedies to facilitate migration**

Not only must an animal have the freedom to move to get to the required destination, but it also must know how to get there. Captivity often makes animals into dunces. The whooping crane is an example. Raised in captivity, when released at the species' traditional time for migration, it does not know where to fly. It has lost the migratory instinct.

*Whooping cranes:* As of April 2007 there were about 340 whooping cranes living in the wild and another 145 living in captivity. The wild flock nests in the summer at Wood Buffalo National Park in Alberta, Canada, and migrates in the winter to various destinations along the Gulf Coast of Texas.

To create a separate flock, chicks from captive breeding flocks were re-introduced at the Necedah National Wildlife Refuge in Central Wisconsin. However, they did not know where to go for the critical winter months. They had lost the migratory instinct and had to be taught to migrate.

Cranes learn the migration route from the previous generation. Chicks hatched on the nesting grounds learn to fly with their parents, following them in the fall to the wintering grounds. Their destinations and the route they use may have evolved for thousands of years, but it exists only in the memories of the birds that use it. If all individuals of a species are lost from a region, the route is lost forever. Birds that are raised in captivity lack an older generation to teach them and they tend to become resident, staying the entire year in the same location.

To train those birds that had lost the ability to migrate, an experiment was developed. The birds were raised in the presence of an ultralight aircraft and their human handlers dressed in special costumes so that the birds would imprint on humans like they would their natural parents. When it came time to migrate, the human-led whooping cranes took off, following the ultralight aircraft on a 1,000-mile journey to Florida. The experiment worked. Some of the cranes returned in the spring on their own, establishing their migration route (Endangered species, 2011; Whooping Crane Migration Tracking Project, 2011).

*Reptiles:* Migration was facilitated for the Eastern box turtle, the Eastern hog-nose snake and a species of salamander that had their migratory route cut off by the construction of a highway near

Brookfield, Connecticut. Under the auspices of the state's Department of Environmental Protection and the state Department of Transportation, a specially-constructed $1 million culvert was built under the highway, enabling reptiles to move safely from their wintering habitat, where they hibernate, to the summer habitat where the females lay their eggs (Miller, 2009).

*Pronghorn:* To protect the seasonal movement of pronghorn in the Greater Yellowstone ecosystem, the U.S. Forest Service has established the nation's first designated wildlife migration corridor—the Path of the Pronghorn. Adopting an amendment to the Bridger-Teton National Forest Land and Resource Management Plan, the agency assures that future activities on Forest Service lands within the corridor will be compatible with the continued successful migration of pronghorn.

Although pronghorn are not endangered, the population that summers in Grand Teton National Park numbers fewer than 200 animals. Because snow in the park is too deep to allow the animals to survive the harsh winters, obstruction of the migration corridor would result in the local extinction of pronghorn from Grand Teton National Park.

"This represents a tremendous conservation victory and demonstrates that by working together we can find solutions to preserve our nation's wildlife heritage," said Dr. Kim Murray Berger, a biologist with the Wildlife Conservation Society who has studied the pronghorn migration since 2003 (Ancient Pronghorn Path Becomes First U.S. Wildlife Migration Corridor, 2008).

*African wildlife:* Wildlife seemed an inexhaustible resource fifty years ago in Africa. However, in such places as the southern African country of Botswana—known for its prolific and untouched wildlife—wildlife numbers plummeted following the construction of hundreds of miles of fences, called veterinarian fences, erected to reduce the risk of wild animal transmission of disease to cattle. This created a dilemma, namely, how to conserve wildlife, the basis of a highly profitable tourist industry, while preserving livelihoods based on livestock production and export.

Nature-based tourism, such as photographic safaris and trophy hunting, now contributes about as much to the economies of southern African countries as agriculture, forestry and fisheries combined. These countries are trying to maximize returns from the wildlife sector by forming transfrontier (or transboundary) conservation areas (TFCAs) such as the Kavango-Zambezi (KAZA) Transfrontier Conservation Area, a southern Africa game reserve, the world's largest conservation area straddling Angola, Botswana, Namibia, Zambia and Zimbabwe, and the Great Limpopo Transfrontier Conservation Area.

Dr. Steve Osofsky, the first wildlife veterinarian in Botswana and now the Wildlife Conservation Society's (WCS) Director of Wildlife Health Policy, believes that a key to the economic well-being of southern Africa is to better understand the relationship between wildlife populations and livestock populations, including the management of wildlife disease that can spread to cattle. Key is ascertaining their relative economic importance. He explained his vision of a better future for southern Africa in an interview March 1, 2010 with Dr. Laurel A. Neme, host of *The Wildlife*:

> Looking at how people can benefit not just from agriculture but from wildlife is very important. I tell students that my job in many ways is to help make wildlife an economically rational and a socio-culturally acceptable land use choice. Because if that's not the case, then wildlife isn't going to survive . . .

> One of the projects we've been working on since 2003 is in Southern Africa's Great Limpopo Transfrontier Conservation Area. This is a region shared by South Africa, Zimbabwe and Mozambique. These three countries have signed a treaty to reconnect land areas, not to create one giant national park but basically to rezone, so that wildlife can move back and forth across places that it hasn't roamed in any great numbers for many, many years—the idea being that wildlife, as a land use, can generate more per unit hectare in some of these areas than any other form of economic activity (Neme, 2010).

Key to protecting the economic viability of the region, he reasoned, was to facilitate wild animal movement, including migration, instead of hindering it.

Here in Greater Yellowstone Ecosystem, however, the cattle industry is opposed to movement onto what it perceives to be its territory by such ungulates as bison and elk because they carry the disease brucellosis. Migration by these animals is a major threat because of the possibility of co-mingling with cattle grazing on the park’s borders. Separation of the invasive species cattle from the native species of ungulates is the preferred method of controlling that disease. This is currently being achieved by the Montana DOL and other IBMP agency members either by fencing, hazing or culling of native species.

**Figure 62. SEPARATION BY FENCING. On its logo, the Montana Department of Livestock symbolizes its approach to livestock management, namely, fencing animal life for commercial purposes. The opposite approach is needed in wildlife management, namely, no fencing, migration, freedom for animals to roam and access for hunters.**

**The brucellosis controversy**

The history of the brucellosis controversy involving the Yellowstone bison herd and cattle near the YNP is documented by the Animal Plant and Health Inspection Service (bold emphasis added):

> During the winter of 1996-97, with the herd population at record levels, the limited forage in YNP was covered with record levels of ice and snow. **As a result, larger numbers of bison moved to areas outside the park looking for food; 1,079 bison that exited the Park were shot or sent to slaughter. An additional 1,300 or more bison starved to death inside the park.** The involved Federal agencies—APHIS, USDA's Forest Service, and the Interior Department's National Park Service—then proposed a series of contingency measures to address the problems caused by that year's severe winter weather in YNP. The short-term objective was to limit as much as possible additional killing of bison during the balance of the winter season, while also preventing transmission of brucellosis to livestock outside the park.
>
> The long-term objective was to develop a long-range plan for management of the Yellowstone bison herd to prevent the transmission of brucellosis from bison to cattle and maintain a viable bison herd.
>
> **While USDA is charged with eradicating brucellosis from the United States, it also remains committed to maintaining a viable and free-roaming bison herd in YNP.** The goals of the eventual elimination of brucellosis from the GYA and maintaining a free roaming bison herd have been jointly agreed to in a Memorandum of Understanding between the U.S. Department of Interior, the States of Montana, Idaho, and Wyoming, and USDA. Eliminating brucellosis and managing a free-roaming bison herd at YNP are not incompatible goals, and achieving them will require a cooperative effort by all involved agencies. The *Record of Decision* for Final Environmental Impact Statement and Bison Management Plan for the State of Montana and Yellowstone National Park was signed December 20, 2000. **The goal of the bison management plan is to maintain a wild, free ranging bison population while minimizing the risk of transmitting brucellosis from bison to domestic cattle on public and private lands in Montana adjacent to YNP**. This plan is a bison management plan, not a brucellosis elimination plan.

APHIS delineates the bison threat it perceives:

> More than 50 percent of the bison in YNP test positive for brucellosis. A positive test indicates that animals have been exposed and are most likely infected. The concern is that when these bison leave YNP, they may transmit brucellosis to cattle in the surrounding States. All three States surrounding YNP are officially free of brucellosis.
>
> **In 1990, researchers at Texas A&M demonstrated that bison infected with *B. abortus* could spread the disease to cattle through contact. Although this was proven under controlled conditions, it is difficult to document transmission of a disease in the wild.** In order to document this, a researcher would need to be present when the transmission occurred and collect samples for tissue culturing. In addition, the animals would have to have been previously tested before the transmission had occurred to verify that the event was caused by the bacterial transmission at the observed time. Therefore, it was necessary to conduct this research under controlled conditions.

> Even though transmission in the wild is difficult to document, results of epidemiological investigations point to domestic bison as the likely source of the disease in infected cattle herds found in Wyoming and North Dakota. In addition, wild elk or bison in the GYA have been identified as the most probable source of infection for five additional cattle herds. Infected elk were the most probable source of brucellosis infection (fistulous withers) in horses in Wyoming. Most recently, elk were the source of infection of a cattle herd in Idaho.

APHIS then poses this question: “can brucellosis be eradicated from Yellowstone wildlife?” Its answer is in the positive:

> Yes. APHIS officials are confident, based on experience in other public and private bison and elk herds, and on other successful disease eradication programs, that use of a combination of disease-eradication and herd-management measures will lead to the successful elimination of brucellosis from bison and elk in the Yellowstone ecosystem.

And how does APHIS propose to eliminate brucellosis? APHIS states its position:

> APHIS is interested in protecting the bison and neighboring livestock from diseases introduced into the herds from outside sources. APHIS intends to work with the cooperating agencies to develop a plan to eliminate brucellosis from the GYA while ensuring a wild, free-roaming, and viable bison herd in Yellowstone (Brucellosis and Yellowstone Bison, 2012).

**Government misrepresentation**

According to US Government Accountability Office’s March 2008 report, “Yellowstone bison: Interagency plan and agencies’ management need improvement to better address bison-cattle brucellosis controversy,” the estimated annual bison management expenditures by the various agencies of the Interagency Bison Management Plan is as follows:

| | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **Total** |
|---|---|---|---|---|---|---|---|
| National Park Service | $1,200,000 | $1,148,075 | $1,207,175 | $1,204,300 | $1,316,000 | $1,182,463 | **$7,258,013** |
| Forest Service | 100,215 | 150,000 | 103,172 | 95,763 | 100,278 | 90,000 | **639,428** |
| Animal and Plant Health Inspection Service | 916,610 | 925,284 | 1,151,667 | 1,156,540 | 1,806,067 | 1,570,408 | **7,526,576** |
| Montana Department of Livestock | 6,053 | 47,628 | 19,504 | 18,533 | 20,353 | 16,906 | **128,977** |
| Montana Fish, Wildlife and Parks | 59,329 | 62,983 | 58,363 | 68,778 | 62,119 | 67,723 | **379,295** |
| **Total** | **$2,282,207** | **$2,333,970** | **$2,539,881** | **$2,543,915** | **$3,304,817** | **$2,927,500** | **$15,932,288** |

The GAO stated that:

> The plan has two broadly stated goals: to “maintain a wild, free-ranging population of bison and address the risk of brucellosis transmission.” The plan, however, contains no clearly defined, measurable objectives as to how these goals will be achieved, and the partner agencies have no common view of the objectives.

The combined agencies spend about $3 million annually on this ill-defined wild bison management plan. APHIS alone has spent $7.5 million between 2002 and 2007. It has told the public, including taxpayers, that it can “work with the cooperating agencies to develop a plan to eliminate brucellosis from the GYA while ensuring a wild, free-roaming, and viable bison herd in Yellowstone.”

APHIS backs up this claim by stating:

> Similar eradication efforts have been successful in other parks, including Wind Cave National Park and Custer State Park in South Dakota and Wichita Mountain Wildlife Refuge in Oklahoma (Brucellosis and Yellowstone Bison, 2012).

Boyd, in his bison status report, stated bison in the Yellowstone National Park were “free-ranging,” while the bison in Wind Cave National Park and Custer State Park in South Dakota and Wichita Mountain Wildlife Refuge in Oklahoma were captive (Boyd, 2003, pp. 170-183).

Brucellosis in cattle is managed by making them captive, that is, by putting them behind fences. The entire controversy surrounding the wild bison herd in the YNP is that they are not captive and that because they are free ranging, they have to be lethally controlled when they migrate across the border. To delude the public into thinking that brucellosis can be eliminated in the free-range bison herds in the GYA by methods similar to eliminating brucellosis in the captive herds in the other three conservancy herds is misrepresentation—possibly to the level of fraud.

Fraud is the false representation of a matter of fact—whether by words or by conduct, by false or misleading allegations, or by concealment of what should have been disclosed—that deceives and is intended to deceive another so that the individual will act upon it to her or his legal injury.

The statement cited above is a misleading allegation and by not disclosing that the other three herds are captive herds, misleads by concealment.

Fraud must be proven by showing that the defendant's actions involved five separate elements: (1) a false statement of a material fact, (2) knowledge on the part of the defendant that the statement is untrue, (3) intent on the part of the defendant to deceive the alleged victim, (4) justifiable reliance by the alleged victim on the statement, and (5) injury to the alleged victim as a result.

Is the statement false that brucellosis can be eradicated in the GYA by similar efforts that have been successful in other parks, including Wind Cave National Park and Custer State Park in South Dakota and Wichita Mountain Wildlife Refuge in Oklahoma? Yes, it is false because the GYA herds are free-ranging, while the other herds are captive.

Does APHIS know that its statement is untrue? Yes, because AHPIS works closely with all the parks and knows whether the herds are captive or free-ranging.

Is APHIS intending to deceive the public about this matter? Yes, by the very fact that its statement does not disclose the captive nature of the other herds.

Is the public reliant on APHIS for the truth of that statement? Yes, because the public normally does not have the time or resources to determine the truth and must rely on the veracity of the government.

And lastly, has the public been injured by this deception? Yes, millions of tax dollars have been spent on a wild goose chase solely for the benefit of the Montana livestock industry and APHIS employees.

In sum, APHIS has misled the public by its statements that it can eradicate brucellosis in the YNP by methods it has used for other federally managed herds. All those herds are fenced. Fencing has been deemed incompatible with a wildlife ecosystem such as Yellowstone National Park and the Greater Yellowstone Ecosystem.

**The "wild, free-ranging" ruse**

Note that APHIS makes the high-sounding claim that "The goal of the bison management plan is to maintain a wild, free ranging bison population while minimizing the risk of transmitting brucellosis from bison to domestic cattle on public and private lands in Montana adjacent to YNP."

In essence, the bison in Yellowstone National Park are captive and fenced at present. As previously mentioned, at the end of the migratory trail habitually used by YNP bison is the Stephens Creek capture facility. It is located *inside the park* adjacent to the northern exit near Gardiner, Montana. Fencing fans out from the capture facility. As bison migrate down from higher elevations in the park seeking places where there is less snow and more forage, government agents on horseback and on motorized vehicles drive the animals into the fencing, and thus into the capture facility, where they are subject to slaughter, sometimes a thousand or more at a time.

For all practical purposes, the capture facility, the fan of fencing and the government agents function as a fence. However, it is a selective fence. While all of YNP is not fenced, and thus the bison are listed by Boyd (Boyd, 2003) as "free-ranging," because of the management actions of the collective governmental agencies, the bison are actually captive. Because they cannot range freely they are not free-ranging. The IBMP program for bison functions as a lethal fence. The capture facilities also vitiate their claim that their goal is to maintain the bison as wild. Wild creatures must have wilderness, and wilderness is not an area of captivity. Zoos are. For bison, YNP functions as a zoo, and at other times, a bison slaughterhouse.

**The "brucellosis transmission" ruse**

APHIS claims that the reason for the drastic actions of lethal control being selectively directed at bison is because they have brucellosis. While brucellosis transmission from bison to cattle has never been demonstrated in the wild, APHIS points out that, "In 1990, researchers at Texas A&M demonstrated that bison infected with *B. abortus* could spread the disease to cattle through contact. Although this was proven under controlled conditions, it is difficult to document transmission of a disease in the wild."

Under crowded conditions, researchers corralled several brucellosis-infected bison with several brucellosis-free cattle and half the cattle contracted brucellosis. What the researchers do not make plain is that the dose of the bacteria was injected and massive, unlike wild conditions. Further, what

APHIS and other participants of the IBMP do not mention is that almost identical studies were done with coyotes and elk, corralling brucellosis-infected coyotes with cattle and in another experiment, brucellosis-infected elk with cattle. The experiments showed that like bison with brucellosis, these animals also transmitted the disease to cattle (Davis, 1990 and Thorne, 1979). But are elk prevented from migrating? Of course not. Montana makes a good deal of its income off of hunters relying on elk migrating down from the Yellowstone elevations. And are coyotes trapped as they leave the park because their risk of transmitting brucellosis to cattle is "not zero"? Of course not.

What the researchers demonstrated is that different species can jump the "species barrier" and transmit disease to each other under captive, crowded conditions.

**The "not zero" ruse**

A similar level of deception is being conducted by government agencies in its implied goal of reducing the probability of brucellosis transmission to zero. The *Record of Decision* observed:

> Commentors are correct that available evidence indicates the risk of transmission under natural field conditions is extremely low. However, because transmission between bison and cattle has occurred under experimental conditions and on ranches with privately owned bison and cattle, the risk of transmission is not zero ( *Record of Decision*, 2000, p. 50).

The Interagency supported its actions as follows:

> Eradication of brucellosis is not an objective; however, a commitment that the plan move toward elimination is. This means seropositive rates cannot remain as they are or increase, but must decrease over the life of the plan. In the selected alternative, this is accomplished primarily through bison vaccination. Preventing brucellosis in cattle is one of the purposes of APHIS' brucellosis eradication program; however, the purpose of action in the plan is confined to actions in the analysis area and is to "maintain a wild, free ranging population of bison and address the risk of brucellosis transmission to protect the economic interest and viability of the livestock industry in the State of Montana." Although the risk of transmission is low, it is not zero. Also, although the likelihood of two outbreaks and a downgrade in state status is also quite low, it is a possibility with serious economic ramifications, should it occur. Both are legitimate reasons for taking actions (*Record of decision*, 2000, p. 57).

Epidemiologically, a goal of zero transmission of a disease such as brucellosis is untenable. Only in a captive environment can such a disease risk be brought close to zero, but even then, cattle in fenced herds can contract brucellosis. The brucellosis disease risk for fenced cattle is also "not zero."

The governmental agencies involved in bison brucellosis risk management have established a goal regarding the risk of disease transmission that other health organizations find does not exist.

For instance, the World Organization for Animal Health (OIE, a retained historical acronym for "Office International des Epizooties") was established to fight animal diseases at the global level and has 178 member countries. It has "a mandate to publish standards aimed at avoiding the introduction of pathogens via international trade in animals and animal products, while at the same time preventing countries from setting up unjustified sanitary barriers . . .”

The OIE standards were “developed on the basis of a highly meticulous risk analysis but taking into account that **zero risk does not exist** (Seminar on sound governance for veterinary services, 2008)” (bold emphasis added).

**Bison are the only problem ruse**
Scott McMillion, writing for Montana Outdoors, the magazine of Montana Fish, Wildlife & Parks, in "Keeping Elk and Cattle Apart: How Montana is working to reduce the growing risk of brucellosis transmission from elk to cattle in the Greater Yellowstone Area" wrote the following for the November-December 2011 issue:

> Close your eyes and say two words: “brucellosis” and “wildlife.”
>
> Chances are, bison appear on the back of your eyelids. After all, the possibility of diseased bison infecting Montana’s cattle herds—and the various reactions to it by state officials and the livestock industry—has dominated headlines for nearly three decades.
>
> But think again. Over the past several years in Montana, Idaho, and Wyoming near Yellowstone National Park, animals in nine cattle herds and two domestic bison herds tested positive for the infectious disease. Scientists say the most likely source of the infections is not wild bison; it’s elk.
>
> In recent years, growing numbers of elk in southwestern Montana have tested positive for exposure to the disease. These “seropositive” elk, as they are called, aren’t necessarily infected with brucellosis or infectious to other animals, but they do harbor antibodies indicating exposure to the disease. The elk have been discovered increasingly farther from Yellowstone National Park, considered the last reservoir of brucellosis in the United States. The wild ungulates mix with cattle primarily in late winter, when they move down from deep snow in high elevations searching for snow-free forage (McMillion, 2011).

**The “lethal control” ruse**
A study determined that neither vaccination nor culling were viable methods of controlling the transmission of brucellosis from bison to cattle. Sustained infections of brucellosis require bison herds in excess of 200-300 animals. Once a herd drops below this number brucellosis tends not to be present.

Writing in “The population dynamics of brucellosis in the Yellowstone National Park,” researchers Andrew Dobson, department of ecology and evolutionary biology, Princeton University, and Mary Meagher, National Biological Services, Midcontinent Ecological Center, Greater Yellowstone Field Station, Yellowstone National Park, stated:

> The removal of animals crossing the boundaries of the park is the present policy for bison in the Yellowstone ecosystem. The historical records that detail the relationship among stock, recruitment, and removals, and the relationship between population size and prevalence can

> be combined to examine the relationship between culling intensity and resultant prevalence . . . This analysis suggests one would need to almost eradicate the bison before one could produce significant reduction in prevalence. More significantly the levels of removal required to eradicate *Brucella* may be sufficient to also drive the bison to extinction (Dobson et al., 1996).

Clearly, the present management of the wild bison in Yellowstone National Park may be sufficiently off track to, in the words of Meagher, "drive the bison to extinction."

**Figure 63. ENTERING THE KILLING ZONE. Bison that exit the park are subject to lethal removal. This trio is headed toward Gardiner Basin.** ***Photo: Janie Osborne/AP file.***

## ANALYSIS

**Overview of ESA**

Under the Endangered Species Act, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. For the purposes of the ESA, Congress defined species to include subspecies, varieties and, for vertebrates, distinct population segments.

The purpose of the ESA is to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such imperiled species, and to take steps as may be appropriate for these objectives. It is administered by the U.S. Fish and Wildlife Service and the Commerce Department's National Marine Fisheries Service (NMFS).

According to the FWS's online site titled "Little Known but Important Features of the Endangered Species Act: Distinct Population Segments, 4(d) Rules, and Experimental Populations:"

> In addition to the listing and delisting of species and subspecies, the ESA allows the listing/delisting of Distinct Population Segments of vertebrate species (i.e., animals with backbones, mammals, birds, fish, reptiles, and amphibians). A Distinct Population Segment is a portion of a species' or subspecies' population or range. The Distinct Population Segment is described geographically instead of biologically, such as "all members of XYZ that occur north of 40 north latitude."
>
> The use of Distinct Population Segments is a benefit to species conservation and a benefit to people whose activities may be affected by the ESA's prohibitions. Conservation efforts are more effective and less costly if they are started early and a Distinct Population Segment listing makes earlier listings possible. By listing a Distinct Population Segment, we apply the ESA's protections only to the deteriorating portion of a species' range.

One potential designation for the Yellowstone wild bison herd would be to list it as an "experimental population," a designation that has been applied to the Colorado pikeminnow, the southern sea otter, the gray wolf and the black-footed ferret. According to the FWS:

> Re-establishing a threatened or endangered species in areas of its former range is often necessary for recovery. However, residents and businesses frequently oppose such reintroductions because they fear the presence of the species will also bring severe restrictions on the use of private and public land in the area. To overcome this serious obstacle to species reintroductions, Congress added the concept of experimental populations to the ESA. Experimental population designations are sometimes referred to as section 10(j) rules.
>
> An experimental population is a geographically described group of reintroduced plants or animals that is isolated from other existing populations of the species. Members of the experimental population are considered to be threatened under the ESA, and thus can have

> special regulations written for them under section 4(d) (Little Known but Important Features of the Endangered Species Act, 2015).

Note: those "special regulations" could incorporate the provisions of regulated hunting with regard to listing wild bison, banning the taking of wolves and the removal of cattle in the ecosystem.

**Distinct population segment (DPS)**
A distinct population segment is one of the lowest taxonomic ranks. According to the Fish and Wildlife Service's policy regarding the recognition of distinct vertebrate population segments under the Endangered Species Act:

> Available scientific information provides little specific enlightenment in interpreting the phrase ''distinct population segment.'' This term is not commonly used in scientific discourse, although ''population'' is an important term in a variety of contexts . . . In all cases, the organisms in a population are members of a single species or lesser taxon.

Generally speaking, a taxon is a group of organisms, which a taxonomist adjudges to be a unit. Usually a taxon is given a name and a rank. There are seven main taxonomic ranks: kingdom, phylum or division, class, order, family, genus, species. It is not uncommon for one taxonomist to disagree with another on what exactly belongs to a taxon, or on what exact criteria should be used for inclusion. A "distinct population segment" or DPS is a unit ranked below "species" and is sometimes referred to as "subspecies."

The Glossary of the International Code of Zoological Nomenclature (1999) defines a "taxon" as

> . . . a population, or group of populations of organisms which are usually inferred to be phylogenetically related [that is, to be related in an organism's evolutionary development and history] and which have characters in common which differentiate [that is, distinguish] the unit (e.g. a geographic population, a genus, a family, an order) from other such units. A taxon encompasses all included taxa of lower rank and individual organisms.

The FWS policy explains that a unit is considered a DPS if it represents an evolutionarily significant unit (ESU) of a biological species. To be considered an ESU it must satisfy two criteria:

1. It must be substantially reproductively isolated from other conspecific population units; and

2. It must represent an important component in the evolutionary legacy of the species.

Note that to define a unit as a DPS one must determine that it is both separate from other populations and a component of its evolutionary history. Thus, what one initially considers a population has a critical bearing on how one measures what it is separate from and a component of. In practice and more specifically, according to the policy:

> Three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act. These are applied similarly for addition to the lists

of endangered and threatened wildlife and plants, reclassification, and removal from the lists:

1. Discreteness of the population segment in relation to the remainder of the species to which it belongs;

2. The significance of the population segment to the species to which it belongs; and

3. The population segment's conservation status in relation to the Act's standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).

*Discreteness*: A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions:

1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

*Significance*: If a population segment is considered discrete under one or more of the above conditions, its biological and ecological significance will then be considered in light of Congressional guidance (see Senate Report 151, 96th Congress, 1st Session) that the authority to list DPS's be used ‘‘ * * * sparingly’’ while encouraging the conservation of genetic diversity. In carrying out this examination, the Services will consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs. This consideration may include, but is not limited to, the following:

1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon,

2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon,

3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range, or

4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. Because precise circumstances are likely to vary considerably from case to case, it is not possible

> to describe prospectively all the classes of information that might bear on the biological and ecological importance of a discrete population segment.
>
> *Status*: If a population segment is discrete and significant (i.e., it is a distinct population segment) its evaluation for endangered or threatened status will be based on the Act's definitions of those terms and a review of the factors enumerated in section 4(a). It may be appropriate to assign different classifications to different DPS's of the same vertebrate taxon.

**Summary of findings on August 17, 2007 petition**

According to the August 17, 2007 90-day finding:

> The bison (also referred to as the American buffalo) is a member of the family Bovidae, which includes domestic cattle. Two subspecies of bison are currently recognized in North America—the plains bison (Bison bison bison) and the wood bison (Bison bison athabascae) (Boyd 2003, pp. 28–31). The species once ranged across central and western North America, but market hunting nearly extirpated the herds by the 1880s.
>
> Numerous Federal, State, and private bison herds currently exist in the United States, but YNP is the only area in the United States where bison have existed in the wild state since prehistoric times (Gates et al. 2005, p. 92). Boyd (2003, p. 38) estimated the plains bison population in North America at 500,000, and identified 50 herds (containing approximately 19,200 head) currently being managed with clear conservation objectives.

To determine whether the Yellowstone bison merit federal government conservation as a "distinct population segment" under the Endangered Species Act, three hurdles must be cleared in an analysis: the population segment must be found to be 1. discrete and 2. significant in relation to the taxon to which it belongs, and then, if so, 3. a population endangered or threatened to go extinct without protection.

*Discrete*

The 90-day finding found that the Yellowstone herd was *discrete*. It said (bold emphasis added):

> Information in our files support the conclusion that **the YNP bison population is the only herd in the United States that has remained in a wild state since prehistoric times (Gates et al. 2005, p. 93). All other bison in the United States are reconstituted herds and are confined with fencing, or otherwise range restricted.** Individuals from the Jackson bison herd in Grand Teton National Park and the National Elk Refuge have been known to migrate north into YNP, but this is a rare occurrence (Gates et al. 2005, p. 109). **Therefore, we find that the YNP bison herd may be discrete from other members of the taxon Bison bison because of physical distance and barriers**.

*Significant*

The next step is to determine if the Yellowstone herd is of biological and ecological significance to the taxon to which it belongs.

The finding stated that following extirpation of bison, YNP is the only area in the United States where bison have existed in the wild state since prehistoric times. As stated under "Information provided in the petition on significance," the information in the petition (bold emphasis added):

> **. . . indicates that the YNP bison herd may exist in a unique ecological setting within the meaning of our DPS policy**.

Further, according to the finding:

> Many of the numerous bison herds currently extant in the United States and Canada were reconstituted from stock that was used to develop bison cattle hybrids (Boyd 2003, p. 23). Research on 11 Federal herds revealed that the bison herd in YNP was 1 of 3 that showed no evidence of genetic introgression with cattle (Halbert 2003, pp. 86–87) based on the alleles examined. (Introgression occurs when the genes of one species infiltrate the genes of another through repeated crossings.) The other two herds were Wind Cave National Park in South Dakota and Grand Teton National Park in Wyoming (Halbert 2003, p. 87)…
>
> The Grand Teton National Park/ National Elk Refuge bison herd is separate from the YNP herd (Gates et al. 2005, p. 93), and there are less than a dozen other unconfined bison herds in the entire lower 48 States (Gates et al. 2005, p. 2). Therefore, the YNP herd is discrete from other members of the taxon. **Recent genetic research confirms that the YNP bison herd is significant because of a lack of nuclear domestic cattle introgression.** Although 3 other Federal herds exhibit this characteristic, the YNP bison are the only remnant population that has remained in a wild state since prehistoric times and, therefore, is important to the management of bison genetic diversity.

The finding observed that the bison herd in YNP is one of three herds that show no evidence of genetic introgression with cattle, it is separate from the other herds and is the only surviving wild indigenous remnant herd since prehistoric times. The FWS thus held that (bold emphasis added):

> **Because of the limited number and extent of bison herds that show no evidence of introgression with domestic cattle, we find that loss of the YNP herd might result in a significant gap in the current range of the taxon**.

And also, according to the finding:

> Halbert (2003, pp. 44–45) found only four of the Federal herds made positive contributions to overall bison genetic diversity (measured in terms of allelic richness and gene diversity). Those herds were: YNP, National Bison Range (Montana), Wichita Mountains National Wildlife Refuge (Oklahoma), and Wind Cave.

Thus, the YNP herd was one of the four Federal herds that made positive contributions to overall bison genetic diversity. The FWS determined that (bold emphasis added):

> Maintenance of genetic diversity is an important long-term goal for management of species populations. Halbert (2003, p. 94) concluded her study by stating: ''In conclusion, this study

> has assessed levels of domestic cattle introgression in 10 federal bison populations and identified at least 2 populations, Wind Cave and YNP, which at this time do not have any evidence of domestic cattle introgression and also have high levels of unique genetic variation in relation to other federal populations. As such, these populations should be given conservation priority * * *'' **Thus, we conclude that the YNP bison herd satisfies this genetic criterion of significance under the DPS Policy.**

Further, the habitat inside the YNP was determined to constitute a significant portion of the range for the bison herd (bold emphasis added):

> According to Gates et al. (2005), most bison in the YNP herd are confined within Yellowstone National Park for all or most of the year. Rut takes place within YNP from around mid-July to mid-August (Meagher, 1973) in one of three rutting areas—the largest rutting aggregation is in the Hayden Valley, the second largest in the eastern Lamar Valley, and a small aggregation occurs in small high elevation grasslands on the Mirror Plateau and Cache/Calfee Ridge (Gates et al. 2005). Most bison remain in YNP during winter, especially in the geothermally-influenced central portion of the Park. Calves are born in April–May on the winter range (Meagher 1973). **For these reasons we have determined that there is substantial information that Yellowstone National Park may constitute a significant portion of the range for the potential YNP bison herd DPS**.

In addition, the Gardiner Basin just outside the north end of the park was determined to constitute a significant portion of the YNP bison herd (bold emphasis added):

> The proportion of Yellowstone bison that move to winter ranges outside YNP varies from 3 to 30 percent per year, depending on conditions (YNP, 2007). Bison move beyond Park boundaries in late winter in response to forage limitation caused by interactions between population density, variable forage production, snow conditions, and grazing competition (Gates et al. 2005). The Gardiner Basin has been considered important winter range for bison since at least the 1940s and is an important component of the Northern winter range; in contrast, the West Yellowstone area does not have unique ecological value as winter range according to Gates et al. (2005). **For these reasons we believe there is substantial information that the Gardiner Basin provides resiliency to the herd during harsh winters, and, therefore, may constitute a significant portion of the range for the potential YNP bison herd DPS.**

However, the findings disagreed with several positions stated in the petition. While being free of domestic cattle introgression was held to be evidence that the Yellowstone herd differed markedly from other populations of the species in its genetic characteristics, the conclusion stated by Meagher that the Yellowstone bison were mountain or wood bison was held to be incorrect. The finding stated (bold emphasis added):

> The petition alleges that the YNP bison herd may be a unique hybrid of the wood and plains bison. No citations are provided, but this conclusion was stated in Meagher (1973, pp. 14–16), who considered the ''mountain'' bison a separate species. **This controversy has since**

> **been resolved, and YNP staff now considers the remnant population, as well as the introduced bison, as being of plains bison origin** (Boyd 2003, pp. 182–183; Wallen 2006).

Delaney P. Boyd, University of Calgary's Faculty of Environmental Design Environmental Science, did her dissertation on the conservation status survey on North American bison for the World Conservation Union/Species Survival Commission's (IUCN/BSG) Bison Specialist Group (BSG). Rick Wallen is leader of the park's bison ecology and management team.

In sum, the 90-day finding made this determination regarding discreteness and significance of the Yellowstone bison herd (bold emphasis added):

> **On the basis of the preceding discussion, we believe that there is substantial information to conclude that the YNP bison herd may be discrete and significant within the meaning of our DPS Policy, and therefore may constitute a DPS**.

Despite the findings that the Yellowstone herd is both distinct and significant and that the Gardiner Basin constituted a significant portion of its range, the FWS concluded that because the herd was considered by the FWS as sufficiently abundant and managed with "clear conservation objectives," listing was not warranted (bold emphasis added):

> The bison in Yellowstone National Park are considered to be plains bison (Bison bison bison). As mentioned previously, Boyd (2003, p. 38) estimated the plains bison population in North America at 500,000, and identified 50 herds (containing approximately 19,200 head) currently being managed with clear conservation objectives. **Given the abundance and management status of the subspecies, we have concluded that the petition has not presented substantial information indicating that its listing under the Act may be warranted**.

In particular, the finding reasoned that since the herd is abundant, control actions (including lethal control) of Yellowstone bison both inside and outside the park does not harm its "quasi-migratory" ranging behavior. The finding stated (bold emphasis added):

> The petitioner's assertion that hazing and killing of bison outside the Park will affect the "quasi-migratory" behavior of the herd, and will result in a restriction of the range is not supported by information available in our files. Bison in YNP attempt to compensate for declining per capita food resources by range expansion (Gates et al. 2005, p. 131). In other words, bison move out of the Park in the winter in search of food, and this pattern has continued since implementation of the Joint Bison Management Plan (discussed in greater detail under Factor D) in 2000 (Clarke et al. 2005, p. 29). **Therefore, the available information indicates that control actions have not affected the "quasi-migratory" ranging behavior of the YNP herd**.

That is, according to the finding, regardless of whether the wild bison were able to access habitat such as Gardiner Basin, deemed to provide "resiliency to the herd during harsh winters, and, therefore, may constitute a significant portion of the range for the potential YNP bison herd DPS," since members of the bison herd keep migrating, their migratory behavior must not have been harmed by the lethal removal of numerous individuals, and that because the bison population continues to grow, bison are not harmed by the practice of lethal control of migrating individuals, namely, those that attempt to cross park borders into Montana. In this instance, the finding addresses the issue of abundance in connection with the Yellowstone bison, stating (bold emphasis added):

> With regard to YNP bison population abundance, the team found that the abundance of bison has grown steadily since the implementation of the Joint Bison Management Plan . . . The population reached almost 4,900 head in the summer of 2005, and now numbers around 4,500. Winter weather conditions have been mild to average during the first 5 years, and the population has not dropped below 2,300 bison. The late winter population has been above the population target and management decision threshold of 3,000 head in 4 of the 5 years of implementation (Clarke et al. 2005, p. 28). Management-related mortality has resulted in greater than 200 bison removed during 3 of the 5 winters, but the population continues to expand … [p. 20 col. 3]
>
> Population data for the YNP bison herd indicate that, since the winterkill and lethal brucellosis control actions in Montana during 1996-97, **the YNP bison herd has continued to grow despite culling for population and brucellosis control, and currently numbers approximately 4,500 animals. We therefore conclude that the petition does not present substantial information indicating that listing the Yellowstone bison herd within YNP may be warranted.** [p. 22 col. 2]

Part of the reasoning behind the denial of listing status is the claim that the Yellowstone bison are being managed well, establishing a lethal-control population threshold of between 2,100 and 3,800. The 90-day listing stated (bold emphasis added):

> As part of the Joint Bison Management Plan, variable numbers of bison may be removed from the herd to maintain optimal population size and for brucellosis control. In addition, the Joint Bison Management Plan establishes that when the population drops to 2,300 bison, measures to protect bison will be increased. Management mortality would cease if the herd drops to 2,100 head. The herd may stabilize at about 3,500 to 3,800 head, but could fluctuate over time based on the severity of winter weather (USDI and USDA 2000, pp. 51-52)…
>
> This size range was identified by YNP staff as sufficient to protect the long-term status of the herd. **The latest conservation genetics information indicates that a population in this range should be able to sustain the current level of genetic diversity indefinitely without the need for introducing immigrants from other populations (Wallen 2006).**

Further, the finding states that the migratory behavior of the Yellowstone bison is not significant.

In assessing "Evidence of the persistence of the discrete population segment in an ecological setting that is unique or unusual for the taxon," the finding concluded that the migration of the Yellowstone herd was not unusual. It said (bold emphasis added):

> The petitioner asserts that the YNP is significant because of its "quasi-migratory behavior." Gates et al. (2005, p. 160) concludes that YNP is a forage-limited system, and that, "Bison move beyond park boundaries in winter in response to forage limitation caused by

> interactions between population density, variable forage production (driven by spring/early summer precipitation), snow conditions, and herbage removal primarily by bison and elk." Winter movement of large herbivores, such as bison and elk, in search of forage is normal behavior. **The fact that bison and elk range outside the Park is not unusual. Based on this information, we would not consider the YNP bison herd movements to winter range outside the Park boundary as a unique behavior within the meaning of our DPS Policy**.

The finding argued that since it was not unusual for herbivores to migrate, the migratory movements of the Yellowstone herd were not significant.

**Discussion of the August 17, 2007 finding**
The finding stated that:

> The petitioner implies that existing regulatory mechanisms are inadequate to ensure protection of the YNP bison herd because some animals are killed outside the Park. We are assuming that, based on the information in our files, the petitioner is referring to lethal control of bison in conjunction with Montana's brucellosis control program.

*Criticism:* The implication is not that the regulatory mechanisms are merely inadequate to ensure protection of the YNP bison herd, but rather, that *the regulatory mechanisms are a cause of the herd's inadequate protection*. The finding states that:

> Management-related mortality has resulted in greater than 200 bison removed during 3 of the 5 winters, but the population continues to expand (Clarke et al. 2005, p. 28). Based on this information we concur with the Status Review Team that the Joint Bison Management Plan is working with regard to successful management of the YNP bison herd.

The issue is not merely herd expansion, but rather the genetic viability of the herd that may or may not be expanding. Lots of bison that have lost the instinct to migrate will not ensure survival of the Yellowstone bison in the event of an unusually severe winter. For bison to exhibit migratory behavior, they must be allowed to be free ranging. By subjecting free ranging behavior to lethal control by killing migrating bison, the free-ranging instinct is being selected out.

Recall that the 2007 finding stated in defense of its position that IBMP's bison culling program was not harming the genetic diversity of the Yellowstone herd:

> The latest conservation genetics information indicates that a population in this range should be able to sustain the current level of genetic diversity indefinitely without the need for introducing immigrants from other populations (Wallen 2006).

The 2007 finding also stated under "evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics" the following in regard to my original petition:

> The petition alleges that the YNP bison herd may be a unique hybrid of the wood and plains bison. No citations are provided, but this conclusion was stated in Meagher (1973, pp. 14-16), who considered the "mountain" bison a separate species. This controversy has since been resolved, and YNP staff now considers the remnant population, as well as the introduced bison, as being of plains bison origin (Boyd 2003, pp. 182-183; Wallen 2006).

I was curious how these statements were supported by research, so I looked for citations at the end of the 2007 finding. There were none listed. Instead was this note under "References:"

> A complete list of all references cited herein is available on request from the Region 6 Endangered Species Program, U.S. Fish and Wildlife Service (see ADDRESSES section).
>
> Author: The primary author of this document is Chuck Davis, Region 6 Endangered Species Program, U.S. Fish and Wildlife Service (see ADDRESSES section).

I emailed the FWS and received this reply:

> Dear Mr. Horsley,
> In response to your question on the 2007 90-day finding on Yellowstone National Park Bison, I found the attached documents in our files. I believe these are the references you were looking for.
> Thank you for your interest.
>
> Sarah Fierce
> Listing Biologist
> U.S. Fish and Wildlife Service
> 134 Union Blvd., Lakewood, CO 80228

The reference "Wallen 2006" is a memorandum by Rick Wallen to Chuck Davis, with a copy to Glenn Plumb, dated 07/19/2006. This memo apparently was in reference to my petition and provided citational support to refute my claims regarding the status of Mountain bison in the park and the genetics of the herd. The memorandum will be quoted in full. It stated:

> Thank you for the update regarding the petition to list Yellowstone bison.
>
> Our winter 2005/2006 flights to estimate population abundance occurred in January and February of 2006. We conducted two flights and made population estimates based on sightability models using a habitat based correction model for each of the two flights separately and a replicate correction model using data from both flights. The replicate model tends to estimate population abundance better than the habitat model. The replicate model estimate was 3546. Attached is the project report provided to park management.

The below report followed:

We are conducting our summer count flights at this time and will finish in two weeks. I should be able to provide an estimate shortly after we finish the third flight. If you need a number earlier I can provide an estimate based on one count in just a few days. We will need a few days to compile our notes from today's flight.

As per my quick review of the finding, I compiled the following thoughts . . .

On the bottom of page 4 and top of page 5 you talk about hybridization of plains and wood bison at Yellowstone. This is incorrect. The Meagher book referred to "Mountain" bison as a separate species from plains bison but this debate was resolved some time ago and we consider both the remnant population of bison as well as the introduced bison as being of plains bison origin. I refer you to a thesis by Delany Boyd on the conservation status of bison.

Boyd, D. 2003. Conservation of North American bison: status and recommendations. MS Thesis, Univ. of Calgary. 220pp.

On page 13 you identify that the current management establishes a population range between 1700 and 3000 bison. While the FEIS identifies 3000 as the target or populations objective, the final decision as noted in the ROD [*Record of Decision*] identifies that when the population drops to 2300 bison, measures to protect bison will be increased and management mortality will cease at a population estimate of 2100. You capture this concept quite well later in the finding. The EIS analysis estimated that the population may stabilize at about 3500 to 3800 bison but would definitely fluctuate in abundance over time based on the severity of weather. At this population level our management plan accepts that there would be some persistent culling to manage the risk of brucellosis transmission at the management zones articulated near the National Park boundary. The latest conservation genetics information suggests that a population of this size should be able to sustain the current level of genetic diversity indefinitely without the need for immigrants from other populations. I believe Fred Allendorf and Gordon Luikart at the University of Montana have a very recent Conservation Genetics text to use for citation if necessary. The National Park Service also has an internal report that specifically addresses conservation of genetics in bison populations and determined that the 96% of the current level of genetic diversity could be maintained when populations of greater than 1000 bison are protected. Dr. Luikart argues that even dips in population abundance below this number would not be detrimental unless the abundance stayed at low levels for several generations of individuals in the populations.

Your discussion of factor C on page 14 should note that reproductive capability for this population is approximately 17% as was exhibited by growth rates when bison were restored to vacant ranges within the park at the turn of the last century and in the 1930's. Population growth rates from 1990 to 2000 were more like 5% and since the IBMP ahs been in place growth rate of the population is about 8%. I would not consider the growth rate of the population as exponential as referenced by Dr. Tom Roffe. The management culling of bison that has occurred over the last 20 years has certainly dampened the potential rate of growth from 17% to the current calculated rates of 5 to 8%. Cite the Gates report and one new thesis from a graduate student at Montana State University. I can also send you a spreadsheet evaluation I did for park management last winter that looks at IBMP period growth rates.

Fuller, J 2006. Population demography of the Yellowstone National Park herds. MS Thesis, Montana State University, Bozeman. 85pp.

Julie successfully defended her thesis in April.

The 1077 to 3000 objective is used again on page 17. I would refer to our management program of conserving a population of greater than 2100 bison and reference one of the two primary goals of the IBMP is to "conserve a population" of Yellowstone bison.

Rick Wallen
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The writer of the 2007 finding, Chuck Davis, endangered species litigation coordinator for the Fish and Wildlife Service at YNP, chose not to cite the two recommended sources regarding genetic diversity, namely the text *Conservation and the Genetics of Populations* by Fred Allendorf and Gordon Luikart, University of Montana, nor an untitled National Park Service's internal report. Instead, he cited Wallen's 2006 memo itself.

Because Glenn Plumb was copied with the Wallen 2006 memo, the "internal report" most likely was a study generated by G.E Plumb, referenced above (see "Plumb study"). As I have argued above, the study did not support the contention by the FWS that the genetics of the wild herd of bison in Yellowstone were being protected by the actions of the IBMP.

Nor does Allendorf and Luikart's text appear to support the claim by Wallen in his 2006 memo that the "latest conservation genetics information suggests that a population of this size should be able to sustain the current level of genetic diversity indefinitely without the need for immigrants from other populations" or "that even dips in population abundance below this number would not be detrimental unless the abundance stayed at low levels for several generations of individuals in the populations."

The resulting 2007 finding discounts the effect on populations of selecting out only migratory animals. Discounting the effects of selection does not reflect what is actually going on in the park by the removal actions of the IBMP. It is undeniable that, indeed, animals are being selected for removal by the IBMP that have certain genetic traits. These actions have an effect similar to genetic drift, as referenced previously. Genetic drift does not result from the effects of natural selection, but instead from a random event that obliterates a certain segment of a population, thereby eliminating a pool of genes that would otherwise have existed.

Allendorf gave as an example the intense natural selection on cliff swallows during a harsh winter storm, whereby larger birds were much more likely to survive the storm than smaller birds. Adult progeny in the next generation were much larger than the mean of the population before the storm event. Bison have also experienced a similar "storm," that is, the massive slaughter of the population at the hands of the European buffalo hunters. Such a sudden reduction of the population is called a bottleneck.

With these genes gone, according to Allendorf, the "loss in genetic variation caused by a population bottleneck may cause a reduction in a population's ability to respond by natural selection to future environmental changes," especially if the populations are too small. As Allendorf pointed out, small populations are more likely to go extinct due to environmental change because they are less able to adapt than are large populations. This is particularly true regarding disease:

> The effect of small population size on allelic diversity is especially important at loci associated with disease resistance. Small populations are vulnerable to extinction by epidemics, and loci associated with disease resistance often have an exceptionally large number of alleles (Allendorf, 2007).

The genetic effects of the actions of the IBMP, however, are even more damaging than the effects of genetic drift, for its actions are not random, nor natural selection, but instead artificial selection. Effective population size in maintaining genetic diversity has little meaning when it comes to the constant weeding out of various traits in a population at the hands of artificial selection. Allendorf cited as an example what has happened to the size of horns in bighorn sheep in response to trophy hunting (Allendorf, 2007). According to David W. Coltman, the author Allendorf cited, a 30-year study of a wild bighorn sheep population—in which trophy hunting targeted rams with rapidly growing horns—resulted in the production of smaller-horned, lighter rams, and fewer trophies. Horn length was found to be highly heritable (Coltman, 2003). The trait of migration is also thought to be heritable.

Apparently the author of the 2007 petition, Chuck Davis, never read the text recommended by Wallen, or if he did, discounted relevant studies.

And genetics is not the only factor. Reservoirs of learned behavior—involving a limited, select number of bison—are being removed. Management actions involving lethal control eliminates those bison that have learned from the past—including their parents and older females—the way to winter forage during severe winters. Removing these bison removes those who serve as leaders out of the park, destroying learned behavior favoring survival. Older female bison are often the leaders. When you kill the teacher, you end up with an uneducated class. Commenting on one instance of lethal control by government agents, Meagher noted: "This removal probably included many of the older experienced females, commonly the leaders . . ." (Meagher, 1989).

The 2007 finding, however, disagrees that lethal control is harming migratory movement. In the finding, recall the FWS reasoned that since bison have continued to move out of the park in search of food in the winter following the implementation of the Joint Bison Management Plan, it concluded that lethal control by the government has not affected their migratory behavior nor restricted their range. Let us look at this issue more closely.

Recall that the finding regarding the Yellowstone herd noted:

All other bison in the United States are reconstituted herds and are confined with fencing, or otherwise range restricted.

Recall that in the finding the FWS stated:

> The petitioner's assertion that hazing and killing of bison outside the Park will affect the "quasi-migratory" behavior of the herd, and will result in a restriction of the range is not supported by information available in our files.

Why has this killing of migratory bison somehow not resulted in a restriction of their range? This magical conclusion relies on three factors:

1. redefinition of the term "free-ranging,"

2. reasoning that culling large segments of wild bison does not restrict their range because, well, so far bison keep heading toward the park borders in an attempt to expand their range, and

3. winking at contradictory statements made by the FWS in its 2007 finding, namely:

- The Gardiner Basin has been considered important winter range for bison since at least the 1940s and is an important component of the Northern winter range.

- For these reasons we believe there is substantial information that the Gardiner Basin provides resiliency to the herd during harsh winters, and, therefore, may constitute a significant portion of the range for the potential YNP bison herd DPS.

- The petitioner's assertion that hazing and killing of bison outside the Park will affect the "quasi-migratory" behavior of the herd, and will result in a restriction of the range is not supported by information available in our files.

**Finding: bison are free-ranging, not range restricted and other myths**

Let us look at the FWS's attempt to redefine "free-ranging." In the finding, the FWS stated:

> One of the primary goals of the Joint Bison Management Plan is to provide for a "free-ranging bison herd" (USDI and USDA 2000, p. 6).

The FWS defines the Yellowstone as being unique from other herds because other herds "are confined with fencing, or otherwise range restricted." In the face of these statements, the FWS concludes:

> Bison in YNP attempt to compensate for declining per capita food resources by range expansion (Gates et al. 2005, p. 131). In other words, bison move out of the Park in the winter in search of food, and this pattern has continued since implementation of the Joint Bison Management Plan . . . in 2000 . . . Therefore, the available information indicates that control actions have not affected the "quasi-migratory" ranging behavior of the YNP herd.

In other words, as long as bison in the YNP can move toward the border, they are migratory and thus free-ranging. While the Yellowstone bison cannot range outside the park without exposing themselves to lethal control, they are still termed "quasi-migratory" with regard to behavior because some do attempt to cross the park boundaries. The FWS has, in effect, defined "quasi-migratory" and "free ranging" as having practical meaning only in relationship to the intent to migrate as indicated by behavior and not having significance in relationship to actually carrying out that behavior, that is, to actually *be* free ranging or to actually migrate.

Apparently, the FWS can claim the Yellowstone herd is not "range restricted" nor is its range behavior restricted, because it can migrate up to the park boundary. Not being able to go beyond the border somehow is not a factor with regard to "free ranging" or its "quasi-migratory" behavior. In sum, as long as the genes of some members impel them up to the border, they are still deemed migratory. Since the result of crossing that border, lethal control, has not resulted *to date* in destroying that instinct, the FWS concluded that the Yellowstone bison can be considered free ranging and their migratory behavior uncompromised.

That, of course, is absurd. In human terms, if this line of reasoning were applied to a prison, a prisoner would be termed free if he merely intended to leave the prison. That he got shot when he tried to step through the gate would somehow, um, not mean he had been restricted, according to FWS lingo. However, natural selection does not operate on intent. If a mouse intends to run down a hole to escape a hawk, but it does not do so and gets eaten, that intent will not propagate its line nor will its genes be inherited.

What has actually been demonstrated is that *despite* the management actions carried out by the IBMP, some bison still possess the genetically controlled behavior to migrate, as well as the learned behavior to do so.

Conversely, to prove that management actions were harmful to the herd's migratory behavior, apparently the only acceptable evidence to the FWS might be something like this:

> 1. after shooting or slaughtering a portion of the migrating bison, a significantly reduced number of bison attempted to migrate the following year and were destroyed,
>
> 2. that despite severe winter conditions, those remaining in the park, unable to exercise their migratory instinct because they now had no such survival instinct or learned behavior, stayed within the park and died due to starvation,
>
> 3. thus resulting in the collapse of the entire herd due to management actions, which artificially selected out via lethal control those with the ability to migrate, leaving only non-migratory bison in Yellowstone National Park, where they expired.

If the way out of the park is not known, if the genetics for that urge has been erased, or if the leadership has been lost, the scenario for a collapse of an entire herd is possible. In addition to deaths inside YNP in the past due to severe winter conditions, such die-offs have occurred elsewhere. J. Dewey Soper in *History, range, and home life of the northern bison*, wrote about such an event in Canada in the early 1800s:

> Excessive snowfall with mid-winter thaw, sleet, and freezing again at severe sub-zero temperatures, is unquestionably the gravest danger. Vague reports were heard of such an occurrence many years ago, alleged to have been disastrous to bison. It seems to be well established, however, that such calamities are exceedingly rare. In the above respect, one of the most suggestive bits of evidence is contained in Preble's report (1908:145-46). Two men on their way to the Yukon in 1871 made a portage from Peace River to Hay River, evidently in the vicinity of Watt Mountain. Here they saw "thousands of buffalo skulls" along the portage route and trails two to three feet deep. Later, making an inquiry regarding this self-evident disaster, they were informed that, about 50 years before, snow fell to an estimated depth of 14 feet and so enveloped the animals that they perished by thousands.
>
> Dawson (1881:54B) writing of the Peace River country about 1880, remarked that “The Indians state that the extinction of the buffalo was not entirely due to the introduction of firearms and the active hunting carried on for the supply of the Hudson Bay forts, but that all remaining were killed many years ago by an excessively severe winter when the snow was over the buffaloes’ backs” (Soper, 1941, pp. 347-412).

If the entire herd does not collapse within the park, what is increasingly more likely to happen is the extinction of their wild traits, which is their defining characteristic. This is being caused now by means of artificial selection via the lethal removal actions of the IBMP that favor bison with more domestic traits, as documented in the Discussion.

The illogic continues. Try to follow this line of reasoning. It goes like this (and these are direct quotes from the 2007 finding): Of course, even though the “Gardiner Basin has been considered important winter range for bison since at least the 1940s,” and even though it “is an important component of the Northern winter range” and even though it “provides resiliency to the herd during harsh winters, and, therefore, may constitute a significant portion of the range for the potential YNP bison herd DPS,” the “petitioner's assertion that hazing and killing of bison outside the Park will affect the ‘quasi-migratory’ behavior of the herd, and will result in a restriction of the range is not supported by information available in our files.”

Maddening.

Wild bison, one way or another, either physically as an entire herd, or genetically or behaviorally, by the continued exclusion from its range via lethal removal will become extinct under the management of the IBMP.

But the FWS does not see this. Apparently, for the FWS, only extinction of this bison DPS would prove that its listing should have been implemented to prevent extinction.

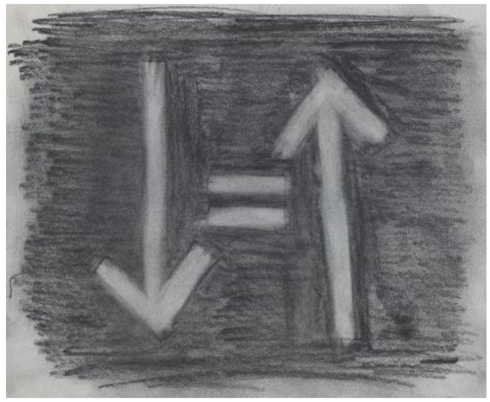


**Figure 64. UP EQUALS DOWN THINKING is characteristic of the type of logic that pervades much of the reasoning that dominates the Fish and Wildlife Service's findings regarding listing of wild bison as endangered, as well as related studies used to support those decisions. Possibly the above figure could be the new logo for the FWS. Maybe the NPS, too.**

**Finding: migrating herbivores migrate**

The FWS found that not only did the governmental lethal control actions have no effect on the "quasi-migratory" ranging behavior of the YNP herd, but the finding concluded that the "quasi-migratory behavior" of Yellowstone's bison is not significant. Recall that according to the finding:

> Winter movement of large herbivores, such as bison and elk, in search of forage is normal behavior. The fact that bison and elk range outside the Park is not unusual. Based on this information, we would not consider the YNP bison herd movements to winter range outside the Park boundary as a unique behavior within the meaning of our DPS Policy.

This finding is in error because it is simply a tautology, namely, it is saying that there is nothing unusual about migratory animals migrating. However, the zoography of the Yellowstone bison is unique, especially in relationship to its distinctive migration routes. The Greater Yellowstone Ecosystem has served as a refrugium (a location of an isolated or relict population of a once widespread species) for bison, its isolation protecting it from unfavorable and extensive change, namely predators, such as wolves and grizzly bears, as well as the invasion of man into that system, whereby man functioned as an overwhelming predator. The isolation of the higher altitudes and the dense forests helped protect the subspecies during the summer months, and the isolation and the lower snow pack of the geothermal habitat, as well as extra-YNP habitat, at lower levels provided protection during the winter months.

The forested areas surrounding the meadows of the plateau regions, for instance, provided protection from predators, as bison under physical attack could run into the dense cluster of trees and "dislodge any of his attackers that have secured a hold by rubbing or crushing them against the trees" (Fuller, 1960). However, when the limits of tolerance for bison due to climatic conditions was exceeded, to survive harsh winters many bison were forced to lower altitudes where the climate was less severe and forage more available. According to Robert A. Garrott, department of ecology, Montana State University and a member of the Fish & Wildlife management program, in *The Ecology of Large Mammals in Central Yellowstone*:

> The odds of predation on bison increased many orders of magnitude with increasing accumulations and duration of snow pack, presumably weakening bison such that they were less able to defend themselves or calves. While we did observe bison being killed in deep snow, observations of wolves attacking bison in late winter typically occurred in low snow meadow complexes and defense sometimes lasted several hours, as wolves continually attempted to isolate and injure vulnerable individuals. An animal in a weakened state is likely much less able to sustain such defense in the face of an attack. Snow pack is also highly influential in driving broad-scale movements of bison, such as winter migrations into the Madison headwaters area and movements among drainages (chapter 12 and 28 by Bruggeman et al., this volume) (Garrott, 2009, p. 327).

The geothermal habitat of the Madison headwaters area is comprised of low-snow areas and provides forage, such as sedges, because of the reduced snow cover, facilitating grazing.

As stated, part of the behavior that contributes to the Yellowstone bison's survival is its migratory response to the ecosystem, namely, persisting in the secluded niches of the higher altitudes, then descending to lower, more exposed areas, for forage so as to maintain strength necessary to ward off predators. If the Yellowstone herd is *bison bison*, that behavior is exceptionally unique, for it enabled 25 bison to survive out of millions that remained on the plains. While plains bison migrate, the vast majority migrated over a level habitat from region to region, instead of from one elevation to another, and were thus easily slaughtered by market hunters. Not only was the Yellowstone herd's survival aided by the unusually rugged mountain region, but in addition the creation of the park by legislative fiat helped protect them from extermination.

To sum this up, when park areas experience greater bison density and when winters become more severe, bison often migrate into areas outside the park, such as the northern egress of the Yellowstone River. This migratory instinct has helped the Yellowstone bison survive forage limitations imposed by winter conditions, as well as predators such as wolves.

What is historically unique about Yellowstone bison is their altitudinal migratory habits, as opposed to the more common migration over level land that typified the plains bison. Most likely this is because they are the descendants of mountain bison that were noted for that behavior by early park observers.

(Ironically, what is presently most unusual about these ungulates is that they are the only ones in the park that drop dead as a result of attempting to migrate out of the park, and for that unique migratory behavior alone, the park's bison should be protected.)

**Meaning of species and subspecies**

Despite finding the herd distinct and significant, the FWS concluded that the "subspecies" was not in danger of becoming extinct due to two factors, 1. its abundance and 2. its management.

But what is meant by "subspecies" and for that matter, "species?" The first hurdle in determining a DPS relies on determining its discreteness, and discreteness is in relation to its taxon, that is, in this case in relation to its rank as a species or subspecies. Since listing a possible DPS depends on the "discreteness of the population segment in relation to the remainder of the taxon," it is important that we understand what is indeed meant by the word “species” and “subspecies.” Within the 90-day finding, there are several usages that appear to be in operation regarding those terms.

The definition of these terms used in the finding is elucidated by the context in which each term is found. Usage of a word and context controls meaning. The meaning of the Yellowstone herd as a species has profound implications. If the herd is viewed as a member of a species or subspecies that is unique to Yellowstone National Park, that would make it discrete, but if the herd is viewed merely as belonging to the 50 conservation herds spread throughout the nation, it would not be discrete and thus would not qualify as a distinct population segment. Here are the usages and their associated context as found in FWS’ 90-day 2007 finding (for convenience sake, a table has been used):

**Table 3. Usage of the word “subspecies” or “species” in a sentence and in context in the 90-day finding by FWS**

| | **Sentence with word “subspecies” or “species”** | **Associated sentence or phrase explaining the word “species”** |
|---|---|---|
| **First usage** | “Mr. Horsley requested that the Service list the herd as a **subspecies** or ‘distinct population group,’ and to designate critical habitat in and adjacent to YNP.” | “…as a subspecies or ‘distinct population group,’” |
| **Second usage** | “Two **subspecies** of bison are currently recognized in North America–the plains bison (Bison bison bison) and the wood bison (Bison bison athabascae)” | “The bison (also referred to as the American buffalo) is a member of the family Bovidae, which includes domestic cattle. …the plains bison (Bison bison bison) and the wood bison (Bison bison athabascae)” |
| **Third usage (Conclusion)** | “Given the abundance and management status of the **subspecies**, we have concluded that the petition has not presented substantial information indicating that its listing under the Act may be warranted.” | “The bison in Yellowstone National Park are considered to be plains bison (Bison bison bison). As mentioned previously, Boyd (2003, p. 38) estimated the plains bison population in North America at 500,000, and identified 50 herds (containing approximately 19,200 head) currently being managed with clear conservation objectives.” |
| | | |

| | | |
|---|---|---|
| **Fourth usage** | "Under section 3(15) of the Act, we may consider for listing any species, **subspecies**, or, for vertebrates, any DPS of these taxa." | "The petitioner asked us to list the YNP bison herd as a 'distinct population group.' We assume that the petitioner meant a Distinct Vertebrate Population Segment (DPS) for purposes of listing under the Act." |
| **Fifth usage** | A portion of a species' range (in this case, ''**species**'' refers to the potential YNP bison herd DPS)… | …refers to the potential YNP bison herd DPS)… |
| **Sixth usage** | This information will help us monitor and encourage the conservation of the **species**. | In summary, we have determined that the petition has not presented substantial information indicating that the potential YNP bison herd DPS may warrant listing as threatened or endangered throughout all or any significant portion of its range. |

Meaning by context:

- the **first usage** suggests that "subspecies" means a distinct population group,
- the **second usage** suggests that "subspecies" means either plains bison or wood bison,
- the **third usage**, the findings conclusion, suggests that "subspecies" in this instance means herds of Bison bison bison that are managed with "clear conservation objectives," namely the 50 conservation herds containing 19,200 head,
- the **fourth usage** suggests that "subspecies" means something distinct from species and means a distinct population group,
- The **fifth usage** states that "species" means the YNP bison herd DPS, and
- The **sixth usage** suggests that "species" means the YNP bison herd DPS. Elsewhere, the YNP bison herd is identified as numbering "approximately 4,500 animals."

What can we conclude? In regard to the meaning of "species" and "subspecies" as used in the 90-day finding, the nomenclature is unclear. While a portion of the finding argues on behalf of a subspecies being defined as a distinct population group that is part of Yellowstone National Park, numbering about 4,500, and which is uniquely wild, being unfenced, in other sentences it implies by association that the subspecies is Bison bison bison, plains bison, and not Bison bison athabascae, wood bison, of which there are 500,000, and which include the so-called *wild* subspecies, consisting of 50 herds managed with "conservation objectives," containing about 19,200 head.

We are thus left with a confused message.  Recall that in one portion of the finding it says this:

> The bison in Yellowstone National Park are considered to be plains bison (*Bison bison bison*). As mentioned previously, Boyd (2003, p. 38) estimated the plains bison population in North America at 500,000, and identified 50 herds (containing approximately 19,200 head) currently being managed with clear conservation objectives. Given the abundance and management status of the subspecies, we have concluded that the petition has not presented substantial information indicating that its listing under the Act may be warranted.

Abundance in the above paragraph is in reference to its abundance as Bison bison bison and the 19,200 head being managed with "clear conservation objectives." One wording implies that despite geographic separation, the Yellowstone herd is essentially part of one great population and is not markedly separate from other conservation herds. Because it is deemed part of that large population, and because those herds are managed with conservation objectives, it does not merit listing. On the other hand, the other usage states that while the herd is markedly separate, it is of sufficient abundance (4,500 head) to make listing as endangered unwarranted.

So, which is the correct view in this context? Recall that the FWS's 90-day 2007 finding explicitly states that YNP herd is distinct, that is, discrete and separate (bold emphasis added):

> The petitioner asserts that the YNP bison ''herd is the only wild, unfenced buffalo herd in the nation,'' but no specific citations are provided to support this conclusion. Information in our files supports the conclusion that the YNP bison population is the only herd in the United States that has remained in a wild state since prehistoric times (Gates et al. 2005, p. 93). All other bison in the United States are reconstituted herds and are confined with fencing, or otherwise range restricted. Individuals from the Jackson bison herd in Grand Teton National Park and the National Elk Refuge have been known to migrate north into YNP, but this is a rare occurrence (Gates et al. 2005, p. 109). **Therefore, we find that the YNP bison herd may be discrete from other members of the taxon *Bison bison* because of physical distance and barriers.**

Further, abundance in the latter portion of the document is related to the YNP herd, not the larger element of the conservation herds:

> On the basis of our review of the petition and other information readily available in our files, we have concluded that the petition does not present substantial information that the Yellowstone bison herd may be threatened or endangered in either of the potentially significant portions of the range as outlined in the two previous paragraphs. Management of the Yellowstone bison herd is guided by a Joint Bison Management Plan for the YNP bison herd (USDI and USDA 2000). Management of bison within the Park is the responsibility of the National Park Service. Culling of bison in interior YNP for population and brucellosis management stopped in 1968 (Gates et al. 2005). Population data for the YNP bison herd indicate that, since the winterkill and lethal brucellosis control actions in Montana during

> 1996–97, the YNP bison herd has continued to grow despite culling for population and brucellosis control, and currently numbers approximately 4,500 animals.

Here abundance appears to refer to the size of the YNP herd and not to the size of the 50 conservation herds, of which the YNP herd is a member. The range of the YNP bison herd is the environs of Yellowstone National Park and is not contiguous with the general collection of the ranges of conservation herds. Therefore, the Yellowstone herd is not merely a component of the 50 herds, but is distinct in and of itself.

A number of years have passed since that decision. Which of these two broad taxonomic alternatives is now being employed by the FWS regarding the wild bison herd of Yellowstone National Park? We find an answer in a more recent 90-day finding by the FWS.

**2009 90-day finding**

In 2009 the FWS received a petition from Biologist James A. Bailey and his wife Natalie A. Bailey requesting that the wild plains bison be listed as threatened or that each of its four major ecotypes be considered DPSs and listed as threatened. The petitioners specified four ecotypes (population segments) of wild plains bison: the northern Great Plains, the southern Great Plains, the Rocky Mountains, and the Great Basin-Colorado Plateau. A 90-day finding concluded that the petition did not provide substantial information to conclude that each of the four population segments may be discrete.

The finding included the wild bison of the Yellowstone National Park, which were labeled as not being any more wild than any other bison in conservation herds. This reversal from its previous determination in 2007 was achieved by re-defining the term "wild" to simply mean any bison from herds not being used for commercial purposes, reasoning that all bison today are a mixture of genes. Further, from their usage by the FWS, the terms "wild" and "natural occurrence" have only genetic meaning.

Specifically, the finding stated:

> However, we note that the wild plains bison is a generalist with regard to its habitat requirements, as evidenced by its broad historical range, and none of the ecological settings of the four population segments is unique or unusual. Each of the population segments contains multiple herds managed under different Federal, State, municipal, or private regimes, and the complete loss of any population segment is very unlikely. No population segment represents the only surviving natural occurrence of the taxon. Lastly, due to multiple, diverse origins and subsequent translocations, no population segment is genetically, behaviorally, or ecologically unique.

As noted, this finding of 2009 contradicts the finding of 2007. The 2009 FWS finding states:

> We recognize that this conclusion differs to some extent from an earlier decision. In a previous negative 90-day finding published on August 15, 2007 (72 FR 45717), we determined that the Yellowstone plains bison herd may meet the criteria of discreteness and significance as defined by our policy on DPS. However, this finding and the previous 90-day

> finding differ in scope. The August 15, 2007, finding only addressed plains bison in the Yellowstone herd. The current finding addresses wild plains bison in all conservation herds.
>
> The 2007 finding concluded that the Yellowstone herd may be discrete from other plains bison, because it was considered the only herd that has “remained in a wild state since prehistoric times” and because of physical distance and barriers. The best available information now indicates that the basis for our 2007 DPS determination was erroneous. We still use the term “wild plains bison” to describe the Yellowstone herd because they are managed as a conservation herd, rather than as a commercial herd. However, we no longer consider the Yellowstone herd to have remained in more of a “wild” state than any other conservation herd.

And how has the herd not remained in more of a “wild” state than any other conservation herd? Because the 2009 finding claims they have not remained “unaltered.” The 2009 finding explains (bold emphasis added):

> Specifically, these wild plains bison are no longer thought to have remained in an unaltered condition from prehistoric times, as implied in the previous determination. In 1902, no more than 30 wild plains bison remained in Yellowstone (Halbert 2003, p. 24). In the same year, 18 female plains bison from the captive Pablo-Allard herd in Montana and 3 bulls from the captive Goodnight herd in Texas were purchased to supplement the Yellowstone herd (Halbert 2003, pp. 24-25). Additionally, intensive management (supplemental feeding, roundups, and selective culling) of the Yellowstone herd occurred from the 1920s through the late 1960s (Gogan et al. 2005, p. 1719). Wild plains bison from Yellowstone also have been used to start or augment many later conservation herds (Halbert and Derr 2007, p. 2). **Despite geographic separation, the Yellowstone herd is essentially part of one metapopulation and is not markedly separate from other herds.**

Like scrambled eggs, the FWS has whipped together the YNP herd with other conservation herds, saying in effect that the YNP herd is just part of a species omelet called a “metapopulation.” Further, it has reduced the meaning of the term “wild” to mean any animal that is not for commercial use, namely, as the 2009 finding states: “We still use the term ‘wild plains bison’ to describe the Yellowstone herd because they are managed as a conservation herd, rather than as a commercial herd.”

When one considers that the term “wildlife” is part of the agency’s name, maybe the Fish and Wildlife Service should be renamed to more accurately define its new perspective. How about Fish and Non-Commercial Life Service?

In point of fact, the term wild has been eroded by the FWS. It is now defined in terms of economic and genetic status only. Wildness in this new world of the FWS is a factor determined by human management practices, and since no herd has remained in “an unaltered condition from prehistoric times, as implied in the previous determination,” no bison herd is more wild than another other herd.

The distortion of the actual position of both the 1999 petition and the 2007 determination is a “straw man” tactic, representing a logical fallacy. To visualize this fallacy, imagine a fight in which one of the combatants sets up a man of straw, attacks it, then proclaims victory. All the while, the real opponent stands by untouched. This ploy is commonly used in political debates and is committed when a person ignores an opponent's actual position and substitutes a distorted, exaggerated or misrepresented version of that position, then refutes it. An illusion of refutation is created by attacking the "straw man," that is, the misrepresented or distorted position of the argument, while never actually refuting the opponent's original position.

The straw man attack in this case is the phrase "these wild plains bison are no longer thought to have remained in an unaltered condition from prehistoric times, as implied in the previous determination."

As used in the FWS's 2009 finding, the term being challenged, namely, "unaltered," refers to the breeding status of bison only. The 2009 finding stated that the 2007 finding "implied" that the herd had remained genetically unaltered. The 2009 finding then refuted that implication, noting that herds had been genetically mixed throughout history, including post-settlement history through translocations and other government management practices.

If either the 1999 petition or the 2007 finding implied that the Yellowstone bison were wild because they had been unaltered, the concept of "unaltered" was broader than merely a genetic interpretation limited to breeding between bison herds. As stated in my 1999 petition (bold emphasis added):

> **The Yellowstone herd is the only wild, unfenced buffalo herd in the nation**…
>
> These herds, protected by the mountains and by the Yellowstone National Park status as a national park, escaped the slaughter of the mid to late 1800s. A few score survived, creating in part a genetic pool responsible for the thousands of buffalo that now populate the United States.
>
> Some scientists believe that because the herd inhabited mountainous regions that it consisted of Mountain Buffalo, often also called Wood Buffalo. **It is this remnant herd that helped save the buffalo from extinction**.
>
> The herd grew from a few score to about 3,000 in 1966. Part of its growth stems from the introduction of Plains Buffalo into the Yellowstone National Park. The Mountain or Wood Buffalo as a pure species is now extinct in the United States. **However, a hybrid or cross between the Mountain Buffalo and the Plains Buffalo may exist at Yellowstone, thus being the only such herd in the nation.** Over 1,000 animals of this unique group were shot or slaughtered by the Montana Department of Livestock as the animals crossed the border of the Park in 1997 to escape the severe winter.

The 2007 FWS determination said this under the heading of "Biology and distribution" (bold emphasis added):

> Numerous Federal, State, and private bison herds currently exist in the United States, **but YNP is the only area in the United States where bison have existed in the wild state since prehistoric times** (Gates et al. 2005, p. 92). Boyd (2003, p. 38) estimated the plains

> bison population in North America at 500,000, and identified 50 herds (containing approximately 19,200 head) currently being managed with clear conservation objectives.

And under the heading of "Information provided in the petition on discreteness," recall the passage where the FWS said this (bold emphasis added):

> The petitioner asserts that the YNP bison ''herd is the only wild, unfenced buffalo herd in the nation,'' but no specific citations are provided to support this conclusion. Information in our files support the conclusion that the YNP bison population is the only herd in the United States that has remained in a wild state since prehistoric times (Gates et al. 2005, p. 93). **All other bison in the United States are reconstituted herds and are confined with fencing, or otherwise range restricted**. Individuals from the Jackson bison herd in Grand Teton National Park and the National Elk Refuge have been known to migrate north into YNP, but this is a rare occurrence (Gates et al. 2005, p. 109). Therefore, we find that the YNP bison herd may be discrete from other members of the taxon Bison bison because of physical distance and barriers.

The position in the 2007 determination was that the "**YNP is the only area in the United States where bison have existed in the wild state since prehistoric times** (Gates et al. 2005, p. 92)."

The Gates et al. citation is from *The ecology of bison movements and distribution in and beyond Yellowstone National Park,* Chapter 4, "History of bison management in Yellowstone National Park: Yellowstone bison in prehistory." The relevant passage stated:

> Yellowstone National Park is the only place in the lower 48 States where bison have existed in a wild state since prehistoric times. Bison occupied the region encompassing the park from shortly after recession of the last glaciers 10,000 to 12,000 years ago, until the 19th century when they came close to extirpation (Gates et al. 2005, p. 92.)

Apparently such unaltered ecological conditions as "unfenced," not being "reconstituted," not being "confined with fencing, or otherwise range restricted" and being "the only area in the United States where bison have existed in the wild state since prehistoric times" do you qualify for the designation "unaltered." The mere and unproven possibility that Yellowstone wild bison genes may have cross-bred with other bison of the same species from another location is interpreted by the FWS as meaning the wild bison in the park have not remained in an unaltered condition from prehistoric times and therefore are not a distinct population segment.

And ironically, while my 1999 petition specifically mentioned that the YNP herd may be a hybrid between plains bison and wood or mountain bison, and while altered, unique and distinct, this was disregarded in the 2009 determination.

The conclusion in the 2009 determination that "we no longer consider the Yellowstone herd to have remained in more of a 'wild' state than any other conservation herd" is fallaciously supported by refuting a position that has been misrepresented, saying that "these wild plains bison are no longer thought to have remained in an unaltered condition from prehistoric times, as implied in the previous determination." The 2009 finding tamed the wild Yellowstone bison by recounting a history of the possibility of interbreeding of the original park inhabitants, citing genetic evidence only, reducing wildness to a factor of genes only, instead of including environment, behavior (such as migratory behavior) and the historical record.

The 1999 petition and the 2007 determination did not imply that the herd's genetic purity has been unaltered since prehistoric times, but instead that the bison's continuous and in that respect unaltered relationship with the land in Yellowstone National Park has retained its wild ecology by not being extirpated or fenced.

To add insult to injury, the 2009 determination ignores a finding of the 2007 determination concerning one area demonstrating an instance of unaltered genetics, so the 2009 finding is selective in where it sees examples of the significance of altered and unaltered conditions regarding wildness. The 2007 determination by the FWS stated that:

> Additional information in our files compiled after this petition was submitted indicates that the YNP bison herd is one of three Federal herds that do not display genetic introgression with cattle. Maintenance of genetic diversity is an important long-term goal for management of species populations. Halbert (2003, p. 94), concluded her study by stating: "In conclusion, this study has assessed levels of domestic cattle introgression in 10 federal bison populations and identified at least 2 populations, Wind Cave and YNP, which at this time do not have any evidence of domestic cattle introgression and also have high levels of unique genetic variation in relation to other federal populations. As such, these populations should be given conservation priority * * *" Thus, we conclude that the YNP bison herd satisfies this genetic criterion of significance under the DPS Policy.

But the 2009 finding now implies that genetic purity and this unaltered genetic condition do not mean much, after all. It states (bold emphasis added):

> The presence of cattle DNA in the genetic makeup of wild plains bison appears widespread, but occurs at low levels. Conservation herds are managed according to their genetic background, so as to maintain genetic diversity and introgression-free herds. We expect the frequency of cattle DNA to remain low in conservation herds. Wild plains bison from introgressed herds conform morphologically, behaviorally, and ecologically to the scientific taxonomic description of the native subspecies. Some wild plains bison herds with evidence of cattle introgression also contain valuable genetic diversity that is not found elsewhere and should be conserved. **We do not believe that there is substantial information indicating that listing may be warranted due to introgression with cattle genes**.

This is a complete and historically tragic abrogation of the original position by the FWS that found value in a bison population such as the YNP herd that was free of cattle genetics. The 2009 determination concluded:

> In summary, the petition does not present substantial information that wild plains bison may require listing either as a subspecies or a DPS. The conclusion that impacts from the various factors discussed above may constitute a threat is not supported by the available information regarding distribution, abundance, and population trends of wild plains bison. Wild plains

> bison are distributed in parks, preserves, other public lands, and private lands throughout and external to their historical range. The current population of wild plains bison is estimated to be 20,500 animals in 62 conservation herds. Recent population trends appear stable to slightly increasing in conservation herds (as noted by the petitioners).

With the magic of government speak, wild bison have just been increased by a magnitude of five and are everywhere in “metapopulations.” The only problem with this position is that it is not true. The only wild, unfenced bison herd without cattle genes in the United States is in Yellowstone National Park.

Metapopulations are defined as a set of local populations within some larger area, where typically migration from one local population to some other habitat is possible (Definitions and synonyms of terms used in metapopulations studies, 2011). But where are the migrations between the habitats of the various conservation herds? These “migrations” are achieved by shipping bison by truck and other “translocations” by government agencies. This is “wild”? And when migration is attempted by natural means, i.e., buffalo crossing the border of Yellowstone National Park into the Gardiner Basin, they are shot or captured for slaughter by government agents positioned there.

According to government speak, bison that are fenced are still wild, bison that have cattle genes are still wild and bison carted around by truck from pasture to pasture are still wild. Under these governmental parameters, a mule trucked from zoo to zoo would be wild.

**Yellowstone bison unique among bison herds**

As mentioned, concurrent with the extermination of millions of bison across the United States during the late 1800s, the bison herds found in and around Yellowstone National Park dwindled to about 200 animals due to killing those outside the park (Hornaday, 1887). Poaching further reduced the herd to a count of 25 in 1902 (Meagher, 1973).

“Again—considering habits, behavior, and census difficulties—the population probably was higher; perhaps 40-50 mountain bison survived,” noted Margaret Mary Meagher, research biologist with the National Park Service, a leading authority on Yellowstone bison. In *The bison of Yellowstone National Park*, she wrote in 1973 the following historical account:

> The bison of Yellowstone National Park are unique among bison herds in the United States, being descendants, in part, of the only continuously wild herd in this country. They are today a hybrid herd, being a mixture of the plains bison (*Bison bison bison* Linnaeus), introduced into Yellowstone National park in1902, and mountain or wood bison (*Bison bison athabascae* Rhoads), which originally inhabited the Yellowstone and surrounding country. They are a wild population, unrestricted by either internal or boundary fences, and subject to minimal interference by man.
>
> Although members of a species which nearly became extinct, and a species of great historical interest, Yellowstone’s bison have not been objects of extensive research . . .

> Yellowstone National Park was established in 1872, before the surrounding area became the states of Idaho, Montana, and Wyoming . . . Most of the land adjacent to the boundary is administered by the U.S. Forest Service.
>
> Haines (1963) summarizes the history of man's occupation of the Yellowstone Plateau. Prehistoric hunters and gatherers used the area extensively. Members of several tribes of modern Indians were primarily summer hunters, although a few sheep-eaters lived a marginal existence throughout the year . . .
>
> During the early years of the park, wildlife had little protection … Legal means for enforcing regulations were lacking, although the Army troops stationed in the park after 1886 did what they could. Attempts at protection had limited effect until passage of the Lacey Act in 1894 provided legal machinery and jurisdictional authority for dealing with violators. Outside the park, ineffective laws contributed to poaching within the boundaries.
>
> Not until 1901 did the Superintendent of the park believe the laws of all three surrounding states were such that the wild bison left in Yellowstone might be effectively protected, but their numbers were so few that survival seemed doubtful. Intensive management of an introduced herd began in 1902 to ensure survival of some bison in Yellowstone …
>
> The present (1970) bison population is completely wild and unfettered by fencing or artificial management (Meagher, 1973 pp. 1-12).

Morphological evidence suggests that the present wild herd are descendants of the wood or mountain bison species. Meagher writes:

> The genus *Bison* probably invaded North America during the later part of the early Pleistocene. The bison occupying the continent in historic times were descendants of a second migration of Bison from Eurasia, which crossed the Bering Straits at the start of the late Pleistocene according to Skinner and Kaisen (1947). Of the invading species, only one persisted to give rise to *B. occidentalis*, the ancestor of B. bison, the modern form. Two subspecies, *B. b. bison* and *B. b. athabascae*, are recognized by cranial evidence, although historical accounts suggest there may have been others (Roe 1951). The form athabascae is apparently the more primitive of the two subspecies (Skinner and Kaisen 1947).
>
> Just when bison first reached the Yellowstone plateau is not known, but modern bison inhabited the area before historic times, perhaps before the most recent period of intermountain glaciation . . . In 1964 a fossil cranium (B. b. athabascae) was found embedded in a natural oil seep on the Mirror Plateau in the park.
>
> The Yellowstone bison of historic times were a remnant of a once much more extensive bison population, known to trappers and Indians, which inhabited the mountain ranges and the intermountain valleys of the Rockies and extended on west into Washington and Oregon. Most of these bison were gone by the 1840s (Aubrey Haines 1968 pers. comm.). According to the distribution map of Skinner and Kaisen (1947), these were mountain bison . . .

The existence of mountain bison, different in appearance and behavior from the plains type and gone from much of their range by the 1840s, has generally been little known. Christman (1971) reviews historical evidence for the subspecies, their distribution to the west of the plains type, and reasons for their early disappearance. He believes the Indians' acquisition of the horse was the factor underlying the extermination of mountain bison from extensive areas of original range, particularly in Washington, Oregon, and Idaho.

**Figure 65. MOUNTAIN BISON. Cows and calves photographed in a remote part of Hayden Valley sometime before 1894. These bison were frequently called mountain bison by early observers. Photo by John Folsom, a winter keeper at Canyon (Meagher, 1973, p. 15).**

Many early references to Yellowstone bison use the term "wood" or more commonly "mountain" bison or buffalo; some of the characteristics of the race were recognized by a number of early travelers and observers. Historical accounts generally agree that, compared with the plains bison, these mountain animals were more hardy, fleet and wary, and had darker, finer, curlier hair. Sex and age differences among animals seen may account for discrepancies in description of size. The geologist Arnold Hague (1893) provides the following:

> The Park buffalo may all be classed under the head of mountain buffalo and even in this elevated region they live for the greater part of the year in the timber . . . most unusual, save in midwinter, to find them in open valley or on the treeless mountain slope. They haunt the most inaccessible and out-of-the-way places, … living in open glades and pastures, the oases of the dense forest, …[their behavior characterized by] the rapidity of their disappearance on being alarmed. It is surprising how few buffalo have been seen in midsummer, even by those most familiar with their haunts and habits. They wander about in small bands . . .

Blackmore (1872) was informed that the mountain buffalo congregated usually in bands of 5-30, rarely more. Other observers agree that the bands were small, and the animals quite wary. Superintendent Norris described them as “most keen of scent and difficult of approach of all mountain animals” (Superintendent of the Yellowstone National Park 1880).

Altitudinal migrations were another characteristic of mountain bison (Christman 1971). Historical accounts from Yellowstone also suggest this habit. Superintendent Norris, in his annual report of 1880, describes summer and winter distributions of bison in the park, stating clearly:

> …summer in the valleys of the Crevice. Hellroaring, and Slough Creeks, and the mountain spurs between them, descending with the increasing snows, to winter…East Fork [Lamar]…and as the snows melt…returning to their old haunts.

The historical accounts of dates and locations of bison (Appendix II) collectively also show a repetitive pattern of seasonal bison distribution which reflects altitudinal movements.

Historical accounts recognizing a mountain buffalo are supported by limited cranial evidence. Skinner and Kaisen (1947) show an overlap in general distribution between mountain and plains bison along the east slopes of the Rockies, including Yellowstone, but state that ranges for historic times must be based on early accounts plus occasional bones or crania. Seven skulls from the Yellowstone’s original wild herd were picked up on the ground along the Gardner River and at Mammoth in 1902. All had weathered surfaces. These were considered as most likely representing *athabascae*. The 1964 skull (Fig. [64]) found on the Mirror plateau was identified by Skinner (1965) as “an exceptionally long horned, apparently young Mountain bison = B. (B.)b. athabascae…”  No Yellowstone skulls which predate the 1902 introduction have been identified as plains type. (Meagher, 1973, pp. 13-17).

**Figure 66. SKULLS OF BISON BISON ATHABASCAE (left) and B. b. bison from the Mirror Plateau, Yellowstone National Park.** ***Photo by David Love, U.S. Geological Survey*** **(p.17).**

A record of numerous sightings of mountain or wood bison is provided in Appendix II of *The bison of Yellowstone National Park*, "A Summary of bison reports prior to 1905, Yellowstone National Park and vicinity." The table is reproduced below in part (bold emphasis added) (Meagher, 1973).

**Table 4. A summary of bison reports prior to 1905, Yellowstone National Park and vicinity**

| Source | Date | Report |
|---|---|---|
| DeLacy (1867) | 7 Sept. 1863 | Eastern side of Shoshone Lake "through scrubby pines, without underbrush. There were many game trails made by the **wood buffalo**, whose tracks appeared numerous and fresh. |
| Blackmore (1872) | 1872 | Lamar. "B.H. informs me that this valley is a favorite resort of the **mountain buffalo or bison**. |
| Dunraven (1876) | 1874 | General locale of Yellowstone National Park. "On the little prairies, open glades, and sparsely wooded slopes, grazes the small **mountain bison or buffalo**, whose race has also nearly vanished from the scene; . . ." |
| Grinnell (1876) | 1875 | "The so-called **'Mountain Buffalo'** was abundant in the Yellowstone Park." |
| Supt. Annual Report (1877) | 1875 | Refers to the triangle of land with the East Fork (Lamar) as the base, extending south 50 miles to the head of Yellowstone Lake (Mirror Plateau, Pelican) "Here is still a herd of three or four hundred of the curly, nearly black bison or **mountain buffalo**." |
| Holmes (1878) | 1878 | Twin Buttes (Firehole area) "there are some upland parks in which there are buffalo signs (the **Mountain Bison**)." |
| Supt. Annual Report (1880) | 1880 | "Bison or **Mountain Buffalo**" "Bison, so called, in the Park, are somewhat smaller, of lighter color, less curly, and with horns smaller and less spread than those of the bison that formerly inhabited the great parks of Colorado. |
| Livingston Enterprise (1885) | Winter 1884-85 March 7 | "the herd of bison or **mountain buffalo** that has long inhabited the Yellowstone Mountain slopes and valleys was seen to number two or three hundred in the Park this winter." |

| | | |
|---|---|---|
| Hague (1893) | (1893) | "That buffalo were among the animals inhabiting the Yellowstone Park was known in the early days of its history; . . . The Park buffalo may be classed under the head of **mountain buffalo**, and even in this elevated region they live for the greater part of the year in the timber, . . . their habits are quite different from . . . the buffalo of the plain . . . |
| Supt. Annual Report (1895) | 1895 | "So long as the only herd of **wild bison** now existing in the United States is on the border of this State, . . . inquiry into various rumors of the killing of bison . . . convince me that this last remaining herd is in danger of extinction by these people . . . estimate . . . two hundred still remain." |
| Supt. Annual Report | 1902 | During the past winter . . . 22 of these animals on the head of Pelican Creek, and there are probably a few more that we were unable to find. **This herd is exceedingly wild**, and will probably never increase in size, and may possibly die out completely. |

The reports were based on generally held understandings of what comprised mountain or wood bison, including outward appearance, range and behavior. Historically, sightings of wood or mountain bison often focused on a "triangle of land with the East Fork (Lamar) as the base, extending south 50 miles to the head of the Yellowstone Lake (Mirror Plateau, Pelican) (Meagher, 1973 p. 118). This is a region that encompasses the Mirror Plateau, Specimen Ridge, Lamar River and Pelican Creek.

**Bison herd divisions in YNP**

Historically, three bison herd have been recorded as existing in the park. One of the most extensive descriptions of bison in the park is in the park superintendent's annual report of 1880 (Meagher, 1973, p. 118):

> "Bison or Mountain Buffalo" "Bison, so called, in the park, are somewhat smaller, of lighter color, less curly, and with horns smaller and less spreading than those of the bison that formerly inhabited the great parks of Colorado. They have also smaller shoulder humps, and larger, darker brisket wattles. They differ materially from the buffalo of the Great Plains, being more hardy, fleet, and intelligent; their hides are also more valuable for robes, as they are darker, finer, and more curly; and these animals are, in all probability, a cross between the two varieties just mentioned.
>
> "There are about three distinct or separate herds of bison within or adjacent to the Park.
>
> [north edge of park]
> "The first, numbering about two hundred, pasture in summer in the valleys of the Crevice, Hellroaring, and Slough Creeks, and the mountain spurs between them, descending, with the

increasing snows, to winter in the deep, sheltered grassy valleys of the East Fork [Lamar] of the Yellowstone and Soda Butte, and as the snows melt, accompanied by their young, returning to their old haunts.

> [Mirror Plateau and Upper Lamar]
> "The second, numbering over one hundred, summer in the elevated and abruptly broken, little-known section of the Park, extending from the Hoodoo region to the Grand Canyon, and from Amethyst Mountain to Pelican Creek, near the foot of the Yellowstone Lake, and winter occasionally upon the East Fork [Lamar] of the Yellowstone and on Pelican Creek. Their other winter haunts are unknown.
>
> [west side of park]
> "The third herd, numbering about three hundred, roams in scattering bands. This season they were discovered upon the Madison Plateau and Little Madison River. Their winter haunts are unknown, though it is probably they are on the pacific side of the Continental Divide, and, if so, they are not permanent occupants of the Park, and are therefore likely to be slaughtered by advancing settlers . . .
>
> "most keen of scent and difficult of approach of all mountain animals."

**Separate herd of wood or mountain bison?**
In a review of the taxonomy of the wood bison Valeries Geist, Professor Emeritus of Environmental Science, Faculty of Environmental Design, University of Calgary, questioned whether wood bison were of genetic origin or an ecotype, that is, a subdivision of an ecospecies consisting of a population that is adapted to a particular set of environmental conditions. He wrote:

> As determined by the careful and critical Roe (1970:43-57), there is little doubt that in historic times bison existed in at least two forms, a dark, large, shy, non-migratory wood bison in the north, and a smaller, lighter, aggressive, migratory plains bison in the south. There may have also been populations of mountain bison (Meagher, 1973), possibly analogous to the small mountain wisent *(B. bonasus caucasicus)* of Europe (Heptner *et al.,* 1961), as well as some regional differences that native people recognized (Seton, 1929:709). Roe (1970) was not concerned if these differences were taxonomically relevant, that is, of *genetic* origin, or if they were ecotypic, that is, a product of environmental circumstances; he was concerned if the differences reported had some foundation in reality. He concluded they had (Geist, 1991).

University of Alberta Biologists G.A. Wilson and C. Strobeck, in a study on the *Genetic variation within and relatedness among wood and plains bison populations*, held that the genetic differences between the bison in Yellowstone National Park and plains bison were not large enough to establish separation from plains bison. The researchers noted that:

> It has been proposed that the bison indigenous to Yellowstone National Park were actually a type of bison called mountain bison, referred to as Bison bison athabascae (Meagher 1973). Again, this taxonomic issue is in doubt (for review, see Roe 1970). Plains bison were also added to the indigenous herd at Yellowstone, which diluted the amount of local input to the

> gene pool to about 40% (Meagher 1973). If mountain bison did exist in this park, the current population should be genetically distinct from other bison populations which do not contain any mountain bison input in their gene pool, or more similar to wood bison as mountain bison and wood bison share the same subspecific designation…
>
> If mountain bison existed and made a significant contribution to the gene pool of the bison at Yellowstone National Park, we would expect this population to be on a branch by itself or amongst the wood bison populations, as both mountain bison and wood bison were considered *Bison bison athabascae*. The genetic distances between the Yellowstone bison and the other populations would also be expected to be larger.

However, that difference was not established by the study. Instead, the study speculated that the Yellowstone bison were plains bison that inhabited the park region when they fled from hunters:

> As neither of these are supported by our results, the bison indigenous to Yellowstone were probably not mountain bison, but rather plains bison driven to the area by hunters (Wilson, 1999).

However, the study relies on data that was assumed to be from randomly collected samples and thereby cannot be analyzed for differences to sub-populations within the park. In the study, the researchers stated that 33 tissue samples were from YNP bison and "were obtained from the DNA repository maintained by the Canadian Parks Service at the University of Alberta. As bison groups are quite fluid, and associations between individuals random, it can be assumed that these are random samples from the populations."

Based on the genetic analysis of various herds and subherds, the assumption that associations between individual bison are random is not valid, for some herd populations have higher incidence of a genetic disease than others within the same contiguous geographical area. For instance, the several herds in the YNP have different levels of mitochondrial disease (See discussion below: Pringle, 2011). If "bison groups are quite fluid, and associations between individuals random," the level of genetic disease would be evenly distributed among the various herds. It is not.

Historical accounts and the archeological record refute the conjecture that plains bison were driven by hunters into the mountains of the Yellowstone area and instead indicate that bison have inhabited the park region going back at least 8,000 years.

"The notion that bison are not native to the area now known as Yellowstone National Park, though still apparently a popular opinion, has no basis in historical record," wrote Yellowstone National Park historians Paul Schullery and Lee Whittlesey in *Greater Yellowstone Bison Distribution and Abundance in the Early Historical Period*. Schullery currently serves as an adjunct professor of American Studies at the University of Wyoming and as an affiliate professor of history at Montana State University. Whittlesey is a park archivist at YNP.

The authors summarized accounts that include formal government survey reports, published and unpublished journals of explorers, trappers, prospectors, military parties and tourists, early published and unpublished maps, anthropological literature, popular journalism such as books and periodical articles about the Greater Yellowstone Ecosystem, and contemporary newspaper articles, as well as the archeological record.

"Contrary to still-popular belief, bison and other large herbivores were not 'driven into higher country' by settlement, but inhabited those higher regions as environmental conditions permitted prior to the arrival of Euro-Americans," they noted, explaining:

> Prehistoric bison distribution in the GYE can perhaps best be summarized simply by saying that bison appear to have been living everywhere in Greater Yellowstone where habitats were suitable…
>
> In the first few decades of the nineteenth century, various writers reported vast herds of bison on the prairies along the edges of the Greater Yellowstone Ecosystem, including the Yellowstone, Wind, and Snake River drainages. Smaller numbers of animals were reported here and there throughout the ecosystem, most often in the internal valleys…
>
> Archeological work, most of it within the past 20 years, has identified bison remains at park sites near Gardiner, Montana; in the Hellroaring drainage; near Tower Junction; in Lamar Valley; and on the Yellowstone Lake shore. These finds indicate bison presence in the park area for 8,000 years (Johnson 1997). Likewise, a recent survey of Greater Yellowstone archeological research has identified bison remains in 29 archeological and three paleontological sites (Cannon 2001).

**Two recognized bison species**
The Integrated Taxonomic Information System recognizes *Bison bison athabasacae* Rhoads, 1898 as a valid subspecies. However, the ITIS provides the following comment:

> According to Wilson & Ruff, eds. (1999), "Recent evidence that environmental influences may explain pelage differences between plains and wood bison, and comparisons of mitochondrial DNA, suggest that subspecific distinction may not be justified. This reassessment has important conservation implications because the presumed subspecies athabascae is listed as endangered." They also suggest that "Although most authorities still favor Bison, several recent reviews have advocated placing American bison in the genus Bos." Still, they retain Bison as a valid genus, and list the two subspecies (*Bison bison athabascae* and *Bison bison bison*)

However, Geist contends that assigning subspecies based on genetic analysis is often flawed, involving fundamental difficulties and ambiguous results. He posited that taxonomic differences may not involve *evolved* differences, but rather differences due to adaptation. Further, he noted that a reduction in genetic diversity can be attributed in part to the fact that bison herds were established from only a few remaining animals after the extirpation numbering in the millions. He noted:

> Concurrent with conventional means of defining wood and plains bison taxonomically, attempts were made to analyze genetic differences among bison populations. The results were ambiguous. Peden and Kraay (1979) found that plains bison populations differed in blood-typing reagents and carbonic anhydrase alleles as much as did the NR bison from

> plains bison in EINP, even though different herds of plains bison originated from the same limited stock at the turn of the century. One cannot assign individual bison to a given subspecies using unique genetic markers on chromosomes (Ying and Peden, 1977) or in blood proteins (Peden and Kraay, 1979), mitochondrial DNA (Cronin, 1986) or nuclear DNA (Bork *et al.*, 1991).
>
> Moreover, there are fundamental difficulties with the genetic analysis when applied to current bison herds: any differences discovered are assumed to represent *evolved* differences, possibly related to differences in *adaptation.* Unfortunately, divergences in allelic frequencies between today's salvaged bison populations are expected for reasons other than adaptation or random mutation. These include differences based on the *founder effect* (reduction of the genetic diversity due to taking of a small sample of bison to found new herds), *genetic drift* (random fixation of alleles in small populations), the *maternal effect* (bison captured from the same herd have a high probability of being related by maternal descent, and have thus reduced genetic diversity) and the *mule dominance effect* (disproportionate genetic contribution of the most dominant founder bull in tiny founding populations) (Geist, 1991).

However, genetic differences have been found between herds that make them distinct, as observed by researchers Natalie D. Halbert and James N. Derr, Department of Veterinary Pathobiology, Texas A&M University, writing in *Molecular Ecology* (2008) "Patterns of genetic variation in US federal bison herds:"

> Like many wide-ranging mammals, American bison (*Bison bison*) have experienced significant range contraction over the past two centuries and are maintained in artificially isolated populations. A basic understanding of the distribution of genetic variation among populations is necessary to facilitate long-term germplasm preservation and species conservation. The 11 herds maintained within the US federal system are a critically important source of germplasm for bison conservation, as they include many of the oldest herds in the USA and have served as a primary resource for the establishment of private and public herds worldwide. In this study, we used a panel of 51 nuclear markers to investigate patterns of neutral genetic variation among these herds. Most of these herds have maintained remarkably high levels of variation despite the severe bottleneck suffered in the late 1800s. However, differences were noted in the patterns of variation and levels of differentiation among herds, which were compared with historical records of establishment, supplementation, herd size, and culling practices. Although some lineages have been replicated across multiple herds within the US federal system, other lineages with high levels of genetic variation exist in isolated herds and should be considered targets for the establishment of satellite herds. From this and other studies, it is clear that the genetic variation represented in the US federal system is unevenly distributed among National Park Service and Fish and Wildlife Service herds, and that these resources must be carefully managed to ensure long-term species conservation.

For reasons that are hard to understand, despite the historical reality that mountain bison existed in Yellowstone National Park for thousands of years, including up to the present time, and despite the fact that bison herds in Yellowstone are found to be distinct and thereby could preserve that linage, there appears to be little scientific interest in verifying that mountain bison still live in the park.

**Eyewitness of mountain bison**

Bob Jackson, a forest ranger with the Yellowstone National Park for 30 years, and now a buffalo rancher, believes a small group of mountain bison is still up on the Mirror Plateau and does not come down into Pelican Valley during the winter any further than Astringent Creek. Demonstrating classic bison behavior, the larger family unit fragmented itself into smaller groups to save itself, he claims. Further, by the lethal control of bison leaving the park, Jackson contends that this practice is breaking up bison family units, which disrupts the entire herd structure of YNP.

In an email dated April 3, 2011, I asked him if he had any information on a wood bison herd in Yellowstone National Park and if any of these animals fit the description of wood bison as given by the federal government. I gave him the following description:

> Wood bison is the largest native extant terrestrial mammal in North America (Reynolds et al. 2003, p. 1015). Average weight of mature males (age 8) is 910 kilograms (kg) (2,006 pounds (lb)) and the average weight of mature females (age 13) is 440 kg (970 lb) (Reynolds et al. 2003, p. 1015). They have a large triangular head, a thin beard and rudimentary throat mane, and a poorly demarcated cape (Boyd et al. 2010, p. 16). In addition, the highest point of their hump is forward of their front legs; they have reduced chaps on their front legs; and their horns usually extend above the hair on their head (Boyd et al. 2010, p. 16). These physical characteristics distinguish them from the plains bison (Reynolds et al. 2003, p. 1015; Boyd et al. 2010, p. 16).

I received the following answer from Jackson April 5, 2011. Apparently, the mountain bison may be separate from the wood bison and a species distinct to Yellowstone National Park. Historically, the bison in Yellowstone were described as a species that was smaller and more fearful than plains bison. Wood bison are described as being bigger than plains bison. Regarding the distinction between mountain and wood bison, Jackson made a humorous reference to the comedy film, "The Big Lebowski," involving confusion between characters with similar names: Jeff "The Dude" Lebowski, an unemployed Los Angeles slacker, and Jeffrey, the "Big" Lebowski, a wheelchair-bound millionaire:

> Dude (James),
> Your description of a "woods bison" may be so but, like man, we're talking of Mt. Bison here (to use the lingo of the Dude in the movie, The Big Lebowski).
>
> Yellowstone has something a lot rarer and distinctly unique than those dime a dozen up north Woods boys. It has the LAST of the Mt. Bison . . . and this last of the last herd is on the Mirror Plateau . . . well mostly. They never did mix with the Plains Bison brought in to Yellowstone. Yes, a few bodily fluids were shared but the culture of the Mt. bison was . . . and is . . . very much more in tune with its environment (except for their running fear of an influx of Homo sapiens). Thus, just like the core of Chinatown in San Francisco stays culturally unique, so does the Mt. Bison. They are in the last throes, though. The Park has pretty much opened the Mirror up to those environmentally incorrect outfitters . . . and the summer range (and its privacy very much needed during early calf rearing) . . . and those ten thousand year old cultured bison are desperate to find a place away from humans. They run

> to the East entrance Absoraka, then north, then south along its boundary, then back to the Mirror and Pelican Valley.
>
> Of course all this uniqueness means those transplants, the Plains bison, aren't eligible for endangered saint hood, are they? Or are they? I feel they have taken on some of the traits of the Mt. boys . . . enough so to wedge a foot in the door.
>
> Sooo, do you want to continue, dude? Go too far and you might be risking the welfare of those Plains type now leaving Yellowstone in the winter? An expendable throwaway? Or that is what you might be thinking, right? I say save both of them. Bob . . . aka Aj.

On April 8, 2001, I wrote Jackson, saying: "I lack a first-hand account. Your personal observations, whatever they might be, Bob, regarding the size and appearance of the mountain bison of YNP would be very helpful. If those on the Mirror Plateau don't look any different, well, that is OK, too. What is is what is." I received the following answer that same day:

> James, The bison on the Mirror mirrors what the original Mt. Bison descriptions were. Smaller, agile and VERY scared of Humans. Their culture is most important since any animal will pick up traits needed for that area over time. The woods of North have to be larger because of the cold. The Mt. bison have to be agile and scared because they can be trapped in canyons and draws. The Mirror bison go into the woods for cover as compared to the plains bison. The above is what I observed to the "T".
>
> I doubt you get any support from Park Biologists as for Mt. bison being in Yellowstone. If they don't discover it then it is a no . . . and as for Mary Meagher she . . . thinks of bison as densities of populations not families and extended families. Thus to her it is all "hard" science. There is no culture. "Scientists" go forever trying to determine subspecies, races etc. Thus with "woods" and plains it goes back and forth. Now the mood is to lump them together. As for Mt. bison those studying the herds of YNP don't have a clue. And as for bison management and brucellosis it is all symptom management.
>
> The more the Interagency breaks up bison families the less the herds spread out into remote sections during the summer. Thus a lot of overgrazing in the Lamar Valley in the summer . . . and then animals having to go out of the park during the winter. Good luck on your thrust in declaring YNP bison unique. I think the uniqueness is in the culture. Any herd allowed to form up into families and thus learn from their ancestors is what Yellowstone needs . . . because they are so much more ecologically compatible. Today's YNP are dysfunctional but not far enough gone that they can't be salvaged in 12-15 yrs (3-4 generations without disruption). Bob

In a reply the afternoon of April 8, 2011, I quoted Meagher, who had stated that, "Over roughly 20 years, an apparent ecosystem change has occurred involving the bison of the interior of Yellowstone National Park." I said the following:

For some reason, this does not make a great deal of sense to me and I don't know why she is calling this the "domino effect." I thought the "domino effect" would be, in this situation, one herd pushing another herd out, but she doesn't seem to be saying that. Or is she?

I read some report that said the Mirror bison are more stressed than the other park bison herds because of an observed weight loss in that herd, compared to other herds. Why should they be more stressed?

Question: why would the Interagency actions (I presume the slaughter of bison that cross the park border) have something to do with preventing the spreading out into the remote sections during the summer, overgrazing in the Lamar Valley in the summer and going out of the park during the winter? I simply don't get it."

I received this reply the evening of April 8, 2011:

James,
The core Pelican herd never goes below Astringent Creek. To go further means contact with humans . . . something Mt. Bison can't tolerate . . . especially during calving season. And this is why the Pelican herd is stressed. Outfitters now go up on the Mirror most every day all summer.

Thus the Mt. bison was ELIMINATED from the upper Lamar, not because of those Mt. Bison wanting to move West but rather summertime outfitting increased dramatically in this area. Thus Saddle Mt., the traditional calving area from the increase of the Mirror, was destroyed as "home."

The bison on the lower Pelican and lower Hayden were and are a cross of Mt. bison and Plains. The "pure" Mt. bison are still on upper Pelican and Mirror . . . just like the core of Chinatown in San Francisco is still Chinese.

Mary [Meagher] was very good at following populations as they moved around. She did a lot of flying to observe. She just didn't get the dynamics, let alone recognize extended families, thus her focus and conclusions were wrong.

And as for interagency actions causing less area for grazing, think of when you and your family move into a new neighborhood. You are more careful, lock the doors and in general feel more like holing up.

Or think of Native Americans and how they clumped together when attacks on them by other tribes made closing ranks necessary. Or think of castles, fortresses and the middle ages. Not very efficient but a necessity.

Bison families are the same. Confidence is an infrastructure phenomenon. There is no one leader. It is the same as the Indians with no one chief. The Steven's Creek trap busts up all the families. Just the fact they feed those bison makes families dysfunctional . . . no different

> than reservation agents giving food to all members of a tribe does the same for those human extended families. Roles are gone!!!
>
> The end result is Yellowstone bison, those that go to the traps, end up very scared. Thus no Oregon Trail expeditions by them. Territories shrink and overgrazing winter grounds in the summer (one hardly saw a bison in Lamar valley in the '70's) is now the norm. And it will be no different until hunting of the bulls stops and outfitters are denied access to ALL bison calving areas (road side shows are what bison expect . . . not back of Hayden horse trips EVERYDAY).
>
> The bulls are the scouts and the protectors. No hunting of them until functional families are again established. If any hunting is to happen outside Yellowstone it should be limited to wiping out entire families and then leaving the rest of the families intact . . . and infrastructure staying status quo.
>
> THEY (herd biologists, scientists, game managers, hunting season statisticians . . . all dealing with herds, you name it), have it all wrong. It is all so dark ages. Bob

From this exchange of information, we learn that Yellowstone may contain a species called the Mountain Buffalo and that it may not be the same as the Wood bison. Or if it is the same, it may have adapted evolutionarily to the Yellowstone environment by expressing a different phenotype. If this is the case, it would be a profound finding.

**Third species hides in Yellowstone?**

Under the heading, "Information Provided in the Petition on Significance," in the 90-day finding regarding my (James Horsley's) petition to protect the wild Yellowstone bison herd was this discussion (a portion of which has been quoted above) by the FWS that concluded that the wild bison in the YNP were of "plains bison origin:"

> (4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. The petition alleges that the YNP bison herd may be a unique hybrid of the wood and plains bison. No citations are provided, but this conclusion was stated in Meagher (1973, pp. 14–16), who considered the ''mountain'' bison a separate species. This controversy has since been resolved, and YNP staff now considers the remnant population, as well as the introduced bison, as being of plains bison origin (Boyd 2003, pp. 182–183; Wallen 2006).

Delany P. Boyd's 2003 masters thesis in Environmental design from the University of Calgary titled "Conservation of North American bison: Status and recommendation" was cited as a reference to substantiate the FWS's claim. This document is a status assessment of plains and wood bison herds managed by municipal, state, provincial and federal governments, as well as several private herds, compiled by interviews with herd managers and a review of relevant literature. Pages 182-183 follow:

**Yellowstone National Park, WY/MT Free-ranging**

The Yellowstone National Park bison herd is the only population of plains bison in North America that has existed continuously in the wild (Coder 195; Ward 2000). During the early 1900s, the remnant herd was augmented with bison from the Goodnight and Allard herds (Wallen 2002, pers. comm.). The NP bison population is considered to be chronically infected with brucellosis (Chevette et al. 1998). Nevertheless, studies have determined that brucellosis is not a threat to the long-term survival of the YNP bison (Mayer and Meagher 1995; USDOI and USDA 2000), the population is currently at 4,000 and increasing (Wallen 2002, pers. comm.). Herd management is affected by the presence of brucellosis primarily because of the potential risk the disease poses to the livestock industry (Chapter 7). The current cooperative management plan incorporates several elements including spatial and temporal separation of bison and cattle, capture, test, and slaughter of seropositive bison, hazing of bison back into the park, vaccination and radiotelemetry monitoring of pregnant bison (USDOI and USDA 2000). The ultimate purpose of the plan is to maintain a wild, free-ranging population of bison while protecting the economic viability of the livestock industry in Montana by addressing the risk of brucellosis transmission; it is not a brucellosis eradication plan (USDOI and USDA 2000). Bison in NYP are subject to predation by wolves (Smith et al. 2000; Laundre et al. 2001). This is one of five national park bison herds participating in a genetic management study led by Texas A&M University. Genetic testing to date has found no evidence of cattle DNA introgression in YNP bison (Ward 2000).

Apparently the only attempt to substantiate that the YNP herd contains no mountain or wood bison is the statement by Boyd that "The Yellowstone National Park bison herd is the only population of plains bison in North America that has existed continuously in the wild . . ." Boyd's unsubstantiated statement does not provide evidence of the claim "the remnant population, as well as the introduced bison, as being of plains bison origin." Plus, if it has continuously been wild in the park and is the only such population in North America, what proof is there that the genetics of the herd has been so diluted by the introduction of plains bison as to have changed the species? There is no such proof and there is no such study.

Recall Chuck Davis' statement in the 2007 finding, namely:

> The petition alleges that the YNP bison herd may be a unique hybrid of the wood and plains bison. No citations are provided, but this conclusion was stated in Meagher (1973, pp. 14–16), who considered the ''mountain'' bison a separate species. **This controversy has since been resolved, and YNP staff now considers the remnant population, as well as the introduced bison, as being of plains bison origin** (Boyd 2003, pp. 182–183; Wallen 2006).

Recall the reference to "Wallen 2006" refers to the 07/19/2006 memo by Rick Wallen to the author of the 2007 finding, Chuck Davis, as provided by Sarah Fierce, FWS listing biologist, to me by email June 14, 2011:

> As per my quick review of the finding, I compiled the following thoughts . . .
> On the bottom of page 4 and top of page 5 you talk about hybridization of plains and wood bison at Yellowstone. This is incorrect. The Meagher book referred to "Mountain" bison as a separate species from plains bison but this debate was resolved some time ago and we

> consider both the remnant population of bison as well as the introduced bison as being of plains bison origin. I refer you to the thesis by Delaney Boyd on the Conservation status of bison. Boyd, D. 2003 Conservation of North American bison: status and recommendations. MS Thesis, Univ. of Calgary, 220pp.

Stating that "this debate was resolved some time ago and we consider both the remnant population of bison as well as the introduced bison as being of plains bison origin" does not constitute a finding or fact. Nor does citing a survey study. Nor does the parroting of that statement by Davis provide a finding of fact. Apparently, the FWS staff believes that saying something establishes fact. This is merely an exercise in bureaucratic wishful thinking.

Such thinking about something as important as the composition of bison species in the park has the potential of driving the herds in Yellowstone into extinction, if, for no other reason, the government's actions are based on ignorance. And apparently they want to remain ignorant, dismissing the possibility of the presence of mountain bison in the park with a cavalier waving of the hand saying, "this debate was resolved some time ago."

Answer this: resolved how?

**Human interference greatest threat**

According to the findings of Halbert and Derr, writing in "Patterns of genetic variation in US federal bison herds," the single largest threat to the conservation of the bison species is human interference, citing artificial selection, domestication, introgression of domestic cattle DNA into bison, and issues related to disease, such as in Yellowstone National Park:

> Despite the clearly successful demographic recovery of bison, the long-term preservation of bison germplasm and, thus, conservation of the species, remain threatened. First, fewer than 5% of bison are maintained in conservation herds (Boyd 2003); the remaining 95% exists in private herds subjected to various levels of artificial selection (primarily used for meat production). Second, introgression of domestic cattle DNA into both the mitochondrial (Polziehn *et al*. 1995; Ward *et al*. 1999) and nuclear (Halbert *et al*. 2005; Halbert & Derr 2007) genomes of many bison herds has greatly complicated species conservation efforts. Additionally, infectious diseases prohibit the transfer of bison out of the two oldest and largest free-ranging herds in North America—brucellosis in Yellowstone National Park and both brucellosis and tuberculosis in Wood Buffalo National Park (Boyd 2003). Therefore, the protection of the native bison genome from selection, domestication, introgression, and disease is paramount to the conservation of this species. Human interference has led to similar threats in other wildlife species worldwide, such as the preferential poaching of male saiga antelopes and consequent reproductive collapse in Russia (Milner-Gulland *et al*. 2003), the rapid domestication of wild banteng in southeast Asia (Bradshaw *et al*. 2005), hybridization between domestic dogs and the endangered Ethiopian wolf (Gottelli *et al*. 1994), and canine distempter in the black-footed ferret in the USA (Primack 1993). The main source of bison germplasm exists in a handful of publicly managed Canadian and US federal herds, from which the majority of extant bison are derived (Soper 1941; Coder 1975).

Of particular interest for this discussion is that researchers noted preferential poaching of male saiga antelope led to their reproductive collapse in Russia (Halbert, 2008). Selective harvesting of animals can have a deleterious genetic impact. Across a broad spectrum, human activity within as well as outside the Greater Yellowstone Ecosystem has radically affected the bison herd.

**Ecological disruption of Yellowstone bison**

As has been noted, bison have experienced profound changes in Yellowstone National Park, going back to their first contact with European settlers, who reduced the herd size to about 25 animals by market hunting and poaching around the turn of the twentieth century. Specifically, a count in 1909 indicated that only 23 bison remained in Yellowstone National Park. All of these animals were located in Pelican Valley, which became the core herd of the park. With the establishment of Yellowstone National Park and the Lacey Act, aimed at curtailment of poachers, herds rebounded in number, sometimes reaching a total of several thousand animals. A pattern of land use by bison, that mimicked the use noted in the first recorded observations, began to become apparent. But that began to change in 1980, especially regarding the core Pelican Valley herd. As noted by Meagher at al (2002) in "Recent Changes in Population Distribution: The Pelican Bison and the Domino Effect:"

> Bison apparently have wintered for centuries in the Pelican Valley area of Yellowstone National Park. Compared with the other locations where bison winter in the park, Pelican Valley routinely experiences the most severe conditions. Nevertheless, a population has survived there because of the presence of geothermally influenced sites. Until 1980, these bison were isolated in winter by deep snows. Both winter and summer range use showed broadly consistent and predictable patterns, as did seasonal movements between range use areas. In the early 1980s, gradual but escalating changes in the bison population became apparent. Annual winter use of foraging areas by the Pelican bison expanded west from traditionally used, geothermally influenced places near the shore of Yellowstone Lake to sedge areas near the mouth of Pelican Creek, Lake area, and on to Hayden Valley. Because Hayden Valley (part of the Mary Mountain unit) was occupied already by wintering bison, as more shifted from Pelican Valley, more bison moved into the Firehole. They also moved earlier. The process of winter range expansion was coupled with a population increase, and more bison moved further west to Madison Junction and beyond, to spill over the park's west boundary into Montana.

**Domino effect**

As population increased, the herd began to spill over into new areas, such as Hayden Valley and Madison Junction. This change in the herd's traditional seasonal movement has been called the "domino effect." Meagher noted:

> We term this cascading pattern of population increase *the domino effect.* Concomitantly with the winter westward shift, summer distributions also changed dramatically. The Pelican bison no longer crossed the Mirror Plateau to reach subalpine areas in the upper Lamar country in early summer. Instead, increasing numbers of bison concentrated in Hayden Valley during the breeding season. Some then moved back to the Pelican area before winter set in. With an increased bison population park-wide, numbers also spread across the Lamar Valley in midsummer, and appeared in meadows west and north of Madison Junction where summer use was not recorded previously. Over roughly 20 years, an apparent ecosystem change has occurred involving the bison of the interior of Yellowstone National Park.

The Pelican herd wintered in the warmer geothermal regions of the Pelican Valley, feeding on sedges. According to Meagher, bison apparently have utilized this winter range for at least 800 years, as suggested by bones at a dated archeological site. Then bison would head up to the mountain meadows on the Mirror Plateau. This was preferred because of the lush forage there and to get away from biting insects. Meagher noted (1973):

> Pelican and Lamar wintering herds were seen in early summer on the lower ridges of the Upper Lamar… by the end of June to mid-July, they moved higher, to the east boundary…, ranging from the Hoodoo to Canoe Lake and Saddle Mountain. By late July to early August, groups usually moved west down the ridges, and some crossed the Lamar River to the Mirror Plateau, where they ranged the northeast rim from Flint Creek to upper Raven Creek until the shift to winter range. At higher population numbers than those occurring during this study, groups also commonly moved the length of Specimen Ridge on the north edge of the Mirror Plateau…
>
> Apparent influences for movement of groups over large areas during summer were the rut, seasonal vegetation changes…, and, most obviously, biting insect populations… Every year herd groups were seldom observed in Hayden Valley during much of July when biting insects were at their worst.
>
> Burger (1967a) compared biting insect populations and animal distribution in 1966 and 1967. He noted that the distribution and abundance of species of Symphoromyia, a small gray biting fly, particularly at elevations below 8,500 feet, was much greater in 1967…
>
> Apparently, the insect population influenced bison distribution and concentration more strongly than did breeding activity.

But then movements changed, apparently because of the "domino effect." The only trouble with this "domino effect" theory is that no initial domino has been conclusively identified. Why was this core bison herd radically changing its behavior? Why would a bison herd—that had inhabited the geothermal areas in the winter, going to higher elevations in the summer to mate, forage and escape biting insects—start going to the more crowded Hayden Valley, where forage was not as lush and where biting insects were more prevalent? Meagher speculated that one possible cause, one possible candidate for the so-called domino effect, was increased road use within the park during winter months. Meagher et al (2002) remarked:

> In recent decades, recreational use by people of the park's interior road system in winter resulted in compacted snow surfaces that, in certain locations and times, provided ready made travel linkages between locations where bison preferred to be. This was seen first in 1980 with bison located on the packed road surface west from the Mary Bay site of the traditional Pelican winter range. The observed changes may not have reached their maximum expression, but the future for the Yellowstone bison does not appear reassuring.

A team consisting of Montana State University researchers M.L. Taper and C.L. Jerde, and M. Meagher, retired, U.S. Geological Survey/Biological Resources Discipline, speculated that one of the reasons for the movement is quite simple: bison like to stay together. Initially, some larger herd units will fragment and scatter when facing a threat, but when allowed to roam freely, will clump together as a family unit. Finding groomed roads easy to travel, they theorized that the clans headed off together on these roads. In “The Phenology of Space: Spatial Aspects of Bison Density Dependence in Yellowstone National Park” they wrote:

> It is apparent that bison could survive by breaking social bonds and scattering in to small sites where a few animals could survive. However, the gregariousness of bison is the stuff of legend—the huge aggregations reported for the Great Plains (Roe 1970). Over time, it has become apparent that when bison are free-ranging and can move, they will move to stay together and maintain their social bonds, rather than scatter. This factor is fundamental to the ease with which bison began to use sections of road. When bison did this in the Pelican area, more of the population survived, and more bison moved to Hayden Valley. But, Hayden Valley was occupied, so more bison moved west, and developed habitual usage of road section usage, foraging sites, and attractive destinations. The population increased greatly, and shifted westward (Taper et al, 2000).

However, the groomed road theory did not hold up. After making over 28,000 observations of individual bison during the winter and spring months of 1997 to 1999 of the Madison-Gibbon-Firehole (MGF) area, researchers at Montana State University found that “grooming roads during winter does not have a major influence on bison ecology.” Writing in the *Journal of Wildlife Management* (2001), D.D. Bjornlie and R.A. Garrott noted in “Effects of winter road grooming on bison in Yellowstone National Park” that:

> Most travel took place off roads ($P<0.001$). Bison utilized geothermal features, a network of trails they established, and river and stream banks for travel. Bison road use was negatively correlated with road grooming, with peak use in April and lowest use during the road-grooming period. Bison in the MGF [Madison-Gibbon-Firehole] area of YNP neither seek out nor avoid groomed roads. The minimal use of roads compared to off-road areas, the short distances travelled on the roads, the decreased use of roads during the over-snow vehicle (OSV) season, and the increased costs of negative interactions with OSVs suggest that grooming roads during winter does not have a major influence on bison ecology (Bjornlie at al, 2001).

A similar finding was reported by Montana State University researchers, Department of Ecology, in *Ecological Applications*, August 2006, based on data collected during the winters from 1997 to 2005 on bison road use. The researchers stated:

> Road travel was negatively correlated with road grooming, and we found no evidence that bison preferentially used groomed roads during winter. Snow water equivalent, bison density, and the springtime melt period were positively correlated with both bison road and off-road travel…
>
> We suggest that the changes in bison spatial dynamics during the past three decades have likely been the result of the natural phenomenon of density-dependent range expansion,

rather than having been caused by the anthropogenic influence of road grooming (Bruggeman et al, 2006).

The trio of researchers summed it up:

> To summarize this section, bison numbers and distributions have shifted westward overall. This is especially striking in the central herd. When the Pelican bison began to move westward, they had a “domino” effect. Hayden Valley was already occupied by the numbers of bison that were “comfortable” at a given time. When more bison arrived, this bumped the system up, and for bison, the solution was to move westward to the Firehole, which was the traditional shift as winter progressed. In turn, these increased numbers on the Firehole led to the shift westward and northward from Madison Junction. But, more bison survived within the park, so the whole process developed a positive feedback leading to the recorded high count of 4,114 in 1994.

However, whatever was causing the domino effect, the resultant range expansion of the herd did not favor the herds’ survival. The report continued:

> Thereafter total park numbers decreased, and this decline was accelerated in the severe winter of 1996-1997 as bison moving outside park boundaries were removed from the population by management action (Taper et al, 2000).

**Greatest influence on bison: park management**
Historically, bison have experienced increased mortality rates within the park during severe winters and due to culling practices by park personnel. Population increases and attempted range expansion by bison has proven fatal to the Yellowstone herd. Park managers periodically culled the central herd during 1954 to 1968 to limit bison numbers within the park (Meagher, 1973). A major reason for the herd reductions was an attempt to control brucellosis among these wild ungulates.

Years prior to the establishment of the IBMP, the National Park Service, in cooperation with the Department of Agriculture, began a brucellosis control program consisting of vaccination of calves and removal of “reactors during reductions,” that is, shipping bison off for slaughter or shooting those that tested positive for brucellosis.

“This cooperation resulted in reductions of animal numbers below the park’s management objective at Lamar in 1964-65,” Meagher noted (Meagher, 1973, p. 71). Herd numbers fell from 1,477 in 1954 to a low of 226 in 1966. This practice of reductions within the park was discontinued in 1968.

However, as herd numbers began to climb again, park managers initiated lethal control of bison that moved outside the park to prevent entry by bison into territory where cattle grazed, such as near Gardiner, Montana. According to serological standards for cattle, the prevalence of brucellosis in the Yellowstone bison has been approximately 40 percent, but correlation with culture results was approximately 25 percent (Meyer & Meagher 1995). According to these data the true prevalence would be closer to 10 percent. Effects on the bison population appear to be minimal (Meagher, 1973; Meagher and Meyer, 1994).

Herd size has fluctuated, going from 25 animals in the late 1800s to an actual count of 44 in 1902, 501 in 1920, 1192 in 1931, 747 in 1944, 1477 in 1954, 975 in 1962, 388 in 1965, 226 in 1966 and

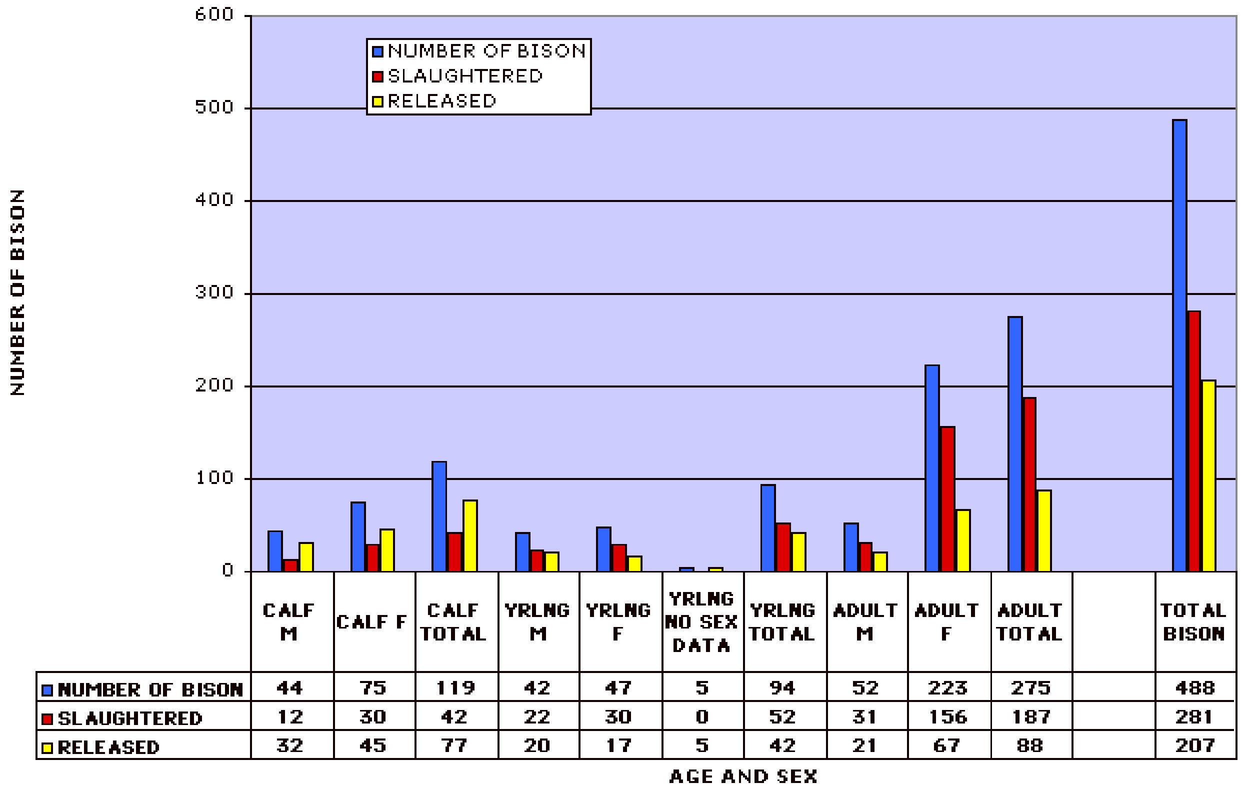
418 in 1968 (Meagher, 1973). In 1988, there were approximately 2,800 bison in Yellowstone. In the winter of 1988-89, 569 bison were killed. During the harsh winter of 1996-97, 1084 bison were subjected to lethal control. In addition to the buffalo that were shot by the government or shipped to slaughter that winter, many starved to death, putting the death toll at more than 1300.

In 2000, the herd population was down to about 3,000 bison, due in large part to actions by National Park Service and the State of Montana to control the bison when they roamed outside the park, and due to winterkill inside the park. For several years following the plan, culling removed several hundred bison each year. However culling numbers began to mount as bison attempted to migrate out of the park to escape harsh winter conditions. During the severe winter of 2005-06, 1106 bison were killed. In 2006 there were 5000 bison. That winter, 1016 were killed. In 2007-08, the largest number of buffalo since the great extermination of 1872 to 1874 were killed by government agents stationed at the borders—a total of 1631. Since 1985, 8,528 wild bison, native to Yellowstone National Park, have been lethally controlled as of February 19, 2015 (How many buffalo have been slaughtered?, 2015, source for Table 5 and Figure 67 below).

**Table 5. Bison killed at Yellowstone National Park: 1985 to 2015**

| **Winter** | **Number** | **Winter** | **Number** | **Winter** | **Number** |
|---|---|---|---|---|---|
| 2014-15 | **701** | | | | |
| 2013-14 | **653** | | | | |
| 2012-13 | **256** | | | | |
| 2011-12 | **33** | | | | |
| 2010-11 | **230** | 2001-02 | **202** | 1992-93 | **79** |
| 2009-10 | **7** | 2000-01 | **6** | 1991-92 | **271** |
| 2008-09 | **22** | 1999-2000 | **0** | 1990-91 | **14** |
| 2007-08 | **1631** | 1998-99 | **94** | 1989-90 | **4** |
| 2006-07 | **67** | 1997-98 | **11** | 1988-89 | **569** |
| 2005-06 | **1016** | 1996-97 | **1084** | 1987-88 | **35** |
| 2004-05 | **101** | 1995-96 | **433** | 1986-87 | **6** |
| 2003-04 | **281** | 1994-95 | **427** | 1985-86 | **57** |
| 2002-03 | **246** | 1993-94 | **5** | **Total** | **8,528** |

With regard to the number captured and killed according to age and sex, the following graph for 11/03 to 7/04 is representative. As one can see in the example below, a disproportionate number of calves and females are slaughtered. The culling for the winter of 2015 that officially commenced January 15 has been described by the NPS as being the lethal removal of bison "without regard for sex, age or disease status." However, culling historically has resulted in disproportionate outcomes.




| | CALF M | CALF F | CALF TOTAL | YRLNG M | YRLNG F | YRLNG NO SEX DATA | YRLNG TOTAL | ADULT M | ADULT F | ADULT TOTAL | | TOTAL BISON |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUMBER OF BISON | 44 | 75 | 119 | 42 | 47 | 5 | 94 | 52 | 223 | 275 | | 488 |
| SLAUGHTERED | 12 | 30 | 42 | 22 | 30 | 0 | 52 | 31 | 156 | 187 | | 281 |
| RELEASED | 32 | 45 | 77 | 20 | 17 | 5 | 42 | 21 | 67 | 88 | | 207 |

**Figure 67. CAPTURED AND KILLED BISON by age and sex from 11/2003 to 7/2004.**

As mentioned, the plan established killing fields, some divided into zones, at the northern and western exits of the park for bison moving outside the park. In addition, it set a cap on the number of bison allowed within the park, stating that “if the late-winter/early-spring bison population is above the 3,000 target, specific management actions may be undertaken at the Stephens Creek capture facility or outside the park in the western boundary area to reduce its size.” Management action included hazing them back into the park or slaughtering. A few bison were allowed to roam in certain zones outside the park, but had to be back in the park by May 15 or be subject to hazing or lethal removal (Lancaster, 2005 p. 439, 400).

**Deleterious genetic effect**

Artificial selections at this magnitude, involving thousands of animals harvested due to such factors as animal movement (migration), time of migratory return (May 15), and capping the size of the herd (3,000), has the potential of a deleterious genetic effect. And bison are subject to management not only at Yellowstone but, as Dale F. Lott noted in *American bison: A natural history*, on other public bison ranges, not to mention in private herds, where selection is for such traits as rump size for the best of cuts.

Public bison ranges are often more like cattle ranges than wilderness, introducing an artificial, controlled environment. For instance, according to Lott, the National Bison Range, “like other overgrazed bison refuges, was divided into several parts by fences. The bison are moved around to ensure that each of those parts goes ungrazed for a whole growing season every two or three years. Now the grasses can compete.”

Through such management techniques "The other public herds also grew; they eventually stabilized or were reduced, as the range required, managed by the same generation of managers with the same goals. With sizeable herds in the public's hands, the short-term future of wild bison seemed assured," Lott said. But what about the long-term genetic effect? he asked.

> But what of the bison's long-term future? In the long run a species adapts by tapping its ultimate resource—its gene pool. The gene pool contains not just the species' reality but also its future possibilities. It limits not just what challenges a species can handle today, but its range of possible adjustment to future changes.
>
> Many genes are in only some individuals. Therefore, the more individuals, the bigger the gene pool. Several million bison would have a very large gene pool, but reduce that population to several hundred and it's become very likely that a lot of genes have fallen by the wayside on the road to extinction . . .
>
> . . . the surviving populations have been divided into even smaller populations in parks and refuges. The size of a species gene pool sets a limit on future adaptation. But very small populations raise another specter: inbreeding. Today's plains bison—Bison bison—mingled with millions of their own kind drifting across a wide and unbroken sea of grass. Suddenly they were reduced to scattered handfuls confined to tiny islands a few miles across that more or less matched their original habitat. It's a scenario sure to chill the blood of a genetically oriented conservation biologist. Deleterious genes that would have been diluted to near-insignificance in a gene pool contributed to and drawn from by millions could suddenly be concentrated and vigorously expressed in a gene pool drawn from fewer than a dozen animals.
>
> From widely outbred to severely inbred in one or two generations—the worst possible case of the infamous genetic bottleneck. It all adds up to a gloomy forecast for the American bison . . .
>
> Given that at present only Yellowstone Park has a significantly larger population, an acceptably effective breeding population can be achieved only by relocating females from herd to herd, thus managing the several federal herds as a single meta-population . . .
>
> Perhaps someday we'll create at least one more island large enough to accommodate a population large enough to be viable over the long term (Lott, 2002, pp. 192-194).

Could Yellowstone National Park be that island? It could be, but at present it is not. In fact, just the opposite is happening. The YNP is becoming an island of extinction. What is happening at the borders of Yellowstone National Park is domestication of wild buffalo, for what is being selected out is their wildness. We are treating them like cattle. Those that stay behind the imaginary fence of the park boundary are allowed to live. Those that stray beyond in search of forage are shot, shipped to slaughter or hazed back into the park by helicopters and cowboys and trucks or relocated into holding pens on the grounds of the park and fed hay just like cattle. This is wilderness?

The cattle of today came from the wild aurochs. It was a massively powerful creature standing almost six to seven feet at its shoulder, slightly smaller than an elephant, fierce and capable of great speed. But where is that species today? Captured and put behind fences, they were selectively bred for prime cuts and tame behavior—and in doing so, bred into extinction. And the few wild aurochs left were hunted to extinction. All we have now are some bones and cave paintings. The last recorded auroch, a female, died in 1627 in the Jaktorów Forest, Poland. Her skull is now exhibited at the Royal Armory (Livrustkammaren) Museum in Stockholm, Sweden (Aurochs, 2011).

Subject to selective breeding, traits such as aggressiveness were selected out, while those with the traits of docility and smaller stature were favored and allowed to reproduce. The wild aurochs were bred into oblivion. Today we call what is left "cattle." As Lott pointed out:

> Cattle look a good deal like the wild aurochs, but even though we have no direct information about aurochs' behaviour, we can be sure it was radically different. Wildness, competitiveness, and self-protectiveness are vital to an animal living on its own, but they're a big nuisance to a rancher.

Over 90 percent of the bison in the United States are being domesticated, that is, being breed for such qualities as meat production. The other bison are in conservation herds, but they, too are either behind fences or have their range restricted. As Lott pointed out:

> So, the needs of the rancher and the nature of wild bison clash head on. The rancher's goal has to be to take the wild out of the bison he or she is domesticating. The conservationist's goal has to be to preserve the wild in the remaining wildness . . .
>
> A better bison, from a stockman's point of view, would be less feisty and less restless.

According to Lott, the great enemy of wildness is selective breeding:

> Sometimes when I talk about wild bison someone points out that all of today's plains bison descend from animals that spent at least some time enclosed in a fence. Therefore, some argue, all of today's bison are domestic and there are no wild bison to preserve. That claim reflects a misunderstanding of what domestication is. It's not being confined—if it were, every animal in most zoos would be domesticated. They're not. Even those that take food from our hands are tamed—habituated to humans—not domesticated. The essence of domestication is selective breeding: humans deciding which individuals will produce the next generation, and choosing them to produce a next generation that will better serve human goals (Lott, 2002, p. 197-200).

One of the traits not wanted by the Montana Department of Livestock is the wild bison's migratory behavior. The wild herd crossing Yellowstone National Park's border is deemed a nuisance and the rationale for lethal control.

**Exploitative selection**

Fred W. Allendorf, regents professor of biology at the University of Montana and professorial research fellow at Victoria University of Wellington, New Zealand, in collaboration with other researchers, studied the outcome of what they term “exploitative selection” in “Genetic effects of harvest on wild animal populations.” (Recall that Allendorf is the author of a genetics text that Wallen suggested Davis reference in his 2007-finding regarding various points made in my original 1999 petition.) They authors noted:

> Virtually all species have separate local breeding groups (subpopulations) that are somewhat reproductively isolated. Harvest of wild populations can perturb genetic subdivision among populations within a species and reduce overall productivity. The primary problem is that harvesting a group of individuals that is a mixture of several subpopulations can result in the extirpation of one or more subpopulations. This will not be recognized unless the subpopulations are identified separately and individuals from population mixtures are assigned to subpopulations.

A phenotype is any observable characteristic or trait of an organism, such as its morphology, development, biochemical or physiological properties, behavior, and products of behavior (like a bird's nest). Phenotypes result from the expression of an organism’s genes as well as the influence of environmental factors and the interactions between the two. The researchers noted that a population’s genetics should be monitored in order to devise recovery programs that would minimize phenotypic changes detrimental to survival.

> There is ample evidence that exploitative selection is at least partially responsible for phenotypic changes over time observed in exploited populations. However, determining the role such changes have played in the decline in harvested populations is much more difficult. This issue is analogous to the controversy in conservation biology about the causal role of genetics in extinction. Extinction, or population decline, is always the result of a variety of interacting biological and environmental factors. Attempts to identify a single cause (e.g. loss of genetic variation or genetic change brought about by exploitative selection) in the decline of wild populations are doomed to fail. A more prudent course is to assume that harvest will result in exploitative selection, develop management and recovery programs that will minimize potential harmful effects of genetic changes due to harvest and then to monitor for molecular genetic changes as well as key life-history traits (Allendorf, 2008).

Migration is a phenotype. Capacity to reproduce is a phenotype. Aggressive behavior is a phenotype. When by artificial or exploitative selection, as opposed to natural selection, one kills bison that are genetically programmed to migrate and that have the sufficiently aggressive behavior to seek out better winter habitat, then there is the potential to select out the very traits necessary for survival in the wild, namely, the ability to change habitat under stress.

Could the governmental culling programs be doing this?

As mentioned above, older experienced females are often the leaders (Meagher, 1989). It is these bison that lead other members of their herd to forage areas outside the park, primarily the Gardiner Basin. When they are killed at the border, their knowledge is destroyed and thus this migratory instinct, coupled with learned behavior, is selected out and abolished from the gene pool.

Ken Cole, writing for *The Wildlife News*, made the following observation in "Greater Yellowstone Bison show signs of inbreeding: Government slaughter could irreparably harm bison species:

> In recent years, while conducting repeated culling—where greater than half of the Yellowstone herd could be killed either by slaughter or winter kill—government managers never studied how their actions affected the genetics of the bison. For example, prior to the winter of 2007/2008 the population was estimated to be 5,500. That winter 1,631 buffalo were killed by the government and hunting but an additional 1,500 died from starvation due to the harsh winter that they were unable to escape because their habitat has been so curtailed by the policy of Montana and its greedy livestock industry. This left only 2,300 bison, or less than half of the bison herd, the following spring and possibly irreparably harmed the remaining genetic diversity of the herd.

A prime reason for the potential for irreparable genetic harm is that the culling process developed by the government does not take into account the genetic composition of the various herds. Removal is based only one initiating factor, migration.

**Genetics not known of bison lethally removed**
Scientists do not know what members of what herds are being killed at the borders by park removals, that is, shootings and shipments to slaughterhouses, according to a study published in the *Journal of Wildlife Management* and funded by the National Park Service and National Science Foundation, involving investigators Julie A. Fuller and Robert A. Garrott, both from the Department of Ecology, Montana State University, and P. J. White, supervisory wildlife biologist, Yellowstone National Park. It appears scientists are not even sure in what direction the bison "dominos" are falling. They speculate that:

> Density-related emigration from the central herd to the northern range may be fueling bison emigration onto private and public lands where large-scale removals occur, exacerbating the brucellosis controversy for natural resource managers.

However, they point out that "removals at the northwestern boundary can no longer be reliably assigned to the northern herd. Long-term studies of marked animals from both herds should be initiated to elucidate the extent and factors influencing these movements (Fuller et al, 2007).

Park managers therefore do not know what genetic traits they are increasing or decreasing—including genetic strengths and genetic weaknesses—by these bison removals. Playing with bison genetics like dice, park managers under the interagency leadership are running a crapshoot. It is a gamble that responsible wildlife managers cannot afford to take.

Herd management requires knowledge of the genetic composition of each herd. Differences in genetic makeup are assessed by means of DNA analysis. One way to do this is through obtaining blood samples. However, the traditional invasive methods of obtaining blood or tissue samples by capturing free-ranging bison are extremely difficult, costly, and dangerous for both the bison and research personnel. Traditional sampling entails a high risk of physiological stress and potential mortality associated with immobilizing agents.

There is a non-invasive way, however.

Lott, who grew up on the National Bison Range and spent most of his adult life studying bison behavior and ecology, in *American Bison: A Natural History,* suggested a novel method of studying a herd's genetic identity—buffalo chip analysis. He touted in Chapter five, "Digestion: Grass to Gas and Chips," the usefulness of fecal studies in wildlife, and for bison in particular:

> In their passage chips also pick up bison cells that contain the individual's complete genome. It is possible that they could reveal not only the individual's identity but perhaps the identity of its parents as well. So science will just keep chipping away at the secrets in the belly of the beast . . . but few other ways are as humane and efficient as chip analysis. No need to subdue the buffalo with a tranquilizing dart—and no worries that hormone levels in the blood sample reflect short-term peaks or bottoms caused by the trauma of the sampling. Little wonder, then, that when the chips are down, the biologist's spirits are up. The investigator that at first seems a figure of fun, a dedicated pooperscooper, is really the very model of a modern-day mammalogist (pp. 52-52).

"Dale was right!" wrote Florence Marie Gardipee in her thesis "Development of fecal DNA sampling methods to assess genetic population structure of Greater Yellowstone bison." She noted:

> The non-invasive fecal DNA sampling protocols I have developed for population genetic studies of free-ranging bison, has just begun to reveal "the secrets in the belly of the beast." I have become the dedicated "pooper-scooper," and hope to continue the use of non-invasive fecal sampling to learn as much as I can about the wild bison of Greater Yellowstone. And, who knows how much we will continue to learn about these amazing animals through just sampling of their feces? Hopefully, we will gain the information and insights we need in order to conserve them for future generations (Gardipee, 2007, p. ix).

Such a study is necessary, she explained, because "the loss of genetic diversity due to multiple bottlenecks, founder effects, hybridization, and domestication pose the risk of genomic extinction, and reduced evolutionary potential." Genomic extinction is what happened to aurochs.

Gardipee analyzed 179 fecal samples collected over two consecutive seasons to evaluate population structure among Yellowstone National Park bison breeding groups and between Grand Teton National Park and YNP bison populations.

"I found significant genetic distinction between YNP and GTNP bison populations," she said. "The differences in haplotype frequencies between Hayden Valley and Lamar Valley breeding groups were highly significant (FST = 0.367, $p < 0.001$), and nearly two times greater than between GTNP and YNP thus providing evidence for at least two genetically distinct breeding groups within YNP."

**Factor of mitochondrial disease**

The government's naive and genetically-uninformed lethal control program has sinister implications for the herds' survival.

Thomas Pringle, a biochemist on the genomic team for the University of California at Santa Cruz, said a hereditary weakness in the various bison herds could be amplified by the culling program.

In a study posted Feb. 7, 2011 in *Nature Precedings*, an online archive for pre-publication research by scientists, Pringle found that most Yellowstone bison whose DNA was tested carried a genetic mutation that affects cellular metabolism. Called mitochondrial disease, which affects the powerhouse units of cells, the defect makes bison lethargic, rendering them less capable of foraging in deep snow, fending off predators and competing for mates.

In his paper, Pringle noted that:

> Recovery of a species from a severe bottleneck requires consideration of both nuclear and mitochondrial genomics because inbred reduced populations may have lost much of their former genetic diversity and harbor unnaturally high frequencies of deleterious alleles. Inbreeding depression in Florida panthers, collapse of the pygmy rabbit captive breeding program, facial tumors in tasmanian devil and required rescue of the Texas State Bison Herd have put such concerns on center stage.

Pringle, whose work on other genomes has appeared in professional journals such as *Science* and *Nature*, said his bison research demonstrates that culling of the wild herd based on brucellosis, rather than on the health of their genes, may push the species over the edge into a form of extinction.

“They're taking a really high risk of killing bison with healthy genes and getting into a situation where they can’t go back; the good DNA will be lost," Pringle said. His paper relies on published genetic data, analyses of bison fossils and samples from herds at national parks like Yellowstone (Zuckerman, 2011).

In his paper, Pringle stated:

> Mitochondrial disease is common in humans so it comes as no great surprise to find another species affected by it. The alarming frequency of occurrence in bison can be attributed to the severe bison bottleneck of the nineteenth century followed by decades of inbreeding and suppression of natural selection. Mitochondrial disease in dog breeds has a similar history.
>
> Based on the available evidence, the disease haplotype was uncommon in pre-contact bison but widespread today, affecting bison in numerous discrete herds including Yellowstone and Grand Tetons national parks. Ironically, Yellowstone bison are used to found new herds and improve genetics of existing herds.
>
> While symptoms of mitochondrial disease vary somewhat according to the specific mutation, the common denominator is inadequate ATP production from loss of oxidative phosphorylation capacity. Exercise intolerance, lactic acid buildup in blood, and ragged red muscle fiber can be expected in affected bison. While not lethal at birth, these bison may be significantly impaired in escape from predators, winter cold tolerance, brushing snow aside for feeding, combat for breeding opportunities and similar aerobic activities (Pringle, February 7, 2011).

Yellowstone bison are affected to different extents in distinct Yellowstone National Park herds, Pringle noted in a press release Feb. 8, 2011, "Widespread Mitochondrial Disease in North American Bison: Genetics study findings: Implications for saving America's last wild bison." Pringle tested 179 bison in Yellowstone National Park and Grand Teton National Park for mitochondrial disease. The press release stated:

> With the National Park Service estimating 1,000 bison or more migrating through deep snows this winter from the Northern Range of Yellowstone National Park, a high proportion of bison with healthy genetics are likely to be slaughtered.
>
> The northern range subpopulation or breeding group are some of the last remaining bison free of mitochondrial disease based on its geographical distribution. The deleterious mitochondria appears more frequently among bison in the central interior herd.

"Bison mitochondrial disease could also be managed away with retention of nuclear genetic diversity since only the latter is passed on by bulls," Pringle noted. "However, this is not occurring with the present system of quasi-random culls of animals of unknown genetic status." To help obviate this disease, he recommended "genetic testing prior to culls" along with other procedures (Pringle, February 8, 2011).

| Park | Herd | V98A I60N | V98V I60I | % Healthy |
|---|---|---|---|---|
| YNP | Hayden Valley | 88 | 6 | 6% |
| YNP | Lamar Valley | 19 | 22 | 54% |
| YNP | Mirror Plateau | 10 | 6 | 38% |
| GTNP | Antelope Flats | 20 | 0 | 0% |
| GTNP | Wolf Creek | 8 | 0 | 0% |

**Table 6. Wildtype mitochondrial DNA sequence data for Yellowstone and Grand Tetons National Parks. First and second columns provide herd locations. The third column shows number of bison carrying the disease haplotype; the fourth the numbers of bison with wildtype mitochondrial DNA. The final column shows the percentage of healthy bison varies with geographic location of the herds (which have little observed mixing) (Pringle, February 7, 2011).**

Based on a genetic disease trait, it appears that the bison herds in Lamar Valley and the Mirror Plateau are dramatically less-affected than the Hayden Valley herd. This means that genetically, the herds are distinct, yet the government's culling program treats them as homogeneous.

Pringle summed up his findings by noting the following:

> North American bison have rebounded from near-extinction in the nineteenth century but from such small inbred founding populations that once-rare deleterious nuclear gene alleles and mitochondrial haplotypes are now at high frequencies. The initial bottleneck was compounded by decades of unnatural selection affecting bison conservation genomics and undercutting restoration initiatives. The genomics era began in late 2010 for bison and sister

species yak with the release of 102 whole mitochondrial genomes, displacing earlier control region and microsatellite data not extending to coding regions. This allows detection of both sporadic and sub-clade level mutations in mitochondrially encoded proteins and tRNAs by comparative genomics methods: deleterious mutations in both cytochrome b (V98A) and ATP6 (I60N) occur within a single common bison haplotype. Since similar mutations in human and dog cause clinical impairment of mitochondrial oxidative phosphorylation, these bison are predicted significantly impaired in aerobic capacity, disrupting highly evolved cold tolerance, winter feeding behaviors, escape from predators and competition for breeding. Because Yellowstone National Park bison are subjected to genetically uninformed culls and surplus animals used to seed new conservation herds, mutational status has significant implications. Continuing take of the remaining bison with wildtype mitochondria may recapitulate errors of nineteenth century bison stewardship bringing bison conservation to the point of no return (Pringle, March 7, 2011).

Yellowstone biologists Rick Wallen concurs in part with Pringle. He states in “Summary of recent publications and monitoring of Yellowstone bison genetics: Pringle 2011, Pérez-Figueroa et al. 2012, Halbert et al. 2012, ) and NPS response Wallen et al. draft manuscript” that:

> Pringle’s reference to the double mutation in haplotype 6 bison is a fact to consider. Our work with UM shows that there are more bison in the central herd that exhibit the haplotype 6 genotype.

But he takes issue with his conclusion:

> Pringle’s conclusion that oxydative phosphorylation functions are impaired in haplotype 6 bison and thus they are less likely to survive hard winters and the effects of predation are not substantiated.

The reason Pringle’s conclusion is not substantiated, according to Wallen, is because:

> Genetic mutation does not automatically equal genetic disease. If the mutations were as deleterious as claimed, they would have been eliminated by natural selection (Wallen, 2015).

However, Pringle notes, the whole point is that natural selection has *not* been able to operate:

> In the case of bison, natural selection has not been fully operative on deleterious alleles for decades, having been largely displaced by predator control, genetically uninformed culls, trophy bull hunts, winter hay feeding, and selection for docility. Recovery of large herds of animals outwardly resembling bison serves no authentic conservation purpose if these bison are hobbled by inherited disease and no longer function as they had evolved up to the era of human interference (Pringle, March 7, 2011).

Wallen in his summary of publications on recent Yellowstone bison genetics comments on the study “Genetic Population Substructure in Bison at Yellowstone National Park” by Natalie D. Halbert, Peter J. P. Gogan, Philip W. Hedrick, Jacquelyn M. Wahl, and James N. Derr, from the Department of Veterinary Pathobiology, Texas A&M University, College Station, TX (Halbert, Wahl, and

Derr); the Northern Rocky Mountain Science Center, US Geological Survey, Bozeman, MT (Gogan); and the School of Life Sciences, Arizona State University, Tempe, AZ (Hedrick).

He sums up the study with this statement:

> Hypothesis: level of divergence is expected to continue to increase in the future.
>
> Conclusion: The identification of genetic subpopulations in this study raises serious concerns for the management and long-term conservation of Yellowstone bison. The continued practice of culling bison without regard to possible subpopulation structure has the potentially negative long-term consequences of reducing genetic diversity and permanently changing the genetic constitution within subpopulations and across the Yellowstone metapopulation.

After giving these summaries, Wallen comes up with his own conclusion, commenting via a "draft manuscript near submission" titled "Population substructure in Yellowstone bison" authored by himself, with co-authors F. Gardipee, G. Luikart and P. J. White.

> Conclusion: Yellowstone bison can be characterized as a single population with genetically similar, yet distinguishable, breeding groups on the northern and central ranges. Effective emigration among the two breeding groups is occurring.
>
> Recommendations:
>
> - Preserve a near equal sex ratio.
> - Manage for breeding groups of about 1500 bison on the northern and central ranges.
> - Monitor diversity indices every one to two generations.

It should be no surprise to anyone reading this petition that the good ol' boys club of Yellowstone biologists should recommend that the park's wild bison should be "managed," i.e., reduced by culling,  for a total bison population of 3,000.

While not specifically identified, Wallen's summary document is from the library of the IBMP. So many of the scientific studies are orchestrated by persons affiliated with the IBMP and its member agencies in one form or another. They make high-sounding claims of wanting to preserve the genetic wild diversity of Yellowstone's bison population, yet at the very moment they are making these claims, they are in the process of violating them. And they are very skillful at doing so and have deluded the public effectively for years.

In a way, it is a form of what is called in Islamic jurisprudence "kitman" (Arabic for secrecy or concealment). It consists of the art of making ambiguous statements, paying lip-service to authority, while reserving personal opposition as a kind of political or strategic camouflage.

While I could find no publication titled "Population substructure in Yellowstone bison," by Wallen and the boys, I did find one titled "Yellowstone Bison—Should We Preserve Artificial Population

Substructure or Rely on Ecological Processes?" by Patrick J. White and Rick L. Wallen, published August 23, 2012, in the *Journal of Heredity.* It is a rebuttal of the Halbert study. It begins by saying:

> Halbert et al. (2012) analyzed microsatellite genotypes collected from 661 Yellowstone bison sampled during winters from 1999 to 2003 and identified 2 genetically distinct subpopulations (central, northern) based on genotypic diversity and allelic distributions. On the basis of these findings, they raised concerns about the management and long-term conservation of Yellowstone bison because of disproportionate culling of the 2 subpopulations in some winters. The data and findings of Halbert et al. (2012) are significant and useful for managers charged with conserving these iconic wildlife. However, their article provides information regarding the behavior and management of Yellowstone bison that does not accurately portray historic or current conditions. This response clarifies those conditions and challenges some of their apparent deductions and recommendations.

White and Wallen point explain their position:

> Halbert et al. (2012, p. 9) deduce that ". . . the identification of genetic subpopulations in this study raises serious concerns for the management and long-term conservation of Yellowstone bison" which ". . . have long been treated as a single metapopulation whereby the total number of bison is assumed to be the most important factor in determining appropriate winter cull levels." It is correct that the Interagency Bison Management Plan (USDI and USDA 2000) provides guidelines for managing toward an end-of-winter abundance for the entire population around 3000 bison. However, management plans and monitoring/research to inform and adjust actions, including culling activities, have considered the two breeding herds (Angliss 2003, Clarke et al. 2005, Gates et al. 2005, Gardipee 2007, Fuller et al. 2009, Geremia et al. 2012). Although the 2 subpopulations have been disproportionately culled in some years, biologists have clearly warned of possible demographic effects if large culls were continued over time (White et al. 2011b). Biologists have also acknowledged that it is not clear how large-scale culling might influence the genotype diversity and allelic distributions of the subpopulations over time (White et al. 2011b).

White and Wallen acknowledge that culls have disproportionately affected the two herds and recognize the adverse effects of large culls. This resulted in the following action:

> These analyses and uncertainties led to the implementation of several adaptive management adjustments to the Interagency Bison Management Plan designed to minimize future large-scale culls of bison, evaluate how the genetic integrity of bison may be affected by management removals (all sources combined), and assess the genetic diversity necessary to maintain a robust, wild, free-ranging population that is able to adapt to future conditions (USDI et al. 2008).

The reference "(USDI et al. 2008)" refers to the citation:

USDI, USDA, Montana, Department of Fish, Wildlife, and Parks, Department of Livestock. 2008. Adaptive adjustments to the interagency bison management plan. Mammoth (WY): National Park Service, Yellowstone National Park.

A photo copy of the portion on maintaining genetic diversity from pages 4 and 5 is provided below (Memorandum, 2008):

**Goal #2: Conserve a wild, free-ranging bison population.**

**Objective 2.1: Manage the Yellowstone bison population to ensure the ecological function and role of bison in the Yellowstone area and to maintain genetic diversity for future adaptation.**

**Management action 2.1.a**—Increase the understanding of bison population dynamics to inform adaptive management and reduce sharp increases and decreases in bison abundance.

*Monitoring metrics*:

- Conduct aerial and ground surveys to estimate the annual abundance of Yellowstone bison each summer (Lead = NPS).
- Document and evaluate relationships between bison migration to the boundary of YNP and bison abundance, population (or subpopulation) growth rates, and snow pack in the central and northern herds (Lead = NPS).
- Continue to obtain estimates of population abundance through the remainder of the year based on surveys, knowledge of management removals, and survival probabilities (Lead = NPS).
- Conduct an assessment of population range for Yellowstone bison that successfully addresses the goals of the IBMP by retaining genetic diversity and the ecological function and role of bison, while lessening the likelihood of large-scale migrations to the park boundary and remaining below the estimated carrying capacity of the park's forage base (Lead = NPS).

*Management responses*:

- If abundance estimates decrease to ≤2,300 bison, then the agencies will increase the implementation of non-lethal management measures.
- If abundance estimates decrease to ≤2,100 bison, then the agencies will cease lethal brucellosis risk management and hunting of bison and shift to non-lethal management measures.

**Management action 2.1.b**—Increase the understanding of genetics of Yellowstone bison to inform adaptive management.

*Monitoring metric*:

- Complete an assessment of the existing genetic diversity in Yellowstone bison and how the genetic integrity of Yellowstone bison may be affected by management removals (all sources combined) by October 2010 to estimate existing genetic diversity and substructure in the population (Lead = NPS).
- Conduct an assessment of the genetic diversity necessary to maintain a robust, wild, free-ranging population that is able to adapt to future conditions (Lead = NPS).

As one can see, the "adaptive adjustments" were nothing but monitoring, protocol for adjusting cull size and assessments. As outlined in this petition above, to date these intentions have not resulted in a realistic plan to maintain the genetic diversity of "a robust, wild, free-ranging population that is able to adapt to future conditions."

Halbert et al. explain the negative effects of culling without regard to herd composition:

> Our study has also revealed longitudinal differences in migration patterns among Yellowstone bison, as it appears that bison moving to the park boundary in the vicinity of West Yellowstone are consistently from the Central subpopulation, whereas those moving to the park boundary in the vicinity of Gardiner may originate from either the Central or Northern subpopulation. These observations warrant serious reconsideration of current management practices. The continued practice of culling bison without regard to possible subpopulation structure has the potentially negative longterm consequences of reducing genetic diversity and permanently changing the genetic constitution within subpopulations and across the Yellowstone metapopulation (Halbert et al., 2012, p. 368)

Commenting on this passage and subsequent ones, White and Wallen have this to say:

> The authors further suggest that current management will ". . . erode the genetic distinctiveness between the 2 groups" (Halbert et al. 2012, p. 9). We agree that bison removals should be carefully managed to prevent unintended consequences and have referenced documents in this response that indicate such management is occurring with frequent assessments of progress toward desired conditions. However, we question whether the National Park Service should actively manage to preserve the genetic distinctiveness of each herd because history indicates humans likely facilitated the creation and maintenance of this population substructure. Rather, we recommend that the National Park Service continue to allow ecological processes such as natural selection, migration, and dispersal to prevail and influence how population and genetic substructure is maintained in the future rather than actively managing to perpetuate an artificially created substructure. The existing population and genetic substructure may be sustained over time through natural selection or it may not. Regardless, we submit that it is the conservation of the ecological processes that is important, not the preservation of a population or genetic substructure that may or may not have been created and/or facilitated by humans.

If this passage were not to be taken seriously, it would make great satire. How can they say with a straight face that "We . . . have referenced documents in this response that indicate such management is occurring with frequent assessments of progress toward desired conditions," knowing that is all that has happened, that is, just "assessments"?

How can they say with a straight face that "we recommend that the National Park Service continue to allow ecological processes such as natural selection, migration, and dispersal to prevail and influence how population and genetic substructure is maintained in the future . . . ," when they are stopping natural selection, migration and dispersal?

How can they say with a straight face that Halbert et al. are recommending "actively managing to perpetuate an artificially-created substructure," when in fact they are questioning artificially altering the composition of herds, stating that the "continued practice of culling bison without regard to possible subpopulation structure has the potentially negative longterm consequences of reducing genetic diversity and permanently changing the genetic constitution within subpopulations and across the Yellowstone metapopulation"?

White and Wallen's paper is only one thing: a rather bad attempt to pull the wool over the eyes of the public. But the charade does not stop here. As though they were cheerleaders on death row, they extol the very population they are seeking to put to death. White and Wallen warble:

> Yellowstone bison are a valuable conservation population because they represent the largest wild population of plains bison and are one of only a few populations to continuously occupy portions of their current distribution and show no evidence of hybridization with cattle in their genomic ancestry (Meagher 1973, Halbert and Derr 2007). Perhaps more importantly, Yellowstone bison are part of an intact predator–prey–scavenger community and move, migrate, and disperse across a vast, heterogeneous landscape where the expression of their genes is subject to a full suite of natural selection factors including competition (for food, space, and mates), disease, predation, and substantial environmental variability. As a result, Yellowstone bison likely have unique adaptive capabilities compared to most bison populations across North America that are managed like livestock in fenced pastures with forced seasonal movements among pastures, few predators, selective culling for age and sex classifications that facilitate easier management (e.g., fewer adult bulls), and selection for the retention of rare alleles—the importance of which has not been identified.

With lip service White and Wallen belittle "most bison populations across North America that are managed like livestock in fenced pastures with forced seasonal movements among pastures," yet that is what they are actually advocating by participating in having the Department of Livestock manage wild bison, by taking part in restricting their movements across the boarder, thus fencing them, and by supporting indiscriminate, excessive and needless culling, demonstrating a gross disregard for the "retention of rare alleles," the importance of which they have no clue, seeking to destroy these wild animals mid-migration by a factor of 900 this year and 900 the next.

New York Times staffer Jim Robins, in "Anger Over Culling of Yellowstone's Bison," reported March 23, 2008 the opinion expressed by an eminent geneticist regarding the effects of killing bison that attempt to migrate:

> James Derr, a professor of genetics at Texas A&M who is studying the Yellowstone bison, said he feared that some behaviors or traits, including the propensity to migrate, could be lost with the killed bison. "The great-grandmother, grandmother, mother and daughter often travel together," he said. Killing them "is like going to a family reunion and killing off all of the Smiths. You are affecting the genetic architecture of the herd" (Robins, 2008).

Seventeen years ago on May 21, 1998 at a meeting of the Greater Yellowstone Interagency Brucellosis Committee, Derr noted the Yellowstone bison have a naturally-occurring resistance to brucellosis. Because of this, he said, "it is important to not reduce the bison population levels any further and risk the elimination of these disease resistant genes" and that "we should know the genetic makeup of bison before management decisions are made which may compromise the future of bison genetic health."

At the same meeting Joe Templeton, Texas A&M University, Department of Veterinary Pathobiology, made these remarks:

> The so-called random shooting at the Montana borders is actually eliminating or depleting entire maternal lineages, therefore this action will cause an irreversible crippling of the gene pool. Continued removal of genetic lineages will change the genetic makeup of the herd, thus it will not represent the animal of 1910 or earlier. It would be a travesty to have people look back and say we were "idiots" for not understanding the gene pool.
>
> Bison have developed a natural resistance genetically as long as they have enough to eat, limited stress and are not consumed by other disease. There is no magic bullet in wildlife disease, therefore management is important. Vaccines are one management tool and one component, but genetic structure is necessary for future management. Every animal which is removed from the breeding population can no longer contribute to the genetic variability of the herd (Geist, 2008).

Apparently, the members of the IBMP are not listening.

**Host of questions**

In the face of a multitude of studies warning against the practices of the IBMP, this dissembling, evasion and distortion present a host of questions. Why are they holding up preservation of wild bison as a good thing when they are devoted to their destruction? Why this poker game with the genetics of the wild bison? Why are irreversible actions via culling of wild bison taken for the sake of grazing a relatively few cattle in an ecosystem? Why this turning of the back?

Historically, did the destruction and extirpation of the vast bison herds in the late 1800s create a bottleneck that contributed to a genetic weakness? Could it be that the “stolid indifference” noted by some observers for plains bison—the indifference and lack of fear of man that in part led to their demise with the industrial slaughter of the late 1800s—could it be that this trait was merely lethargy stemming from mitochondrial disease?

Could it be that the Lamar Valley and Mirror Plateau herds possess to a larger degree the traits of mountain or wood bison, who are noted for their fear of man and their energetic flight on seeing or smelling human beings, while the Hayden Valley bison have more of the traits of the introduced plains bison? Could the increase in the reproductivity of the Yellowstone bison experienced in recent years be due in part to the change of habits noted for some of the northern herds—that instead of returning to their haunts in the Mirror Plateau they began to go to Hayden Valley during the spring and mating season, thereby introducing more healthy genes?

Could it be that the culling program of the government itself is contributing to the prevalence of mitochondrial disease by selecting out the less aggressive animals, that is, those that stay behind because they don’t have the energy to migrate? Such questions bear investigation.

**Possibility of Mountain or Wood bison**

Pringle’s findings lead to another intriguing question. Why would the more energetic northern herd change its seasonal habits, avoiding the Mirror Plateau, where the grass is greener and life is easier, that is, where forage is more lush and there are fewer insects? Meagher believed that it was because the roads had been groomed in the winter, making travel easier, but that theory has been disproved. Maybe they just got tired of climbing hills. But being this herd has been tested to be genetically more energetic and less lethargic, that does not make sense, either. Scientists have postulated that it is due to an increase in density, that is, due to a greater population. But if that is so, why was the range expanded to where there is more competition for forage, instead of less competition up on the Mirror Plateau?

If this change is due to the "domino effect," then we must ask again: what is the domino? What is the reason for this mysterious chain reaction? What impelled the herd to change its habits? The reason is crystal clear to Bob Jackson, as noted above. It is the herd's fear of people. Over the years, the Mirror Plateau, because of its remoteness, has seen a great increase of human intrusion, due in large part to guided expeditions into this back county by Yellowstone outfitters.

But why would this fear impel them into the larger Hayden Valley herds? Recall that Meagher said buffalo are gregarious animals that like to stick together. Jackson believes bison are much like people and when the going gets tough, they band together. Human intrusion spooked them from the Mirror Plateau and they joined the Hayden Valley gang for protection. But they joined the herd that is experiencing one of the highest rates of slaughter as they attempt to leave for a winter respite.

**And then there were none**

Since their discovery as a remnant herd in Yellowstone National Park, in many respects things have not changed much for the wild bison here in Yellowstone. They are still being shot or shipped to slaughter as they cross park boundaries, except it is not by poachers, but by government agents. They are being penned in the Stephens Creek capture facility within the park, in violation of the Congressional act that established the park, which provided "against the wanton destruction of the fish and game found within said park and against their capture or destruction for the purpose of merchandise or profit." And possibly worse, today, by the invasion of people into the ancient haunts of the last wild bison in America, the last of the very last Mountain bison are being pushed to the brink of extinction by being forced into the slaughtering facilities of the IBMP.

In essence, the government has no clue as to what it is doing, but just keeps killing wild bison because these bison obey the instinct to migrate and cross the invisible borderline of Yellowstone National Park, a line up against which the government grants preference to the presence of cattle, culling wild animals that dare to cross. Culling is based on neither genetic health of the herds nor the preservation of genes vital to survival in the wild. Culling is based, in fact, on the opposite—the expression of this genetic strength via migration.

What is happening is that government agencies have taken up the interests of the livestock industry, forgetting their mission to protect wildlife. To do this, they have reached the level of fraud, deluding the public, pretending to have the best interests of the wild bison at heart, when in fact it is all smoke and mirrors. Further, they have tricked the public into thinking their program can work by citing programs that do not pertain and by setting a goal of zero disease transmission, a goal that can only be reached by removing cattle from the ecosystem. Yet, they refuse to do so, putting an entire wild species at risk of extinction.

They have turned their backs on historical and present-day eye-witness accounts that identify Mountain buffalo as a species that still may inhabit the park, merely claiming that this issue has long ago been resolved when, indeed, it has not. No such studies to date have been made to support or detract from that possibility. Moreover, they have established a capture facility at the end of the bison migration route, making the bison captives of the park, yet in a grand example of double-speak claim they want to maintain bison that are “wild and free-ranging.”

In a few short years the genetic and learned migratory traits that contributed to the survival of wild bison for millennia is being systematically selected out at the borders of Yellowstone National Park from the last wild herd in the United States. Those that survive now are those that do not migrate. When those bison that stay behind die in droves inside the park during severe winters, the government simply looks the other way. Our national icon, the last and largest remaining member of megafauna that crossed the Bering Land Bridge a decamillennia ago, has been reduced to the status of a pest. The generations that come after us will look at the government agencies in charge of wildlife preservation as populated, at least when it comes to bison, by wildlife antagonists. But that generation will have no ability to bring back the wild bison. It will be too late.

In my opinion, the term “Indian Country” means a country compatible with wilderness and the wildlife in it, instead of the sultan’s attitude of dominance and fear of wildlife. Native American activists gathered in Montana’s capital February 10, 2015, to protest the deaths of hundreds of Yellowstone National Park wild bison killed “to ease the worries of Montana ranchers about a cattle disease carried by many park buffalo,” according to Laura Zuckerman, writing for Reuters. The demonstration marked a week of protests over federal-state management of Yellowstone bison. But these same ranchers are not as worried about elk, nor do they campaign for keeping elk from migrating out of the park, yet elk pose an even greater risk of spreading the disease to their cattle.

“This is a new beginning to protect the bison and other wildlife in Indian Country,” Jimmy St. Goddard of the Blackfoot Tribe in Montana said. However, as reported by Reuters, “Rick Wallen, lead wildlife biologist for Yellowstone’s bison program, said in a statement this week that cutting bison numbers was required to accommodate concerns expressed by surrounding states ‘that they really didn’t want wild bison outside the national park.’”

Tell that to the 120,000 people who commented on allowing bison outside YNP, the majority of whom were in favor of habitat expansion beyond the park. Tell that to the three million visitors of the park each year. Tell that to the many residents and land owners in the Greater Yellowstone Ecosystem who have expressed their desire to have bison on their land. It is my hope that indeed, “This is a new beginning to protect the bison and other wildlife in Indian Country.”

## CONCLUSION

To protect the wild herd of bison in Yellowstone from extinction a number of things must be done.

First and foremost, work toward restoring the health of that herds. This means allowing it to inhabit its full range so that it can live in its “house,” the ecosystem.

Work toward allowing the herds to restore their altitudinal migratory range, that is, up and down the Madison and Yellowstone Rivers. This is what most likely helped prevent the extinction of bison in the first place.

Work toward restoring the predator-prey relationship. This is the only way to establish a healthy herd, for the wolf instinctively knows which animals need to be culled, such as juveniles, the diseased, the undernourished, the injured, the old and those that stay behind. As a culler, IBMP makes an IDIOTIC wolf.

Allow the bison herds to cure themselves of the disease brucellosis under the care of Mother Nature by allowing the herds to disperse—and that again means restoring historical migratory habitat. That also means keeping the herds within healthy numbers, which only the wolf knows how to do, along with regulated hunting. The more fearful bison, and thus the more genetically healthy, will make themselves less of a target to predators, both animal and human.

Instead of a sultan's view of nature, which decimated the bison and the wolf in Eurasia, adopt the heart of the American Indian tribes toward bison and wolves. They are the ones who evolved successfully with these keystone animals. Economically, wild bison can pay their own way, for they have been the staff of life for millennia. They can be of more profit to the local economy than cattle. Hunting of bison outside the park should be continued under the joint supervision of the government, a citizens group and Native American tribes.

To help accomplish these goals, surround the Greater Yellowstone Ecosystem (GYE) with a cattle-free zone. Mary Meagher, the renowned Yellowstone National Park biologist, advocated creating a "cordon sanitaire" around Yellowstone where cattle would not be permitted. Cattle originally spread the disease of brucellosis to bison. Livestock in close proximity to wildlife promotes an unhealthy relationship. Close the Stephens Creek capture facility and other such capture facilities. Cease the bison vaccination program—it has no useful purpose. A wildlife park should not function as a stockyard or be managed like one.

Specifically, instead of creating no-tolerance zones for bison in the Gardiner Basin, all of Gardiner Basin should be a no-tolerance zone for cattle, as well as the Hebgen Lake region. This would assure that brucellosis would not be transmitted to cattle. It would allow bison to migrate unmolested at least up to the natural bottleneck of Yankee Jim Canyon. It would preserve the genetic purity of the last wild herd of bison, preventing them from mating with cattle that now graze year around in the basin. And it could save taxpayers $3 million annually.

The integrity of the GYE should be preserved. It is one of the last remaining large, nearly intact ecosystems in the northern temperate zone on earth and is one of the world's foremost natural laboratories in landscape ecology and geology. It is a world-renowned wildlife refuge, covering about 28,000 square miles. However, it cannot function in full health if it is fragmented.

In sum, to restore the balance of nature in this ecosystem, leave it alone. Allow wild bison to be wild. Within and on the borders of the Greater Yellowstone Ecosystem, remove invasive species such as cattle, make the culling of wild bison by government agents unlawful and ban the killing of wolves. Let Yellowstone be wild.

## APPENDIX

Below is the original petition submitted by James Horsley, Jan. 5, 1999, to list the wild Yellowstone bison as endangered and as a distinct population segment.

James Horsley
Moorhead Healthcare Center
2810 2nd Ave. N.
Moorhead, MN 56560

FISH & WILDLIFE ENHANCEMENT
FEB 11 99

JAN. 5, 1999

Mr. Bruce Babbitt
Secretary of the Interior
Department of the Interior
18th and "C" Street, N.W.
Washington, D.C. 20240

Dear Mr. Babbitt:

I, as a citizen of the United States, am deeply concerned about the fate and survival of the wild herd of buffalo at the Yellowstone National Park.

This is a petition to list the herd at Yellowstone National Park as endangered persuant to the Endangered Species Act because it is endangered in a significant portion of its range, the environs of Yellowstone Nation Park. Petitioner also requests that the region surrounding Yellowstone National Park coterminous with the migratory or quasi-migratory range of that herd be designated a Critical Habitat. The Petitioner chooses the option of either listing the herd as a subspecies or as a distinct population group, or both. A suitable extension of their habitat would be the region North of the Yellowstone River, once a common hunting ground designated for the Blackfoot and Flathead nations under a treaty in 1855. Since the treaty provision were modified unilaterally, without the consent of the Flathead nation, it would presumably be still in force.

The reasons for listing the Yellowstone herd as endangered are both biological and historical.

Prehistorical man followed the buffalo over the land bridge that once connected the Asian and North American continents. Stone points found near Obsidian Cliffs in the Yellowstone National Park link Native Americans with the buffalo back 11,000 years. Blood analysis indicates that blood found on the points includes bison blood. Campsites according to carbon analysis date the fires having burned 11,000 years ago.

③

The Yellowstone herd is the only wild, unfenced buffalo herd in the nation. Buffalo are now thought to have engaged in quasi-migration, moving according to where there was adequate forage and more suitable climate. There was not a massive north and south migration like waterfowl, but, instead, a fluctuation of a more regional nature, sometimes north, sometimes south, sometimes east, sometimes west. In the case of the Yellowstone herd, animal sometimes leave the park and head north, sometimes west, sometimes south. The migratory route is usually always down from the higher altitudes in winter to lower altitudes to escape harsh winter climates.

For this reason buffalo population groups evolved in relationship to the region with regard to their migratory habits.

These herds, protected by the mountains and by the Yellowstone National Park status as a national park, escaped the slaughter of the mid to late 1800s. A few score survived, creating in part a genetic pool responsible for the thousands of buffalo that now populate the United States.

Some scientists believe that because the herd inhabited mountainous regions that it consisted of Mountain Buffalo, often also called Wood Buffalo. It is this remnant herd that helped save the buffalo from extinction.

The herd grew from a few score to about 3,000 in 1996. Part of its growth stems from the introduction of Plains Buffalo into the Yellowstone National Park. The Mountain or Wood Buffalo as a pure species is now extinct in the United States. However, a hybrid or cross between the Mountain Buffalo and the Plains Buffalo may exist at Yellowstone, thus being the only such herd in the nation.

Over 1,000 animals of this unique group were shot or slaughtered by the Montana Department of Livestock as the animals crossed the border of the Park in 1997 to escape the severe winter.

On some of these animals were found ~~with~~ a collars used by biologists to track their migratory paths. The collars were found on animals shot by the DOL. Information from these migratory studies would be useful in determining

⑤

the critical habitat of the herd.

This is the last wild herd in the United States. Its ancestors were responsible for enabling man to populate North America. The buffalo herds were followed by early man from Asia to the present day United States.

Half the herd is now gone due to their slaughter, their destruction attempting to interrupt their migratory movement. At present they are stopped at the Park border by state officals using rifles, trucks and helicopters. Some are shot. Some are hazed back into the Park. Due to the stress, some of the females abort. The animals were headed toward grass lands both public and private located at lower latitudes, grass lands occupied by non-native, old world cattle.

We, as a nation, are exercising a preference for ~~over~~ a world-wide abundant domestic species over the last wild herd of native buffalo in existance today in the United States. Some scientist believe that if more slaughtering occurs and if another severe winter comes, this herd will collapse, that is, cease to exist. Gone will be the last link between man of North America and the major meat animal which early man followed here, the buffalo.

This is a distinct population group both historically and due to its unique migratory nature, its migratory habits being molded by the region which it occupies. It is the last unfenced herd. fencing has a profound influence on the migratory habits of the species in that it blocks the natural expression of the herd's instincts.

At present several plans are being studied as to how best to manage these animals, from one plan allowing free ranging to one, a Senate bill, advocating the elimination or forcible return of all Yellowstone buffalo leaving the Park.

No plan involves the Native American, which seems to demonstrate a degree of racial arrogance, especially when you consider that the American Indian has had a 11,000 year association with the buffalo and was responsible for successfully herding the animals, which reached a population on the plains in excess of 30 million

(7)

A government policy favors the American Indian in relationship to the preservation of endangered species. Native Americans are given preference in the management of such things as habitat regarding endangered species.

It would thus make good common sense to include the Native American in any program aimed at stopping the destruction of this endangered distinct population group. As a possible solution to a tenable habitat, the region north of the Yellowstone River, historically set aside for the buffalo and its hunting by Plains and Columbia Basin Indians, should be studied.

We have had two relative mild winters, The next winter may not be so mild, pushing the buffalo onto the killing fields of the low land grass lands.

This last link between primative man and the animal that helped such people get to this continent and survive should be protected from extinction as a distinct population segment, namely the last wild buffalo herd in the nation, the Yellowstone buffalo.

The Petitioner urges that the Yellowstone herd be listed as an endangered species or distinct population segment, and, to assure its survival, study the migratory habits of the animal, allowing it free range so as to conduct the study. With such a study in hand, recommendations could be made as to critical habitat.

Based on the historical use of the region set aside for buffalo hunting for the American Indian tribes, namely the area north of the Yellowstone River, the Petitioner requests that this region be considered as a habitat, a reserve allowing the buffalo the expression of its migratory instinct. Further, the Petitioner requests that the Native American be involved in the management of the Yellowstone buffalo to assure their survival.

Sincerely,

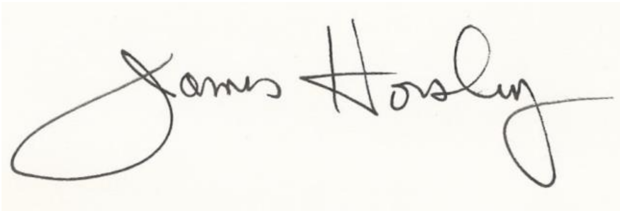
James Horsley

James Horsley

cc.

✓ Jill Parker, Endangered Species Chief, Denver

**Submitted this 2nf day of March, 2015,**



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