Bison

Bison, commonly known as buffalo and weighing up to a ton, are the largest land mammals in North America. Millions of them once roamed from the Arctic to the Appalachians. By 1900, as a result of poaching and hunting for their hides and meat, Yellowstone had the only wild herd left in the U.S.; army soldiers counted only 23 in the park in 1902. The near extinction of this American icon was directly responsible for the congressional act of 1894 that prohibited hunting in national parks.

After Yellowstone's bison population increased through intensive management, occasional culling had limited their number to about 500 by 1967. But then park management shifted toward allowing natural processes to regulate population numbers for all wildlife species to the extent possible. As the bison population grew, more animals could be seen wintering in geothermal areas and at lower elevation ranges both in and outside the park. Although some people have regarded the increasing number of bison outside the park as evidence of food shortages caused by overgrazing, and others believe that the bison were simply taking advantage of roads the park had begun grooming for snowmachine use; it is a natural tendency for wildlife to seek easy access to food. While the effect of road grooming on bison is still under study, research has shown that bison and elk grazing are complementary, with the two grazers selecting different plants and plant parts. Like Yellowstone's elk, bison numbers are primarily controlled by the severity of the winter; only the strong survive. Unlike Yellowstone's elk, however, bison cannot be hunted by sportsmen outside the park, yet their population size has been affected by legal killing there.

Domestic Problems

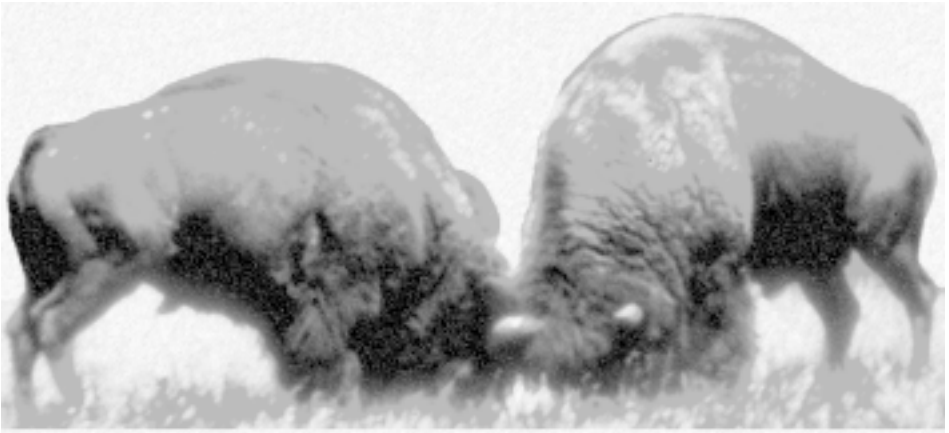
Because some bison carry brucellosis, a disease that also infects domestic livestock, for nearly 30 years bison entering Montana from the park have been captured and shipped to slaughter or shot, even on national forest land. When the heavy snow and ice of the winter of 1996-1997 drove an unusually large number of bison from the park, nearly 1,100 were captured in or near park boundaries and sent to slaughter in Montana or killed by state and federal officers. This reduction, combined with an estimated natural winter mortality of 300 to 400 animals, brought the Yellowstone bison population down to about 2,000 in the spring of 1997, and many visitors complained of seeing fewer bison.

For more than 60 years, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has sought to eliminate brucellosis in domestic cattle across the United States. Although there is no documented case of Yellowstone bison transmitting brucellosis to humans or domestic cattle, some bison that leave the park have tested positive for exposure to the disease, and livestock interests regard them as a threat to

Montana's "brucellosis-free" status. Montana has objected that other states may impose testing requirements on Montana cattle, which could increase costs for livestock producers who want to ship their breeding stock out of the state.

Bison that wander outside Yellowstone are also unwelcome in many places because they can damage fences, gore horses, and pose traffic and other human safety hazards. Because of these concerns, Yellowstone has been party to "boundary control agreements" intended to keep bison from entering most areas outside the park at certain times of year.

In 1926, recognizing that the park lacked sufficient winter range for wild ungulates, Congress authorized the Secretaries of the Interior and Agriculture to buy more wildlife habitat from willing sellers. Efforts to acquire winter range and provide more separation for bison and cattle continue.



What is Brucellosis?

Brucellosis is a disease caused by the bacterium *Brucella abortus*, that afflicts both domestic livestock and wild animals such as elk and bison. Exposure is primarily through contact with infected birthing tissue or fluids. Although carriers do not die from the disease, it can cause an exposed pregnant cow to miscarry her first calf. With milk pasteurization required by law, there's virtually no risk of people catching the human version of the disease, called "undulant fever," unless they come into direct contact with the infected fluids of a contagious bison female or fetus. In humans, the disease can be treated with antibiotics.

Brucellosis was probably introduced to North American wildlife by livestock brought from Europe. Elk, which are far more numerous than bison, can also carry brucellosis, but it is bison that have been the focus of concern as possible transmitters of the disease to domestic livestock. Studies have shown that about half of Yellowstone's bison have been exposed to the bacteria, but the available evidence suggests that as few as 12 percent of the animals actually carry it. Brucellosis has not had any apparent effect on the health of the bison population.

There is no known cure for brucellosis in livestock. The strain 19 vaccine that has been used for several decades is believed to be about 65 to 75 percent effective in preventing brucellosis in livestock, depending on the age and sex of the animal. However, this vaccine appears to provide bison little protection against the disease and causes miscarriages in bison.

WHERE THE BUFFALO ROAM

Bison are extremely popular with the public and, like other park wildlife, roam across the unfenced boundaries of Yellowstone. In recent years, the park has spent considerable effort developing information and discussing alternatives for bison management with other agencies and park neighbors. Three biologists work full-time on bison and other ungulates (see "Elk and Other Ungulates," page 3–21).

Research. The NPS and other Department of the Interior agencies are committed to research that will increase our knowledge about bison ecology, the brucellosis organism in wildlife, and its possible risk of transmission to livestock. Much of this research was newly funded beginning in 1996. Effective control of the disease in wild animal populations will not be possible unless an effective vaccine is developed. The park is working with several agencies to evaluate the safety and efficacy of potential vaccines for bison, but research and development of such tools are costly and take time.

DETECTING *BRUCELLA* FROM BLOOD DNA

A group of molecular biologists is investigating a diagnostic test that may be able to detect the bacterium *Brucella abortus* using the polymerase chain reaction (PCR) technique. Much of the equipment, reagents, and technical skills needed for the project have been generously provided or loaned by the cooperators. Since December 1996, they have collected hundreds of samples of bison blood for DNA analysis, looked. at 19 strains of *Brucella* species' DNA using gene-sequencing technology, and begun to compare *B. abortus* from wild bison and domestic cattle to determine the genetic diversity of each. The results of this research may help answer questions about the pathogenicity of brucellosis and the risk of transmission between wild bison and domestic cattle—issues that could affect the long-term management of bison in and around the park.

Coincidentally, the PCR process relies upon an enzyme from a microorganism, *Thermus aquaticus*, that was discovered in a Yellowstone hot spring in 1967 as part of other research.

A long-range plan. Suggestions that Yellowstone become like other bison refuges, with fences and periodic culling, have been resisted by park managers, who are obligated to maintain the integrity of this wild, free-ranging herd. A multi-agency effort to produce a long-term bison management plan, underway since 1990, has been delayed by controversy and litigation. A draft Environmental Impact Statement was finally released for public comment in June 1998. Following a lengthy review period, a final action should be determined by 2000. Alternatives range from capturing all bison in Yellowstone and slaughtering all that test positive for brucellosis, to the use of public hunting to control bison numbers and distribution, to establishing tolerance zones for bison that wander outside park boundaries and acquiring more winter range.

Education. An exhibit that explores the natural history and public controversy about bison opened at the Canyon Visitor Center in August 1997 (see page 6–9). A cooperative project between Yellowstone National Park and the Buffalo Bill Historical Center in Cody, Wyoming, "Where the Buffalo Roam" was immediately popular; after it opened, attendance at the visitor center rose from about 2,500 to more than 5,000 people a day. Outside the park, various organizations have sponsored educational forums and advertisements to promote their preferred option for management of the Yellowstone bison herd.

Program Needs

- MANAGEMENT. Personnel and equipment are needed to carry out bison management actions such as hazing and capturing the animals as they attempt to leave the park or other federal lands.

- MONITORING. Park staff need to conduct more frequent ground and aerial monitoring to track bison herd numbers and movements.

- RESEARCH. Scientists must continue to pursue better diagnostic techniques and the development of effective vaccines and vaccine delivery methods. More research is also needed on the genetic variability and ecology of bison and their relationship to other plant and animal species in the ecosystem.

Bison

Stewardship Goals

Yellowstone maintains a wild population of native bison with ecological and genetic integrity whose population and distribution are determined, to the greatest extent possible, by ecological processes.

Professional staff manage bison based on sound science and work cooperatively with the surrounding states to manage the risk of disease transmission to cattle.

Staff monitor the bison population, distribution, and behavior, and facilitate necessary research on the animals' ecology and interactions with other species, including humans.

Visitors enjoy opportunities to safely observe wild bison and learn about their natural history and ecology.

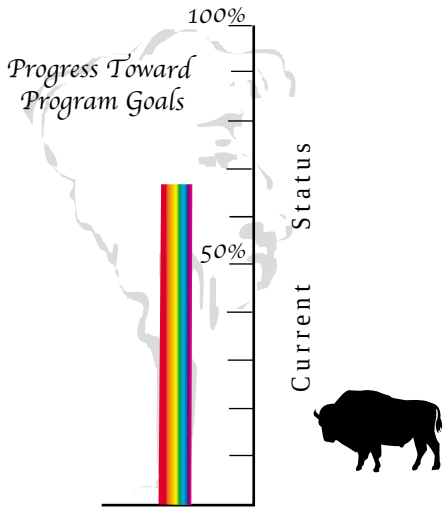
Current State of Resources/Programs

The park is home to a viable, free-ranging population of ≥ 2,000 bison, controlled primarily by the toll of winter, but the unfenced and growing herd conflicts with long-standing federal and state efforts to eradicate the brucellosis disease from domestic livestock.

Staff wildlife biologists and rangers join in efforts to manage bison conflicts beyond park boundaries, but major controversy pervades the public and scientific debates about bison, brucellosis, and livestock management.

Staff biologists monitor bison movements and, with outside researchers, participate in studies of bison ecology and disease transmission and control.

Millions of people enjoy seeing wild bison and learning about their important role in the Yellowstone food chain; but their strength and speed surprise some visitors who are injured by approaching too closely.



1998 Funding and Staff

Recurring Funds	
Yellowstone N.P. Base Budget	$ 130,000
Non-Recurring Funds	
One-time Projects	$ 156,700
Fee Demonstration Projects	$ 50,000
Staff	3.3 FTE

The human resources and funding necessary to professionally and effectively manage the park to stewardship levels will be identified in the park business plan.