Elk Feedgrounds in Wyoming

August 30, 2004

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Introduction

Elk management in northwestern Wyoming has been challenging since Europeans first settled the area in the late 1800s. Even prior to any significant settlement of elk wintering areas like Jackson Hole, there were reports of thousands of elk starving to death during hard winters, and with the first settlers came reports of elk raiding ranchers' haystacks. The early settlers didn't want to see the elk die, but at the same time, they could not afford to lose precious hay needed to carry livestock through the winter. The obvious solution was to create areas where elk could be fed, thus avoiding large-scale die-offs while keeping the animals out of ranchers' hay. This is precisely what took place with the first and largest elk feedground, the National Elk Refuge, created in 1912.

Early wildlife managers did not foresee the consequential problems elk feedgrounds would create. While the creation of feedgrounds addressed the problems of elk die-offs and damage to stored hay crops, it exacerbated the problem of disease transmission. What started as a logical solution to some very real problems, has become one of the most complex and controversial wildlife management challenges of the 21st century.

The purpose of this paper is to provide factual information on the many different facets of elk feedgrounds in northwest Wyoming. There have been volumes written on the various issues involving elk feedgrounds over the years. This document is not intended to cover every aspect of every issue, but rather provide a well-rounded discussion on the topic as a whole, providing key, factual information on what we believe to be the most important issues surrounding elk feedgrounds.

History of Feedgrounds in Wyoming

The National Elk Refuge was the first elk feedground in Wyoming, created in 1912. By the late 1880s, human settlement and conversion of historic elk winter range to use by domestic livestock had already begun to compromise elk habitat and their migration routes to wintering areas. However, even before extensive settlement of Jackson Hole, early hunters and settlers noted unusually heavy snows resulted in the death of thousands of elk. Severe winters in 1909, 1910, and 1911 reportedly took a heavy toll on elk numbers. In 1910, the Wyoming legislature appropriated $5,000 to purchase all available hay in the Jackson Hole valley to feed elk. Thus began the first government-subsidized feeding of wildlife in northwest Wyoming. The supply of hay was inadequate and elk raided ranchers' haystacks. Despite these early efforts, many elk starved to death.

The first official suggestion for a permanent elk refuge was by Wyoming State Game Warden, D.C. Nowlin, in 1906. After retiring as State Game Warden, Nowlin became the first manager of the National Elk Refuge. In 1911, the Wyoming legislature requested a Congressional appropriation for "…feeding, protecting, and otherwise preserving the big game which winters in great numbers within the confines of the State of Wyoming." One month later, Congress appropriated $20,000 for feeding, protecting, and transplanting elk and ordered an investigation

of the elk situation in Wyoming. Following this assessment, Congress appropriated $45,000, on August 10, 1912, for the purchase of lands and maintenance of a refuge for wintering elk.

By 1916, a combination of public and private lands formed the 2,760-acre National Elk Refuge. Several additions have been made since then, increasing the total acreage to nearly 25,000 acres today. Due to the location of the town of Jackson and other development in the Jackson Hole Valley, it is estimated that only one-quarter of the historic elk winter range remains.

The Jackson elk herd is one of the largest elk herds in the world, with a 2004 winter population estimated at 13,500. The population objective for the Jackson elk herd is 11,029, established by the Wyoming Game and Fish Commission in 1987. Annually, 45-65% of the Jackson elk herd winters on the National Elk Refuge. A 1974 Memorandum of Understanding (MOU) between the Wyoming Game and Fish Commission and National Elk Refuge calls for a maximum of 7,500 elk on feed in any given winter on the refuge. Each year, forage conditions are monitored regularly by Game and Fish and National Elk Refuge personnel. The decision of when to start and stop feeding is typically made jointly.

The elk on the National Elk Refuge are annually counted and classified through a group effort by local representatives from the various natural resource management agencies. The fewest elk ever fed on the refuge was 3,110 during the winter of 1930-31. The highest recorded number was in 1996, when 10,736 elk were counted. The average number of elk fed on the refuge from 1999-2003 is just over 6,000 elk. Elk are typically on the refuge for about six months, from November through April of each year. On average, the elk are fed for about 2.5 months from late January until early April. There have been nine winters since the refuge was created when the elk were not fed at all.

In 1975, the National Elk Refuge made a change from feeding baled hay to pelleted alfalfa. Managers determined that pelleted alfalfa was easier to distribute in large quantities and maintained its quality better while in storage. Currently, feeders use mechanized equipment to lay down lines of alfalfa pellets at four different locations on the refuge.

Annually, the cost for the alfalfa pellets to feed the refuge elk is about $300,000. This cost is split equally between the Wyoming Game and Fish Department and National Elk Refuge. Additionally, local Boy Scouts collect the elk antlers shed on the refuge and sell them at the annual antler auction in Jackson. This typically generates approximately $80,000 each year. The Boy Scouts keep 20% of the proceeds and the remainder goes to help fund feeding of the elk.

In 1958, the Cooperative Elk Studies Group was formed, composed of representatives of the Wyoming Game and Fish Department, National Elk Refuge, Bridger Teton National Forest, and Grand Teton National Park. All four agencies have legal responsibilities pertaining to the management of the Jackson elk herd. The group meets annually to share information and coordinate management and research of elk.

More recently, the Jackson Interagency Habitat Initiative (JIHI) was formed during fall 2001 by several wildlife biologists from the above agencies. The goal of JIHI is to maximize

effectiveness of native winter and transitional range for ungulates and a diversity of species indigenous to this region through identification of habitat enhancement opportunities. The group is focusing on habitat enhancements in Buffalo Valley and the Gros Ventre River drainage.

Wyoming Game and Fish Feedgrounds

In 1929, supplemental feed was left in metal sheds in the drainages of the Upper Green River, Gros Ventre, and Greys River by the Game and Fish Department in an effort to prevent large scale die-offs of elk during severe winters. It was understood that during severe winters someone would snowshoe to these sheds and put out hay in an attempt to reduce winter losses. This marked the beginning of supplemental winter-feeding of elk by the Game and Fish Department (Dean, et. al. 2003).

Wyoming's first damage law was enacted in 1939, imposing limited liability on the Game and Fish Commission to pay for damages to crops caused by big game animals. This legislation created a significant financial burden to the Game and Fish Commission and largely contributed to the establishment of elk feedgrounds in Wyoming. Wildlife managers found it was easier and less expensive to feed elk in key problem areas rather than continually try to keep elk out of haystacks.

Elk were fed at many different locations during the 30-plus years following the creation of the damage law, primarily to prevent damage to stored and fed hay and growing crops. Many sites were temporary and only small amounts of hay, or cake, were fed. The Game and Fish Department has fed elk in at least 51 different locations since 1948. Many of the present feeding sites were started in the late 1940s and early 1950s. By the early 1960s, the present elk feedground system was mostly in place, with the last two feedgrounds started in the 1970s.

Currently, the Game and Fish Department manages 22 state-operated elk feedgrounds. In addition, the National Elk Refuge is managed by the U.S. Fish and Wildlife Service. In 2004, the annual cost to the Game and Fish Department for managing its entire feedground program was approximately $1.36 million.

The 22 state feedgrounds are located in Teton, Lincoln, and Sublette counties on BLM, Forest Service, state, and private land holdings. Annually, the average number of elk fed on all 22 state feedgrounds (not including the National Elk Refuge) since 1975 is approximately 13,000 elk. The highest number recorded was in 1988-89, when the Game and Fish Department fed a total of 16,967 elk. Conversely, the lowest number of elk fed since 1975 occurred during the winter of 1976-77, when only 4,964 elk were fed.

Elk are typically fed with a team of draft horses and a sleigh. Elk are fed seven days a week, with most feedgrounds starting in late November and ending in mid April. Small square bales of grass or alfalfa hay are generally used. Feeders try to disperse elk as much as possible and feed on clean snow each day.

The Game and Fish Department purchases between 6,000-9,000 tons of hay annually, with the majority of the hay being small square bales. The Department prefers certified weed-free hay

and makes every effort to purchase only certified hay. Most hay is purchased from Teton, Lincoln and Sublette County ranches, with some hay coming from Idaho each year. The Department contracts the hauling, which typically takes about four months to complete. Each feedground has several sheds where the hay is stored.

Elk feeders are contracted seasonally by the Game and Fish Department and may feed at one or more feedgrounds each year. Individual elk are generally fed between eight and ten pounds of hay per day. The feeding season ranges from 70 to 160 days, depending on severity of the winter and location of the feedground. The average length of the feeding season is 127 days. This equates to approximately 0.5 ton of hay per elk each year.

The Game and Fish Department has experimented with feeding one-ton bales with tractors on several different feedgrounds, but has encountered problems with getting tractors started during cold spells. Consequently, the majority of the feeding is still being done with teams of draft horses pulling a sleigh or wagon.

Just as there are population objectives set for each elk herd, there are also numerical quotas set for each feedground within those herds. Both herd objectives and feedground quotas are established by the Wyoming Game and Fish Commission. It would require Commission approval to initiate a new elk feedground or terminate an existing feedground. At times, the Game and Fish Department has deemed it necessary to implement emergency temporary feeding under unique circumstances. This action requires approval by the Game and Fish Commissioner for that region.

National Elk Refuge vs. State Feedgrounds

There are significant differences between the feeding operations on the National Elk Refuge and the 22 state elk feedgrounds. The size of the National Elk Refuge, at nearly 25,000 acres, and its reduced amount of snow, are probably the biggest differences. Most of the state-operated feedgrounds are approximately 75 acres and are typically located on transitional range or at an elevation higher than traditional winter range. Additionally, state feedgrounds are often close to private land damage situations with no fence to prevent elk from moving from the feedground.

While the elk refuge has to accommodate a higher number of elk (7,500 vs. an average of 600 on each state feedground), the National Elk Refuge has a much higher ratio of land per elk. This, combined with less snow cover, allows the elk refuge to feed fewer days per year and less per elk. The refuge feeds approximately 3-5 pounds of pellets per elk per day, versus 8-10 pounds of hay per elk per day on state feedgrounds.

The Game and Fish Department experimented with feeding alfalfa pellets at the Greys River feedground, but the elk caused extensive damage to woody plants, and even wooden corrals, in an attempt to find necessary roughage. One consequence of feeding alfalfa pellets was the elk tended to spend less time on the feedline when they dispersed to find roughage. Thus, they tended to have a greater impact on woody vegetation than they otherwise would if fed baled hay.

Elk Population Dynamics

There are eight elk herd units managed by the Game and Fish Department's Jackson/Pinedale Region. Elk in seven of the eight herd units are supplementally fed during the winter months. Herd units are defined as populations with less than 10% interchange with adjacent herd units. Naturally, elk populations fluctuate from year to year. Table 1 presents the results from the 2004 winter elk counts as well as the long-term average (27 years) and individual feedground quotas. The winter of 2004 was average to above-average for snow accumulation. Subsequently, feedground attendance was above the long-term average for many feedgrounds. Over the past 27 winters, an average of 20,500 (including the National Elk Refuge) elk per year have been provided supplemental winter feed.

Table 1. Elk Herd Units and Feedgrounds in western Wyoming.

Herd Unit	Feedground	Elk Trend Count Data 2004	1976-2002 Ave.	Feedground Objective
Afton	Greys River	810	853	1000
	Forest Park	771	696	750
Fall Creek	Camp Creek	1004	754	900
	Dog Creek	1214	766	800
	Horse Creek	1346	1064	1250
	South Park	1401	984	1000
Hoback	Dell Creek	230	253	400
	McNeel	680	574	600
Jackson	Alkali	1246	454	800
	Fish Creek	379	697	1000
	Patrol Cabin	1214	448	650
	Natl. Elk Refuge	5876	7436	7500
Pinedale	Fall Creek	547	648	700
	Muddy Creek	486	600	600
	Scab Creek	710	488	500
Piney	Bench Corral	813	390	250
	Finnegan	205	333	400
	Franz	428	397	450
	Jewett	750	590	650
	North Piney	0	388	400
U. Green River	Black Butte	423	493	500
	Green River Lakes	356	510	675
	Soda Lake	355	727	800

Winter feedgrounds support the majority of elk in the Jackson/Pinedale Region (Table 2). Annual elk survey data comparing elk on feed versus elk on native winter range over the past 5 years (2000-2004) indicates 80% of all elk winter at designated feedgrounds. Feedground attendance over the last 5 years has varied from 71% in the Jackson Herd Unit to 96% in the Fall Creek Herd Unit (Table 2). Options for elk utilizing native ranges vary greatly among the 7 elk herd units.

Table 2. Percent of elk on feedgrounds (FG) compared to native winter range (NWR), 2000-2004.

	2000		2001		2002		2003		2004		5 Yr. Ave.	
Herd Unit	**FG**	**NWR**	**FG**	**NWR**	**FG**	**NWR**	**FG**	**NWR**	**FG**	**NWR**	**FG**	**NWR**
Afton	88	12	86	14	87	13	69	31	81	19	82	18
Fall Creek	95	5	96	4	97	3	93	7	96	7	96	4
Hoback	90	10	97	3	94	6	82	18	87	13	90	10
Jackson	61	39	71	29	74	26	74	26	72	28	71	29
Pinedale	86	14	96	4	99	1	81	19	96	4	92	8
Piney	74	26	88	12	86	14	88	12	83	17	83	17
U. Green River	84	16	65	35	94	6	79	21	87	13	81	19
Total	89	11	79	21	85	15	79	21	82	18	80	20

During winters with less than average snowfall, a portion of elk will remain on native ranges as long as forage is available. This varies greatly among the various feedgrounds and native range complexes. For example, 35%, or more than 800 elk in the Upper Green River Herd Unit wintered on native habitat during the winter of 2001 (Table 2). Snow accumulations were far below normal and native forage was available throughout the winter months. Conversely, the winter of 2004 was average to above-average and elk correspondingly left winter habitat in favor of supplemental hay at feedgrounds. The 2004 surveys indicate that 13%, or approximately 250 elk, foraged during the winter months on native habitat in the Upper Green River Herd Unit (Table 2).

Nearly all of the 22 state-operated feedgrounds were established to prevent elk damage to stored hay crops and prevent co-mingling with livestock on private lands. One additional outcome of the supplemental feeding program has been the near elimination of natural over-winter mortality for elk populations in northwest Wyoming. Regardless of the severity of winter weather, elk that attend feedgrounds experience only 1-2% mortality during the winter months. Feeding has led to productive herds and enabled local populations to be maintained at levels commensurate with summer habitats, but at levels larger than the native winter habitats could support.

It should be noted there is an estimated 7-12% loss in overall production for feedground elk as a result of abortions and births of non-viable calves due to brucellosis. However, this loss of calf production is offset by the higher over-winter calf survival that is a result of supplemental feeding. This point can be seen by comparing the five-year average calf production for two adjacent elk herds, one with brucellosis and the other without brucellosis. The West Green River elk herd, near Kemmerer, which is not supplementally fed and has shown only 1% seroprevalence of brucellosis, has 37 calves : 100 cows. The Piney elk herd, located immediately to the north, is supplementally fed with a brucellosis seroprevalence of 30%. Despite the loss of calves due to brucellosis, the five-year average calf production for the Piney elk herd is also 37 calves : 100 cows, presumably due to the lack of winter mortality.

Table 3 presents population trends and productivity ratios (calves : 100 cows) for all seven herd units with winter feeding programs. As of 2004, five of seven herd units exhibit a declining population trend, which is a direct result of hunting seasons the past several years. Liberal harvest has been necessary as calf elk production and survival has been good, indicating future recruitment of elk will be more than adequate to maintain these populations.

Table 3. Elk herd units and population trends, 1999-2003

	Population Estimates			Herd Unit	Post-Season Classification Ratios (Juveniles:100 Females)	
Herd Unit	**2003**	**1999-2003 Ave.**	**Trend**	**Objective**	**2003**	**1999-2003 Ave.**
Afton	2270	2620	Decrease	2200	34:100	33:100
Fall Creek	5450	4880	Increase	4392	41:100	33:100
Hoback	1080	1040	Stable	1100	40:100	37:100
Jackson	13730	15880	Decrease	11029	28:100	20:100
Pinedale	1950	2140	Decrease	1900	24:100	24:100
Piney	2840	2800	Decrease	2424	33:100	37:100
U. Green River	2150	2740	Decrease	2500	23:100	28:100

Disease

Artificial feeding of wildlife, be it birds or bison, is a two-edged sword. Most wildlife disease professionals consider artificial feeding a potential health threat to the fed animals due to the belief that prolonged congregation of animals around a feeding site increases the probability of disease transmission. This increased probability is generally irrespective of how the disease is transmitted, i.e., direct contact, aerosol, environmental contamination, or infected feces and urine.

Positive benefits of feeding include: increased winter survival, increased disease resistance (an increased plane of nutrition enhances the immune system), and increased production (less offspring lost *in utero* as a result of malnutrition).

The elk feedgrounds in northwest Wyoming encompass benefits and detriments. Following are examples of current and potential diseases that impact, or could impact, elk maintained on winter feedgrounds.

Brucellosis

Brucellosis is a highly contagious bacterial disease of both animals and humans recognized since the 19th century. Brucellosis is a disease of concern for wildlife, cattle, and humans. A Cooperative State-Federal Brucellosis Eradication Program has existed for over 70 years to eradicate brucellosis because of its economic impact on cattle and because it can be a serious human disease. This generally successful program has nearly eliminated brucellosis in domestic livestock, but the disease still exists in free-ranging elk and bison in the Greater Yellowstone Area (GYA) in the northwest portion of Wyoming and in adjacent portions of Idaho and Montana (see Figure 1). Brucellosis is not known to exist in wildlife at any other locations in these states.

Figure 1. Map of GYA

Brucellosis may have been introduced into the GYA from infected bison that were transplanted into Yellowstone National Park from a brucellosis-infected cattle ranch. In addition, elk may have contracted brucellosis when they fed on cattle feedlines in the early 1900s.

There are several *Brucella* species. *Brucella abortus* is the bacterium that infects elk, bison, and cattle. The current taxonomic scheme recognizes 8 biovars. *B. abortus* types 1 and 4 are probably the most common isolates from elk and bison in the GYA.

Infection of the female reproductive tract results in abortion. Cows usually abort their first calf following infection. A few cows will continue to abort their second, or even third, calf. Fetuses delivered near term often are stillborn or fail to thrive due to an overwhelming *Brucella* infection. The male reproductive tract (testes, seminal vesicles, prostate) can also be infected. Infection of the bone or joint membranes results in lameness that may make the animal more susceptible to predation.

The most common route of transmission is thought to be oral as a result of an animal licking or ingesting infected fetuses, placentae, fetal fluids, or vaginal exudates. Under cool, moist conditions, *Brucella* bacteria can persist for more than 100 days in the environment and transmission may occur by animals grazing on contaminated pasture or consuming other feedstuffs contaminated by discharges or fetal membranes. Treatment of brucellosis in animals

is generally unsatisfactory because it requires multiple drugs administered daily for several weeks.

The Game and Fish Department vaccinates elk against brucellosis on 21 of its 22 feedgrounds. The Dell Creek feedground is maintained as an unvaccinated control with which to compare efficacy of vaccination on other feedgrounds. A more thorough discussion of the Game and Fish Department elk vaccination program can be found under the section on the Brucellosis-Feedground-Habitat Program.

The Game and Fish Department tests elk for brucellosis at many of its feedgrounds. It also gathers blood samples from hunter-killed elk, which are thought not to winter regularly on feedgrounds. Seroprevalence data collected from 12 feedgrounds where elk have been vaccinated averaged 23.6% (range: 13-30%); the average seroprevalence of elk from the unvaccinated Dell Creek feedground has been 32%. The seroprevalence of elk not frequenting feedgrounds has averaged 2.3%. These data support the contention that feedgrounds increase the probability of disease transmission. Conversely, feedgrounds provide the only opportunity to effectively vaccinate elk and are one of the best methods to prevent co-mingling of elk and livestock during winter months.

Chronic Wasting Disease

Chronic wasting disease (CWD) is a fatal disease of the central nervous system of mule deer, white-tailed deer, and Rocky Mountain elk. Chronic wasting disease has been found in primarily central and southeastern Wyoming (see Figure 2). Chronic wasting disease is one of a group of diseases called transmissible spongiform encephalopathies that are thought to be caused by abnormal proteins or "prions." These prions are unlike viruses or bacteria in that they contain no DNA and, thus, are not living organisms.

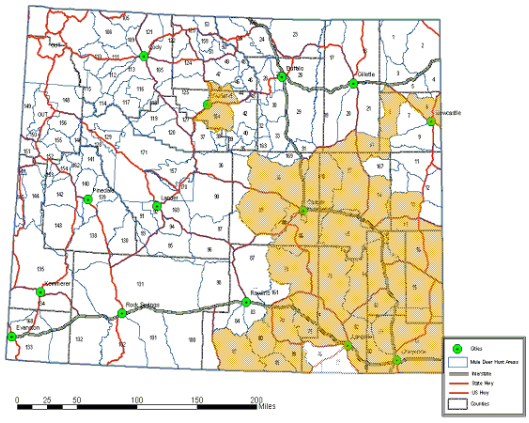

Figure 2. Deer Hunt Areas with CWD

Affected animals experience progressive loss of body condition, reluctance to move unless approached closely, increased drinking, depression, and eventually death. Many animals are seen near water and are reluctant to leave such areas. All animals showing clinical signs of CWD eventually die; however, it is not known if just being infected with the prion always results in disease and death.

The mode of transmission of CWD has not been identified. Evidence suggests the disease can pass directly from infected animal to uninfected animal; by contact with soil, plants, or feed contaminated with the prion; or by direct or indirect contact with the carcass of an animal that has died from CWD. There currently is no evidence that CWD can be transmitted to humans or domestic livestock.

The Game and Fish Department has conducted systematic surveillance for CWD since 1997 by examining hunter-killed deer and elk. Biologists remove lymph nodes from the head that are located just behind the curve of the jawbone. These lymph nodes are tested by an enzyme-linked immunosorbent assay (ELISA) test similar to one of the tests used for brucellosis. This test is highly accurate and can be conducted quickly. The overall CWD prevalence of deer found in the endemic area (shaded area on map) is 7.7% (range: 0.5-28.0%) whereas the prevalence for elk is 3.4% (range: 1.0-9.3%). It is unknown why more deer than elk are found to have the disease. Also, a higher percent of buck deer test positive for CWD compared to does; it is unknown if more bull elk get CWD than do cow elk. In addition, 1,095 elk from the Jackson herd have been tested since 1997 and none were found to be infected.

The prevalence of CWD in captive elk or deer has been found to be much higher (59-85%) than for free-ranging animals. This is thought to be due to an increased opportunity for animal-to-animal transmission and/or exposure to an increasingly contaminated environment. Mathematical models have been developed based on free-ranging and captive animal data. These models predict that over a period of several decades CWD prevalence rates will increase with a concomitant decrease in population. Some assumptions of this model have been called into question by scientists and, thus far, there is no proven example of a wild population declining due to CWD.

Many people are concerned that elk on feedgrounds may mimic the circumstances of elk in captivity and suggest that feedgrounds will result in high CWD prevalence resulting in drastic population declines as implicated by the disease models. Although this may happen, a perfectly acceptable alternative hypothesis is that CWD will have little or no impact on elk populations based on the known low prevalence rates for CWD in wild elk. Although there are many opinions, no one knows what will happen if elk on feedgrounds become infected with CWD.

The only tool wildlife managers have employed to slow the spread of CWD is increasing the hunter harvest or otherwise culling deer in a CWD area. This increased killing does result in decreased prevalence simply because decreased numbers of deer result in decreased opportunities for disease transmission. Nonetheless, all attempts at culling have only resulted in lower deer numbers. As of August 2004, culling has not stopped the spread of the disease. Many wildlife disease professionals believe that CWD cannot be stopped from spreading in the wild in the foreseeable future. If true, CWD will likely eventually infect elk in the GYA.

The only way humans have ever been able to control any disease is by developing a thorough understanding of the disease agent, the pathophysiology of the disease it causes, and its mode of transmission. Today, hundreds of research experiments are being conducted around the world to understand diseases like CWD. This research takes time, but eventually we will likely learn how to slow or stop the spread of CWD, how to protect animals from contracting CWD, or even how to cure animals already infected with the disease.

Tuberculosis

Tuberculosis (TB) is a worldwide disease affecting domestic and wild animals, birds, and humans. Tuberculosis is caused by bacteria of the genus *Mycobacterium*. Bovine TB, caused

by *Mycobacterium bovis*, is of most concern to elk and bison in the GYA. Tuberculosis causes lesions in the lungs and elsewhere, resulting in emaciation and oftentimes death. Infections can be unapparent for years.

Bovine TB is not presently found anywhere near the GYA, but there have been cases of TB in game farms in Montana and Colorado. Currently, there are focal areas of bovine TB in free-ranging white-tailed deer in Michigan and bison in Canada. Domestic cattle are capable of harboring TB and transmitting it to wildlife, but the disease has been nearly eradicated in cattle and is highly regulated to prevent its spread.

The disease is usually spread through inhalation of the bacteria by a susceptible host. High densities or artificial concentration of animals are thought to exacerbate the spread of TB. Although TB vaccines exist, none have been proven effective in preventing the disease in wildlife. Like brucellosis, individual animal treatment would be difficult in wild animals due to the need for long-term antibiotic treatment. Testing for TB in free-ranging animals is difficult because animals have to be held for three days to finish the testing process.

The WGFD has sampled 2,532 elk in the GYA since 1992 and found no cases of TB. Today, TB surveillance is conducted in conjunction with CWD sampling because the lymph nodes examined provide evidence of either disease.

Table 4. Jackson Elk Bovine TB/CWD Surveillance, 1992 - 2002

YEAR	SAMPLE SIZE	% OF TOTAL HARVEST
1992	120	3%
1993	312	12%
1994	302	7%
1995	260	8%
**1996	339 (*104)	11%
1997	310 (*243)	9%
1998	393 (*317)	19%
2000	262 (*197)	20%
2002	234 (*234)	10%
Total	2532 (*1095)	

*Number of CWD samples collected and tested.
**CWD surveillance started in 1996.

Prevention is the most rational management strategy for TB. This is being accomplished by continuous surveillance and examination of hunter-harvested wildlife. The nearly successful TB eradication program for cattle, and the recently implemented TB eradication program for farmed elk and deer, make it unlikely that TB will be introduced into wildlife of northwest Wyoming. Reduction or elimination of feedgrounds would not prevent the introduction of TB into the GYA, but feedgrounds could contribute to the maintenance and spread of TB should it arrive.

Other Diseases

There are other diseases to which elk are susceptible. Diseases such as pasteurellosis, necrotic stomatitis, and psoroptic mange (scabies) have been documented in elk both on and off feedgrounds. Pasteurellosis appears to be a function of animal densities, which cannot be reduced when animals are being fed. That is, the density (number of animals per given area) doesn't change greatly with the total number of animals being fed. Elk are somewhat resistant to this disease and outbreaks are sporadic and mortalities relatively low. Necrotic stomatitis, primarily a disease of feedground elk, has been managed by good feeding management, such as moving feedlines daily, feeding on clean snow, and using high quality forage. Scabies is a parasitic disease primarily of adult bull elk and its prevalence may be a function of animal condition; however, animals in good health and nutrition may be less susceptible to this parasite. High animal densities may exacerbate the parasite's spread. Feedgrounds both hinder (by providing good nutrition) and maintain (by increasing animal densities) this disease.

There are other North American and foreign diseases that are always a potential threat to the elk of the GYA. Paratuberculosis (Johne's disease), meningeal worm, anthrax, malignant catarrhal fever, and foot and mouth disease could be of serious concern to elk managers should they become endemic in the GYA.

Brucellosis and Livestock

The bacterium responsible for brucellosis was first isolated from cattle in the United States in 1910, and by 1934, 33 states had regulations requiring negative blood tests on imported cattle. Because of the widespread occurrence of bovine brucellosis in the U.S. and its importance as a disease of humans, the Cooperative State-Federal Brucellosis Eradication Program was initiated by an act of Congress in July 1934. In addition to costs of human health care associated with brucellosis, the disease was estimated to be costing the livestock industry $50 million annually.

The brucellosis eradication program is based on three components common to all disease eradication programs: 1) Surveillance to locate reservoirs of brucellosis; 2) Control to prevent spread of the disease; and 3) Eradication or elimination of all infected herds, individuals, and reservoirs. Surveillance techniques evolved and improved over time, and they are largely based on tests of milk or blood to detect antibodies against the causative organism. Control involves quarantine of infected and exposed animals and restrictions on movements of high risk animals. Vaccination is an important tool of control that reduces spread within affected herds and minimizes introduction of infection from outside a herd. Eradication has largely been based on test and slaughter of infected cattle. Depopulation is the preferred method in the late stages of an eradication program.

Cattle in Wyoming were certified as brucellosis free in 1985, culminating significant expense and effort on the part of Wyoming cattle producers and federal and state livestock health regulatory officials. Montana and Idaho cattle were certified brucellosis free in 1985 and 1990, respectively. Wyoming lost its brucellosis-free status in February 2004 because of a bovine brucellosis outbreak that was likely due to transmission from elk wintering on a feedground.

Currently, only Texas and Wyoming do not have brucellosis-free status. Nationwide costs of the eradication program have exceeded $4 billion, but savings once brucellosis is eradicated are expected to far exceed costs of eradication.

Wyoming and federal livestock health officials have identified seven occurrences of bovine brucellosis outbreaks they believe were transmitted from elk or bison in Wyoming since the early 1960s. Prior to the 1970s there was not a great deal of effort put into identifying sources of bovine brucellosis because the disease was relatively common in cattle. As the eradication program progressed in Wyoming, increasingly extensive efforts were made to identify sources of bovine brucellosis outbreaks, largely because of the importance of identifying all brucellosis-affected cattle herds. During the five-year period 1980-1984 there were three bovine brucellosis outbreaks attributed to elk and in the period 1985-1989 there were three additional outbreaks in cattle for which elk or bison were believed to be the likely sources.

The Parker Land and Cattle outbreak in Fremont County occurred in February 1989, after Wyoming was declared brucellosis-free. The Parker Land and Cattle brucellosis outbreak was identified and contained, and Wyoming did not lose its brucellosis-free status. However, this outbreak attracted considerable local and national attention and resulted in formation of a Governor's Brucellosis Task Force, the Greater Yellowstone Interagency Brucellosis Committee, two reviews of Wyoming's brucellosis eradication program by USDA/APHIS/Veterinary Services, and development of the Game and Fish Department's Brucellosis-Feedground-Habitat Program. There was no bovine brucellosis outbreak during the period from 1990 through 2002. A bovine brucellosis outbreak was discovered in Sublette County in November 2003. This was in a cattle herd that adjoined an elk feedground and is likely due to cattle contact during winter with reproductive products from a brucellosis-infected elk from the feedground during the winter of 2002-03 or 2001-02. In June of 2004, a single cow from another cattle herd, in Teton County, was confirmed positive for brucellosis. In July of 2004, one more cattle herd, in Campbell County, was confirmed positive for brucellosis. To date, this cattle herd is not known to have a history of co-mingling with elk or bison in the Greater Yellowstone Area.

The 2003 Sublette County bovine brucellosis did spread to a second cattle herd; and, according to rules of the eradication program, Wyoming lost its brucellosis-free status in February 2004. This loss of brucellosis-free status has impacts on the livestock industry throughout Wyoming and the nation. Marketability of cattle in Wyoming is negatively impacted, and there will be a continuing focus on the cattle industry of the Greater Yellowstone Area by other states and brucellosis-free countries.

Under the rules of the brucellosis eradication program, the status of Wyoming's cattle was down-graded from Free to Class A, which has certain requirements that affect all cattle producers in Wyoming. All test-eligible cattle must be tested and demonstrated to be free of brucellosis within 30 days prior to interstate movement or change of ownership. This may cost $3-10 per head, which is a significant added cost to producers. Because of the reservoir of brucellosis in elk and bison of the GYA, producers in Wyoming, Idaho, and Montana will continue to have to vaccinate their cattle and participate in surveillance programs indefinitely. These activities are expensive for producers and are not necessary in states where there is no reservoir of brucellosis.

The 2004 Sublette County bovine brucellosis outbreak demonstrated the risk to cattle associated with proximity to elk feedgrounds. There also are risks to cattle if elk traveling to or from feedgrounds must pass within proximity of cattle, especially in spring, when infected elk are likely to abort. On the other hand, elk feedgrounds are an important tool available in the effort to eradicate brucellosis from elk. Elk on feedgrounds are trapped and tested for antibodies against *Brucella abortus*, allowing the Game and Fish Department to monitor the prevalence of brucellosis and progress of the Brucellosis-Feedground-Habitat Program. In addition, feedgrounds play an important role in reducing co-mingling of elk and cattle, thereby lowering the risk of transmission of brucellosis to cattle. Presence of elk on feedgrounds provides accessibility to elk to vaccinate them against brucellosis, thus reducing transmission of brucellosis among elk and the risk of transmission to cattle.

Brucellosis–Feedground–Habitat (BFH) Program

The Wyoming Game and Fish Department developed an integrated program in an attempt to control brucellosis in free-ranging elk associated with feedgrounds in the late 1980s. This integrated approach, called the Brucellosis-Feedground-Habitat (BFH) Program, combines ongoing Game and Fish Department programs (feedground elk vaccination, feedground management, habitat enhancement, elk/cattle separation, education) with the goal of eliminating brucellosis in elk and keeping elk and cattle separated during potential brucellosis transmission periods. This BFH program is currently staffed with one permanent and three contract biologists. Staff support for several of the BFH program activities comes from inter- and intra-agency personnel. Additional support for the program comes from the USDA Animal and Plant Health Inspection Service (APHIS), and the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) provides some technical and policy advice.

Elk Vaccination

The Game and Fish Department began vaccinating elk using remote delivery biobullet technology in 1985 at the Greys River Feedground. The Game and Fish Department currently vaccinates elk against brucellosis on 21 of its 22 feedgrounds while maintaining the Dell Creek feedground as an unvaccinated control with which to compare vaccine efficacy.

Vaccination is typically conducted on feedgrounds in January and February, after elk counts have been performed to estimate populations. Feedground operators and/or BFH personnel deliver biobullets from hay sleds, while also marking animals on one side with oil-based paintball markers to make sure animals only receive one dose.

During the first two years of a previously non-vaccinated feedground, or a feedground where adequate coverage has not been achieved in the recent past, all calves and all females are vaccinated. Calfhood vaccination only occurs after this period. Nearly 62,000 doses of vaccine have been administered using these technologies since 1985 (Table 5).

Elk are vaccinated with the strain 19 vaccine, a modified living bacterium that is less pathogenic than *Brucella abortus* (also referred to as "field strains"). The vaccinated elk is transiently

infected with strain 19, which stimulates the immune system to ward off the most deleterious effects of actual infection caused by the more virulent field strain.

The biobullet is fired from an air-powered rifle capable of accurately administering the vaccine at distances of up to 150 feet. The bio-bullet and its contents completely dissolve in the muscle tissue within several hours of implantation.

In controlled studies, *Brucella abortus* strain 19 vaccination was shown to reduce abortion rates in elk (Thorne et al., 1981). Research has demonstrated that the newer strain RB51, the preferred vaccine for cattle, provides no protection against abortion in elk, even when administered more than once.

The strain 19 vaccine is designed to prevent abortion, but not infection by field strain *Brucella*. Thus, vaccinated elk may contact and become infected by *Brucella abortus*, but not abort their calves. Strain 19 protects about 30% of the elk (about the same as for cattle) from abortion, which is the desired goal of vaccination in order to prevent disease transmission. Even though the strain 19 vaccine is not 100% effective, vaccinating all the calves over several years develops a "herd immunity", which is effectively higher than a single year's 30% efficacy.

Table 5. Wyoming elk feedground vaccination summary

	1985-2004 Strain 19 Vacination Summary	
Feedground	**Year Initiated**	**Total Doses**
Alkali	1991	2453
Bench Corral	1997	1768
Black Butte	1989	3343
Camp Creek	1989	3933
Dell Creek*	----	0
Dog Creek	1990	4127
Fall Creek	1994	2700
Finnegan	1996	903
Fish Creek	1993	1598
Forest Park	1988	4066
Franz	1997	1228
Greys River	1985	5119
Patrol Cabin	1991	2174
Horse Creek	1989	5480
Jewett	1997	1917
McNeel	1992	2596
Muddy Creek	1995	1940
NER	1989-91, 03-04	5020
North Piney	1995	156
Scab Creek	1995	2553
Soda Lake	1992	1945
South Park	1990	4227
Upper G.R.	1986	2691
Totals		61937

* Dell Creek has never been vaccinated (control)

A presumptive diagnosis of brucellosis in wild animals can be made through a variety of serologic (blood serum) tests. It is "presumptive" because these tests only detect antibodies made by the animal when it becomes infected with the *Brucella* bacteria. The tests cannot determine if an animal is actually infected with bacteria and is capable of transmitting brucellosis. For example, *Brucella* can be cultured from only 25% of bison having antibodies to the organism. Because the vaccines comprise living bacteria, they also induce an antibody response.

Older tests could not distinguish between antibodies caused by vaccination and those caused by actual infection. Thus, seroprevalence data (the percent of animals testing positive in a given sample) measured by these older tests over-represented the number of animals actually infected with field strain *Brucella*. Today, the WGFD uses a validated serology test (competitive ELISA or cELISA) that does distinguish between antibodies induced by vaccination from those induced by actual exposure to the field strain bacteria. All seroprevalence data now reported by the WGFD are from tests conducted with the cELISA and presumably indicate the percent of animals exposed only to field strain *Brucella*.

Brucellosis Serology

The Game and Fish Department initiated brucellosis surveillance in elk on the Greys River Feedground and National Elk Refuge in 1971 to monitor the distribution and prevalence of the disease. Currently, Game and Fish personnel trap, bleed, and test elk on four to five feedgrounds annually. To date, 3,705 yearling and adult female elk trapped on 19 different feedgrounds have been tested. It is important to remember seropositivity only indicates the animal has been exposed to *Brucella* and has formed an antibody response, but does not determine presence (or infection) of *Brucella* within the animal.

Serologic data (Table 6) indicate *Brucella* seroprevalence averages 32.4% (+/- 13.9) on Dell Creek feedground, which serves as a control and has never been vaccinated, and has fluctuated from 8% in 2004 to 50% in 1999. All vaccinated feedgrounds combined average 23.6% (+/- 15.9), and vary from 0% at Greys River in 1994, to 59% at Greys River in 2004. A 2-tailed paired sample t-test reveals mean seroprevalence at Dell Creek compared with all vaccinated feedgrounds is not significant (P= 0.27).

However, due to the complexity of factors involved in brucellosis transmission and the high variance in seroprevalence among years and feedgrounds, direct comparisons of mean seroprevalence may not accurately assess strain 19 program efficacy. Additionally, prevalence comparisons between Dell Creek and vaccinated feedgrounds within years assumes all transmission factors are equal excepting protection afforded by strain 19 vaccine in prior years on vaccinated feedgrounds. Thus, these data indicate strain 19 vaccination may have influenced declines in seroprevalence on several feedgrounds assuming all transmission factors are equal with Dell Creek, but are to be interpreted with caution.

Table 6. 1993 – 2004 Brucellosis seroprevalence (%) by feedground as determined by 4 standard and cELISA tests.

Year	Dell Cr.*	NER	Dog Cr.	Horse Cr.	S. Park	F. Park	Alpine	Finnegan	Franz	Black B.	Upper GR	Fall Cr.	Muddy Cr.
1993							11					29	
1994							0					15	
1995							13						37
1996			13				9						24
1997		13	33				3						
1998	26	15	43				14						
1999	50	13					9						
2000	45			19			26			9			
2001	26	7				26	54	18					
2002	35	18				33	50						
2003	37	17			26		51		37		15		
2004	8	20					59						27
Mean	32.4	14.7	29.7	19.0	26.0	29.5	24.9	18.0	37.0	9.0	15.0	22.0	29.3

*Dell Creek Feedground is a control; elk have not been vaccinated on this feedground

Elk/Cattle Separation

Preventing elk from establishing feeding patterns in cattle wintering areas greatly decreases the potential for brucellosis transmission to cattle. Each year, Game and Fish Department personnel employ a variety of techniques designed to keep elk and cattle separated. Techniques used include: 1) feedgrounds; 2) providing stackyard materials; 3) hazing elk; and 4) lethal take of elk.

The Game and Fish Department provides game-proof fencing to prevent elk from depredating stored hay crops. Since the inception of the BFH program in 1991, elk-proof fencing materials for 175 haystacks have been provided to cattle producers in three counties in western Wyoming.

In some situations elk are actually hazed away from hay crops using pyro techniques. Often elk have to be physically moved or herded from cattle feedlines, typically through the use of snowmobiles or helicopters. In more severe damage situations where elk cannot be readily moved to a proper wintering area, some elk are shot. Elk may be harvested by hunters through late season depredation hunts on private lands or in extreme cases, by Game and Fish personnel through the use of kill permits.

The amount of time spent implementing management actions varies with the severity of the winter, but the long-term trend would show a dramatic increase in such activities over the past 20 years. A review of Daily Activity Reports for Wildlife Division employees in the Jackson/Pinedale Region from fiscal year 2000 through fiscal year 2004, show a total of 6,067 person hours, or 758 person days, have been spent to prevent elk damage and elk/cattle co-mingling. This would equate to an average of 152 days/year.

Given the average daily cost (salary only) of $176 per game warden, this equates to $26,752 per year spent addressing elk damage. There are additional costs for equipment such as trucks, snowmobiles, and aircraft charter. The Game and Fish Department has spent between $1,000 and $10,000 in most years using helicopters to haze elk. Annual snowmobile operation costs routinely exceed $10,000. When conflict prevention efforts fail, emergency elk feeding has

been used to manage elk. This involves additional hay purchase, numerous additional days worked, hotel, and vehicle costs for persons from outside the region. Emergency feeding costs in 2003-04 exceeded $8,000.

These figures do not include considerable time spent by BFH and Habitat personnel who also contribute regularly to such activities. Also, this does not include other activities indirectly related to elk damage, such as processing damage claims, initiating feedgrounds, and administering Hunter Management Areas for hunts designed to alleviate elk damage.

It is important to note that the Department's considerable effort to manage damage conflicts and maintain elk and cattle separation occurs with an average of only 20% of the elk wintering away from feedgrounds. This workload frequently exceeds the workforce assigned to the region.

Given the combination of deep snow, present land ownership patterns, land use, and resource allocation, it is doubtful the Department could adequately address damage and separation issues with less elk feeding. If no circumstances changed, it would take a reduction in elk numbers or elimination of livestock use to eliminate feeding as a management tool.

Wolves create an additional feedground management dynamic (Werbelow, 2003). In early winter, wolves often disrupt feeding operations and increase the potential for elk damage and co-mingling with cattle. During spring, wolves may improve management by moving elk away from feedgrounds to spring transitional ranges.

In addition to winter activities, BFH personnel have been monitoring areas since 1999 where elk parturition and cattle turnout dates overlap. During the elk calving period, from late May to mid June, there is a potential risk for brucellosis transmission to cattle on overlapping ranges. Twenty public land grazing allotments in three counties have been identified as potential risk areas (See Fig. 3). Monitoring efforts to date have not revealed co-mingling in the majority of these allotments. Coordination and education efforts with land managers and grazing operators will be continued to resolve elk/cattle interaction if and when conflict areas are identified.

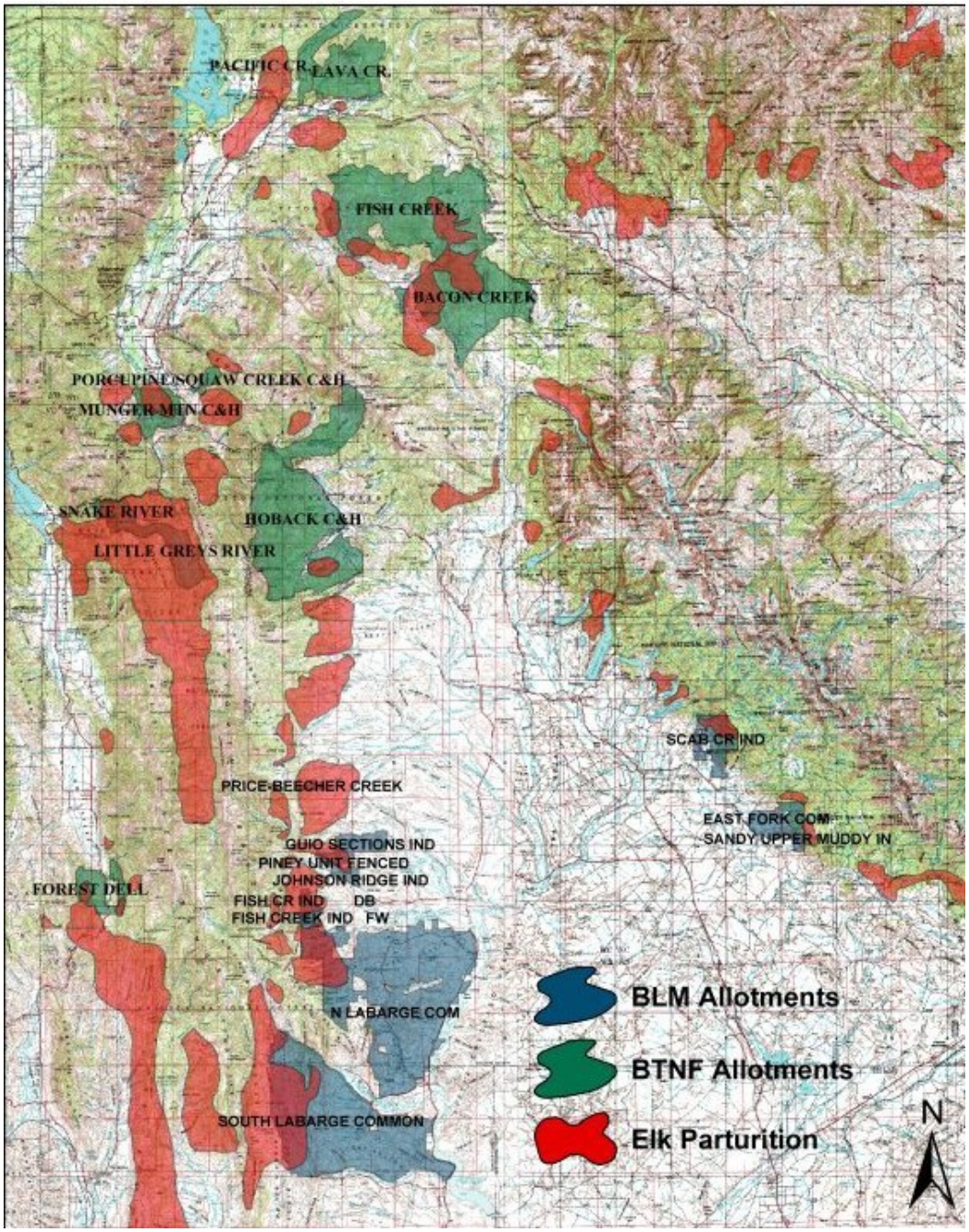

Fig. 3. Overlaps in elk parturition and public land grazing allotments where livestock grazing begins prior to June 15th

Habitat Enhancement

A variety of habitat enhancement techniques have been employed to manipulate vegetation and promote a more desirable assortment of plants or plant communities. These habitat enhancement techniques include prescribed fire, mechanical treatments, and herbicide application. Game and Fish Department BFH and Habitat biologists typically prefer to use prescribed burning as the

primary tool, as it most closely mimics natural disturbances and is the most cost effective enhancement method per acre.

Elk habitat and forage have been significantly modified through human control of wildfire. Fire suppression over the past century, along with a general reduction of ground cover by domestic livestock, have significantly reduced fire on the landscape (DeByle and Winokur, 1985; Baker, 1925). Fire has historically been responsible for creating a mosaic of diverse age classed vegetation for all habitat types throughout the mountain West and rejuvenating plant communities dependent upon disturbance. Ecotones between plant community successional stages produce a combination of forage and cover highly preferred by elk (Skovlin, 1982).

Forage within burned areas frequently possesses elevated nutritional values, especially crude protein and digestibility, for 5-10 years post-fire. Moreover, fire-induced changes in vegetation species composition generally benefit free-ranging ungulates and are long-term, lasting 25-100 years. Historically, approximately four percent of the landscape in the West was burned each year by wildfire. Less than one fourth of this amount has burned annually within the past several decades, leaving a disproportionate amount of the landscape in advanced successional stages. Human controlled (prescribed) fire is used to reintroduce fire to the landscape to promote a balance of diverse plant communities and age classes across the landscape.

Mechanical treatments are a tool used to improve habitat for elk and other wildlife. There are numerous mechanical devices that can be used to manipulate vegetation. Most include varieties of modified farm equipment designed to disturb the vegetative cover, setting back natural succession of plant communities. Pulling a disc, half-round drum, ripper, mower, or enormous chain behind a tractor are some techniques used to promote herbaceous production, species diversity, and reduce competitive plants in shrub, grass, and small tree vegetation types. Thinning and harvesting using chainsaws or the forward harvester (mechanical vehicle used to cut and move trees) can also be used as a vegetation management technique to rejuvenate stands, increase production, and eliminate undesirable species.

Herbicide application to reduce specific plants, while increasing the quantity and quality of other plants, can also help create diverse plant communities. The herbicide “Spike” can be used to reduce the density of sagebrush, promoting increased herbaceous production. Targeted application of various herbicides can also help control noxious weeds and reduce competition with more desirable and palatable natives.

Game and Fish Department personnel, with various partners, have treated over 67,000 acres of habitat over the last 12 years in the Jackson/Pinedale Region with the primary goal of enhancing the quality and quantity of elk ranges (See Figure 4). There are three BFH project biologists working in different geographic areas within the Jackson/Pinedale Region. These areas include the Pinedale, Big Piney, and Jackson BFH projects areas. Listed below are completed habitat treatments for each BFH project area.

Pinedale BFH Area Vegetation Treatment Summary

15 projects completed from 1993-2004

10 prescribed burns	= 12,860
2 herbicide (Spike)	= 620
3 mechanical (aspen cutting)	= 110
TOTAL	13,590

Piney BFH Area Vegetation Treatment Summary

13 projects completed from 1992-2004

3 mechanical (various)	= 4,476
5 prescribed burns	= 3,540
3 herbicide (Spike)	= 1,355
TOTAL	9,371

Jackson/Afton BFH Area Vegetation treatment Summary

28 projects completed from 1990-2004

23 prescribed burns	= 43,200
5 mechanical (mostly cutting)	= 1,100
TOTAL	44,300

Figure 4. Number and location of habitat enhancements and wildfires within the Jackson/Pinedale Region.

Habitat improvements to increase forage quality and quantity can reduce dependence on feedgrounds, in terms of days of use and/or amount of feed consumed, but their effectiveness is currently limited and quite variable for several reasons. Elk generally move to supplemental feed when native forage becomes limited due to ungulate consumption or snow depth, which varies from year to year. If the potential for damage on private lands exists, elk are either moved to adjacent feedgrounds and/or feeding is initiated early to attract elk away from potential damage/co-mingling conflicts. Thus, the need to prevent damage to stored crops and co-mingling of elk and livestock and variable winter conditions reduce the overall effectiveness of habitat improvement efforts.

Habitat improvements are an important part of the multi-faceted approach to managing brucellosis, and provide benefits to many wildlife species, but habitat improvements alone are not likely to solve the problem or allow phasing out of elk feedgrounds. However, habitat improvements in conjunction with other management actions such as conservation easements, land acquisitions, and forage allocations for wintering elk on public lands may allow phasing out certain feedgrounds.

Information and Education

Game and Fish Department personnel regularly inform and educate various public factions about wildlife diseases, including brucellosis and chronic wasting disease. Educational outreach efforts have included multi-agency symposiums, group presentations, videos, news releases, interpretive signs at feedgrounds and crucial winter ranges, and a number of brochures and publications. The importance of quality wildlife habitat and the significant role fire plays in natural ecosystems is also stressed throughout these efforts. Game and Fish Department field personnel make numerous contacts with private landowners regarding habitat improvement projects, wildlife-friendly management techniques, or ways to prevent co-mingling of elk and livestock. Additional efforts are focused on youth education at events such as the Game and Fish Department's annual Youth Conservation Camp at Dubois and the annual Hunting and Fishing Expo in Casper to inform kids, and their parents, on the vaccination program and brucellosis management.

The BFH program is an effective integrated management approach addressing brucellosis and elk management. Surveillance has indicated remote delivery of strain 19 vaccine has reduced opportunities for brucellosis transmission in elk through enhanced immunity. Techniques employed to maintain elk/cattle spatial and temporal separation have been effective. Thousands of acres of habitat enhancement projects coupled with modified feedground management practices have maximized elk use of spring and fall habitats, potentially decreasing the average time elk occupy feedgrounds and the associated density dependent rate of disease transmission. These enhancements have also benefited numerous other wildlife species and have restored ecosystems to a more properly functioning condition.

Although the BFH approach has demonstrated its effectiveness in reducing opportunities for brucellosis transmission and reducing elk/cattle conflicts while enhancing habitat for numerous wildlife species, this approach alone will not likely eradicate the disease from the GYA. However, until a more efficacious vaccine is developed and/or the various elk/livestock/habitat conflicts are resolved, the BFH program may be the only practical approach currently available to control brucellosis in elk at a manageable level.

Interagency Coordination

Brucellosis and elk feedgrounds have a long history in Wyoming. Brucellosis was probably introduced as an exotic disease of elk around 1900 and elk have been fed since 1910. Although brucellosis was known to be present in elk and bison of the GYA in 1934, when the Cooperative State-Federal Brucellosis Eradication Program was adopted, little or no thought was given to its presence in wildlife and future problems it would eventually present to complete eradication of the disease. Brucellosis and wildlife related issues in the 1960s and 1970s were largely focused on bison of Yellowstone National Park.

Brucellosis was first identified in elk in 1930 at the National Elk Refuge and at Greys River Feedground in the 1940s. The scope of brucellosis in elk as a problem began to be recognized in the 1970s when the Game and Fish Department began testing large numbers of elk for antibodies

against *Brucella abortus* at Greys River Feedground, the National Elk Refuge, and other elk feedgrounds. Also during the 1970s, livestock health officials dealt with persistent brucellosis problems in a herd of cattle adjacent to the Greys River Feedground. The Game and Fish Department began controlled research on brucellosis in elk at the Sybille Wildlife Research and Conservation Education Center in 1971-72.

By the late 1970s, research at Sybille and testing on elk feedgrounds demonstrated brucellosis was an important disease in elk, causing approximately 50 percent of infected females to abort their first calf following infection. Brucellosis was present on all elk feedgrounds and research into the possibility of vaccinating elk against brucellosis was appropriate. By 1985, the Game and Fish Department, with concurrence of USDA/APHIS/Veterinary Services, concluded Strain 19 vaccine was safe in elk and about as effective in elk as it is in cattle at preventing abortion when a vaccinated elk becomes infected.

In 1985, the same year Wyoming's cattle were declared free of brucellosis, the Game and Fish Department initiated vaccination of feedground elk with a ballistic bio-bullet system on a trial basis at Greys River Feedground. During this time, increasing regional and national attention was being paid to brucellosis in elk and bison of the GYA. In order to encourage inter-agency communication, the Tri-State Brucellosis Technical Committee was formed in 1988 and held its first meeting in October in conjunction with a meeting of the U.S. Animal Health Association. The Technical Committee met one or two times a year, but it had no authority and served only to establish dialogue and understanding among agencies and parties.

In response to the Parker Land and Cattle bovine brucellosis outbreak, Wyoming Governor Mike Sullivan established the Wyoming Brucellosis Task Force in May 1989. The Task Force established a goal to "Protect the integrity of Wyoming's free-ranging bison and elk populations and livestock industry by eradicating wildlife brucellosis by the year 2010." The Task Force recognized a number of problems stood in the way of achieving this goal and that the brucellosis problem involved all the GYA, not just Wyoming. And, it recognized cooperation and coordination of all state and federal wildlife management, land management, and livestock health agencies, along with stock grower and conservation organizations, in the three affected states was needed to eliminate brucellosis in wildlife in the GYA. The Task Force made numerous recommendations, many of which have been implemented, while others have not been accomplished. A key recommendation was to establish a multi-agency, tri-state brucellosis committee to address brucellosis in wildlife in the GYA.

In 1995, an MOU establishing the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) was signed by the Governors of Wyoming, Montana, and Idaho and the Secretaries of Agriculture and Interior. The MOU contained a goal, mission, and ten objectives that would guide the GYIBC in its activities. With establishment of GYIBC, the Tri-State Brucellosis Technical Committee was disbanded. The GYIBC has established and maintained communications, understanding, dialogue, and cooperation among member agencies that was not previously possible. The GYIBC has sponsored two symposiums on brucellosis in the GYA, written an informative white paper on brucellosis, adopted a resolution recommending against new feedgrounds in the GYA, prepared an Information and Education Plan for Citizen Participation and a video on brucellosis in GYA, and written technical reports on male

transmission of brucellosis, brucellosis in horses, vaccine safety and efficacy, a bison quarantine protocol, etc. The GYIBC's commitment to respect and honor mandates and responsibilities of member agencies prevents unilateral initiation of management actions, which has led many people to conclude it "moves with glacial speed."

In response to the November 2003 bovine brucellosis outbreak in Sublette County and loss of Wyoming's brucellosis-free status in February 2004, Governor Dave Freudenthal established the Wyoming Brucellosis Coordination Team. It is charged to develop best management practices and specific recommendations related to four topics: 1) Reclaim Wyoming's brucellosis-free status and improve surveillance in cattle and work to end transmission between cattle and wildlife; 2) Develop a road map of what to do in the event of a new brucellosis outbreak in cattle; 3) Address human health concerns associated with brucellosis; and 4) Reduce, and eventually eliminate, brucellosis in wildlife. Four committees were formed to address these topics: 1) Human health issues; 2) Cattle issues; 3) Regulatory issues; and 4) Wildlife issues. The Brucellosis Coordination Team has established an ambitious meeting schedule and intends to present its report and final recommendations to the Governor in late 2004, in time to prepare legislation for the 2005 legislative session, if necessary.

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