

**Jackson Elk Herd Unit (E102)**  
**Brucellosis Management Action Plan Update**  
**April 2011**

**A. Introduction and herd unit overview**

This update to the Jackson elk herd (JEH) Brucellosis Management Action Plan (BMAP) was prepared to evaluate brucellosis management recommendations developed and implemented during this plan's original development in 2007. Meetings among Wyoming Game and Fish Department (WGFD) personnel, interested livestock producers, federal land managers, and state and federal livestock health and regulatory officials were held to discuss progress on the plan's recommendations, review the various brucellosis management action options, and develop new brucellosis management recommendations based upon updated information. The WGFD has made much progress in the JEH to better understand characteristics of elk to elk brucellosis transmission, refine elk parturition delineations, and to reduce the risk of both intra- and inter-specific brucellosis transmission. This update should be considered complementary to the original JEH BMAP.

The Jackson EHU is located in the upper Snake River drainage and includes all drainages of the Snake River downstream to and including the Gros Ventre River drainage and Flat Creek north of the town of Jackson. The Jackson EHU includes elk Hunt Areas (HA) 70-72 and 74-83 (Figure 1). Total area of the Jackson EHU is approximately 2,350 mi<sup>2</sup> (~1.5 million acres) of which 2,299 mi<sup>2</sup> (98%) have been delineated by the WGFD as occupied elk habitat. Approximately 2,054 mi<sup>2</sup> (89%) are delineated as Spring/Summer/Fall range, 2 mi<sup>2</sup> (0.1%) as Crucial Winter Yearlong range, 152 mi<sup>2</sup> (6.6%) as Crucial Winter range, 52 mi<sup>2</sup> (2.3%) as Winter range, 39 mi<sup>2</sup> (1.7%) as Winter Yearlong range, and 151 mi<sup>2</sup> designated as parturition range (Figure 2).

The U. S. Forest Service (USFS) manages 1,454 mi<sup>2</sup> (61.8%) of the area. The National Park Service (NPS) manages 683 mi<sup>2</sup> (29.0%) of land within the area, comprised of Grand Teton National Park (GTNP), Rockefeller Memorial Parkway, and Yellowstone National Park (YNP). GTNP and the National Elk Refuge (NER; 38.7 mi<sup>2</sup>; 1.6%) comprise most of the valley floor north of the town of Jackson. Private lands account for 114 mi<sup>2</sup> (4.8%) of the area. State lands make up the remaining 5 mi<sup>2</sup> (0.2%). There are three state-operated elk feedgrounds within the Jackson EHU: Alkali, Patrol Cabin, and Fish Creek; each of these are located in the Gros Ventre River drainage east of GTNP. Elk also receive supplemental winter feed on the NER, operated by the U.S. Fish and Wildlife Service (USFWS).

# Jackson Elk Herd Unit (E102) Hunt Areas

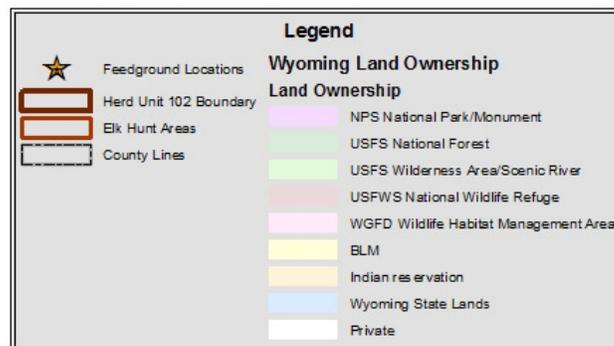
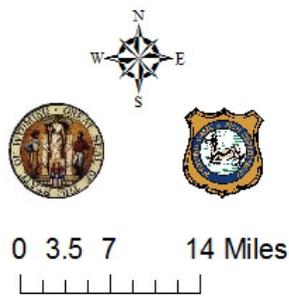
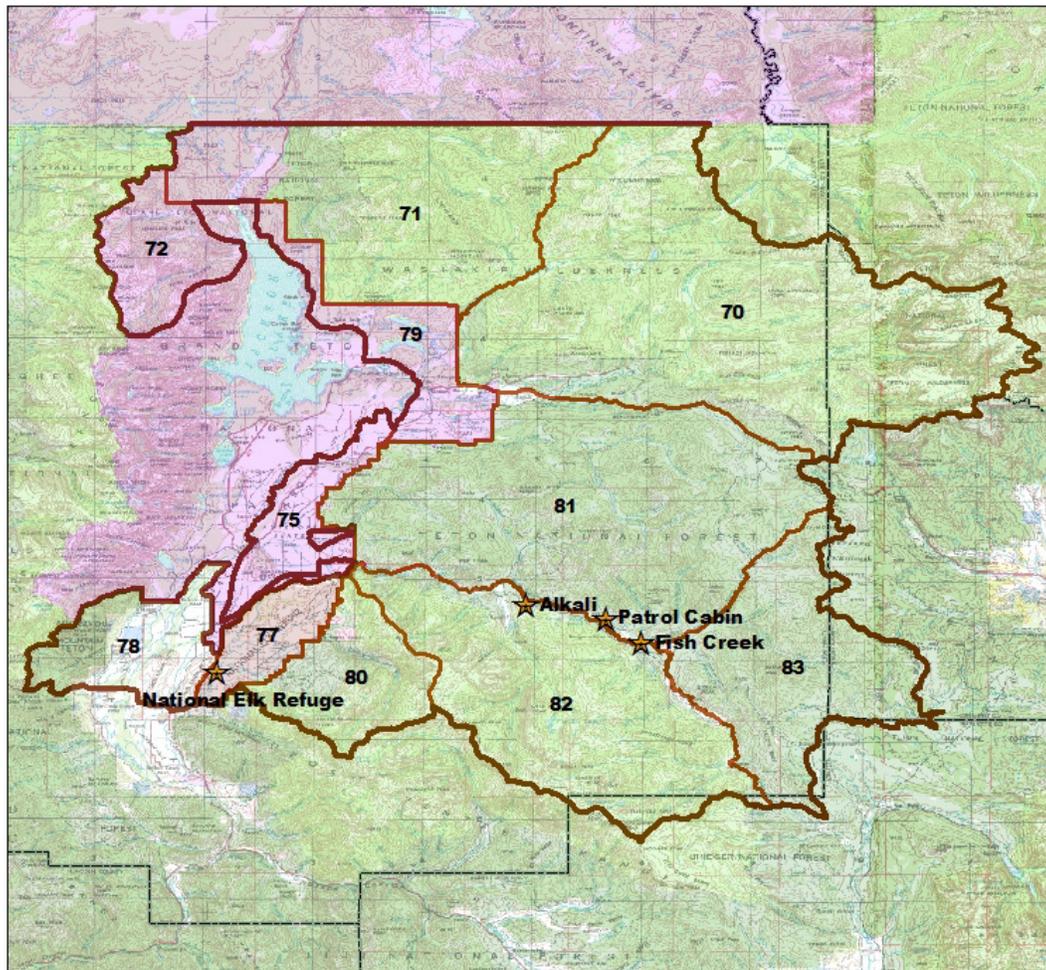


Figure 1. Land ownership, feedground locations, and Hunt Areas within the JEH. *Hunt Areas shown reflect boundary changes that are pending May 2011 approval by WGFC.*

# Jackson Elk Herd Unit Seasonal Ranges

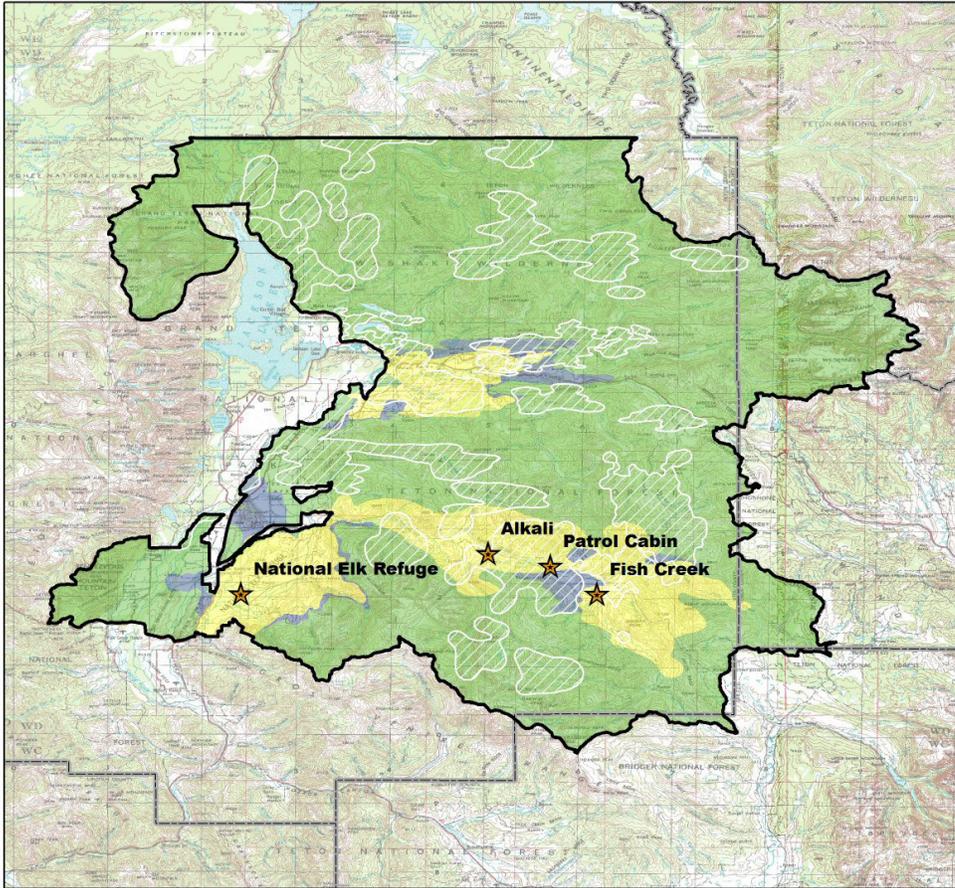


Figure 2. Currently delineated seasonal elk ranges and feedgrounds within the JEH.

## **B. Brucellosis Management Options**

Listed below are potential options for managing brucellosis in the JEH. Short-term objectives of these options are to reduce co-mingling of elk and cattle and the prevalence of brucellosis in elk. Long-term objectives include eliminating the reservoir of brucellosis in wildlife in the GYA if determined to be technically feasible, maintain livestock producer viability, reduce/eliminate dependence of elk on supplemental feed, maintain established elk herd unit objectives, improve range health, and maximize benefits to all wildlife. The Wyoming Game and Fish Commission (WGFC) will require support from various constituencies (agriculture, land management agencies, sportspersons, etc.) prior to pursuing these options, and several options will require decisions from entities other than the WGFC.

1. Re-locating feedgrounds to lower elevation sites with increased geographic area for elk to disperse and increased distance from winter cattle operations.
2. Reduction/elimination of supplemental feeding.
3. Reducing numbers of elk on the feedgrounds through increased harvest.
4. Reducing numbers of susceptible cattle and stored crops in areas around feedgrounds during winter, or implementing changes in cattle operations by providing incentives to producers.
5. Elk-proof fencing of feedgrounds or private lands to prevent elk from drifting onto private land and reduce commingling.
6. Elimination of seropositive elk on feedgrounds through test and removal program.
7. Extensive habitat enhancement projects in suitable winter range areas near feedgrounds where the potential of commingling with livestock is minimal.
8. Acquisition of native winter range through fee-title purchase, conservation easements, or other methods.
9. Continuation of *Brucella* strain 19 elk vaccination.

## **C. Discussion of Options**

### **1. Feedground Relocation**

The three state-operated feedgrounds in the Gros Ventre drainage would be most suitable for relocation among all feedgrounds in the JEH. This option would initially require a suitable area lower in elevation, in a lower precipitation zone, with no winter cattle operations in the vicinity. If such areas were identified, habitat conditions should be evaluated to determine production, health of vegetation, and approximate potential of the area.

There would potentially be benefits to increasing the feeding area of the Gros Ventre feedgrounds. Since wolves recolonized the Gros Ventre drainage in 1998, elk movement among and between the feedgrounds in the Gros Ventre has become unpredictable, frequently with the consequence of all Gros Ventre elk on feed being concentrated on just one of the feedgrounds (WGFD 1999, 2005). This is despite WGFD attempting to separate elk among all three feedgrounds by allocating less feed (or not feeding at all) at the feedground of highest elk density. Commission quotas for Alkali, Patrol Cabin and Fish Creek are 800, 650, and 1,000, respectively. It is believed that the feeding area on

Fish Creek feedground is sufficient for >1,000 elk (feeding area of about 71 acres). The feeding area at Patrol Cabin is only 40 acres, which becomes problematic when 1,000+ elk congregate at the site, resulting in undesirably high elk densities. Avenues WGFD could take for expanding the Patrol Cabin feeding site are USFS or private land. Surrounding landowners have discussed with WGFD personnel the possibility of feeding elk on their private land.

While some cattle producers are supportive of creating new feedgrounds (e.g., in the Buffalo Valley), the WGFD will not pursue that option in the foreseeable future. Options for relocating any of the state-operated Gros Ventre feedgrounds appear to be limited, as the sites are likely located as optimally as possible for the purposes they currently serve. Future opportunities to implement this option for feedgrounds in the JEH would be facilitated by combining with options 3 through 7. If more optimal locations for these feedgrounds existed, the following should be considered.

#### Pros:

- may contribute to lower brucellosis prevalence
- elk would have increased area to disperse
- elk could be fed on larger areas and in more sanitary conditions
- elk numbers could be maintained at or near current levels

#### Cons

- brucellosis prevalence may persist
- might require funds for erection of new structures, fences, roads, etc.
- difficulty would be experienced during initial habituation of elk to the new site
- localized damage to vegetation
- may increase dietary competition of elk with other native species

## 2. Feedground Elimination

If current conditions and herd objectives change, through implementation of one or more options 3, 4, 6, 7, and 8, this option might become more realistic. The WGFC has the authority to make this decision.

In April 2006, WGFD assembled a document evaluating the proposal for a phase-out of elk feeding in the Gros Ventre drainage (WGFD 2006). This document was a comprehensive assessment of the Gros Ventre feedground phase-out proposal submitted to Governor Freudenthal in response to a request by the Greater Yellowstone Coalition, Wyoming Outdoor Council, and Jackson Hole Conservation Alliance (2005). Based on that evaluation, the WGFD does not support a trial phase-out of feedgrounds and believes the continuation of supplemental feeding is necessary. It was concluded that the only way a trial phase-out of feeding could be attempted is if the population of elk wintering in the Gros Ventre were reduced by 1,000-1,500 animals, mitigation measures to prevent livestock and elk commingling were implemented by landowners in areas of highest potential for damage and commingling, and the NER agrees to accommodate any additional elk that would move from the Gros Ventre drainage to the NER. WGFD will continue to monitor conditions in the Gros Ventre drainage. If any of the factors preventing a trial phase-out change, the Department may reevaluate that proposal.

Pros:

- would reduce the risk of intraspecific transmission of brucellosis and other density-dependent diseases
- would facilitate efforts to eliminate brucellosis in elk in the JEH
- would reduce feedground and vaccination expenses to the WGFD

Cons

- would increase the risk of property damage and interspecific transmission of brucellosis to livestock if implemented abruptly with current numbers of elk and /or prior to elimination of brucellosis in elk
- would increase elk winter mortality
- would lower the number of elk that could be maintained in the JEH
- would reduce income to the WGFD due to reduced license sales
- would reduce hunter opportunity
- may increase potential for vehicle-elk collisions

3. Elk Reduction

Reducing elk numbers on the feedgrounds in the JEH through liberalized hunting seasons could allow more flexibility to pursue options 2, 5, 6, and 7. Reductions beyond the current, WGFC-established, elk herd unit population objectives would require a public input process to discuss the issue and determine the level of support. The postseason population objective for the JEH is 11,000 elk and the current population simulation model indicates the herd is within 10 percent of objective. The WGFD will continue to design and implement harvest strategies to ensure elk populations are maintained at established Herd Unit objectives.

After several years of managing for population reduction in the JEH, WGFD management strategy is transitioning to one of population maintenance. Preseason classifications indicate that herd segments in the southern portion of the herd unit reproduce at twice the rate of migratory elk from YNP. Post-season classification surveys also indicate that resident elk on USFS land exhibit low calf:cow ratios.

WGFD is recommending that future harvest levels need to target specific segments of the elk population to prevent further population decline while maintaining hunting pressure on more robust southern herd segments. Proposed harvest strategies along with lower calf production in some herd segments will continue to move southern resident elk numbers towards objective while allowing northern and Gros Ventre elk, which are below objective, to increase. Hunting season structure in the Teton Wilderness (TW) and GTNP will continue to reduce hunting pressure on elk that migrate from YNP and the TW. Hunt season modifications being proposed in 2011 focus hunting pressure on segments of the population that are difficult to harvest from subdivisions along the Snake River while being responsive to public concerns.

Further reducing elk numbers, below current population objectives, on all feedgrounds in the JEH through liberal hunting seasons could allow more flexibility to pursue options 2 and 6, and could lead to more favorable conditions for options 7 and 8. The WGFC has the authority to make this decision.

Pros:

- may contribute to lower brucellosis prevalence

- would increase hunting opportunities in the short term
- would increase license revenues in the short term
- would decrease elk densities on feedgrounds
- potentially reduce conflicts on private lands
- would reduce costs of supplemental feeding and vaccination

Cons:

- the response of seroprevalence of brucellosis in elk when populations are reduced is unknown, yet it is unlikely to reduce incidence to an acceptable level assuming the remaining elk are still fed.
- damage to private crops may still continue as hunter harvest is random and does not select for “problem” elk
- the general public may be unwilling to accept large reductions in elk numbers
- success might be limited to hunter efficiency
- would result in loss of hunting opportunities in the long term
- would reduce license revenue in the long term (might be offset by reduced management costs)

4. Cattle Producer Change of Operation

This is an option that high-risk and other producers in the JEH could implement to minimize/eliminate brucellosis risks to their herd. Brucellosis transmission potential within cattle and testing requirements associated with cow/calf operations would be eliminated if all cattle operations were yearlings, spayed heifers, and/or steers. Conversion to yearlings would also eliminate the need of storing most hay crops and winter feeding, reducing winter elk conflicts. Operations that feed through the winter can take small measures to avoid attracting elk such as feeding in the morning and feeding every day to keep feeding areas clean of hay. The opportunity for disease transmission is also greatly reduced if cattle and elk do not co-mingle between February and 15 June. Implementing facets of this option would require changes by the producer and possibly a favorable decision by the USFS to alter grazing permits.

Evaluation and implementation of alternatives in this option are totally under the jurisdiction of individual livestock operators, Wyoming Livestock Board, State Veterinarian, and APHIS. Discussion and recommendations pertaining to this option should be contained in Individual Ranch Herd Plans for each livestock operation.

5. Fencing

This is an option that would facilitate implementing all other options. Fencing of winter cattle feedlines could prevent elk from commingling with cattle. Elk-proof fencing around private stackyards reduces “attractiveness” to and likelihood for damage by elk. New fencing would require favorable decisions by the landowner. Where fencing stackyards is considered beneficial at reducing damage/commingling, the WGFD currently provides fencing materials to landowners.

Large-scale, elk-proof fencing around feedgrounds can contain most elk within a given area, as evidenced by fences in Jackson Hole (along west boundary of NER), Star Valley (along west boundary of Greys River feedground), and Pinedale (border of USFS land from New Fork canyon to Fremont Ridge). Smaller-scale fences (e.g., adjacent west

of Muddy Creek feedground) may prevent elk from drifting onto localized areas, but likely do not contain most elk in the Herd Unit.

The Department has, in the past, resisted fencing private lands. WGFD could support large-scale projects such as fencing fall and spring pasture, but would not be able to fund them. If a specific proposal were developed, with an interested and supportive landowner, Natural Resources Conservation Service (NRCS) or APHIS could potentially provide some funding for implementation. WGFD could facilitate in locating funding sources for landowners that have the desire to implement a large-scale fencing project. Similar to option #4, NRCS has the potential to become an available source of funding for fencing projects where brucellosis concerns are the impetus.

Pros:

- may reduce damage problems and complaints
- may reduce risk of elk-cattle brucellosis transmission
- may be successful in fencing off stored hay and small-scale livestock operations
- reducing the attractiveness of particular operations to elk may lead to overall reductions in damage in the general area

Cons:

- costs may be prohibitive- must consider construction, maintenance, and monitoring
- congregating all or most of the elk within the fence may be unfeasible
- long lengths of fencing could impede movements of other wildlife
- does not address seroprevalence of brucellosis in elk
- some producers may be unwilling to erect fences
- may require federal agency cooperation and potential National Environmental Policy Act (NEPA) compliance
- could impede public land access
- takes away opportunities to view wildlife

6. Elk Test and Removal

This option has been shown to reduce brucellosis antibody prevalence among elk captured from feedgrounds (see WGFD Test and Slaughter pilot project report- Scurlock et al. 2010; <http://gf.state.wy.us/wildlife/Brucellosis/index.asp>). The number of aborted fetuses and associated fetal fluids contaminated with *B. abortus* would likely be decreased among elk attending feedgrounds in the JEH if this option were implemented, likely reducing risk of both intra- and interspecific brucellosis transmission. The WGFC has the authority to make this decision.

Pros:

- would reduce brucellosis antibody prevalence in elk
- may reduce elk numbers to more efficiently pursue options 1,2,6,7, and 8.
- may increase tolerance of elk on private lands if brucellosis prevalence is decreased
- may increase other State's acceptance of cattle from within the GYA

### Cons:

- very expensive and requires substantial fiscal and personnel resources
- requires large traps on feedgrounds capable of working many animals with large holding pens
- must be implemented for several years to have appreciably decrease in brucellosis antibody prevalence
- general public may not support such an operation due to decreased elk numbers/hunting opportunity
- does not address other potential diseases on feedgrounds
- Data suggest only 54% of antibody-positive elk are actually infected
- *Brucella* antibody prevalence will likely rebound post implementation
- would require federal agency cooperation and potential NEPA evaluation for federal lands

### 7. Habitat Enhancement

Implementation of options 2, 3, 4, and 8 would facilitate this option. Habitat enhancement projects might reduce the time elk spend on feedgrounds. If habitat improvements are completed near feedgrounds or between summer range and feedgrounds, the enhanced forage produced will decrease the dependence of elk on artificial feed, snow conditions permitting. Reduced feeding durations and lower elk concentrations on feedgrounds, especially during the high transmission risk period, may decrease the probability of intraspecific brucellosis transmission events. Habitat enhancement projects also create vegetative diversity and improve range conditions for other floral and faunal species (including livestock).

Increased forage quantity/quality in autumn may entice elk onto the feedgrounds and away from damage situations, without an earlier initiation of feeding. Increased forage quantity/quality in spring may entice elk off of feedgrounds, reducing risk of intraspecific brucellosis transmission.

The interagency group Jackson Interagency Habitat Initiative (JIHI) has spearheaded much of the progress on enhancement of elk winter range and transitional range in the last decade in the JEH. JIHI was formed in the fall of 2001 by several wildlife biologists from the BTNF, NER, WGFD, and GTNP. The JIHI group reports its progress and takes recommendations at the annual Advisory Group meeting of the Jackson Cooperative Elk Studies Group. WGFD involvement with those groups, and habitat enhancement projects, is ongoing. The implemented Lower Gros Ventre habitat enhancement included 17,000 acres of burn units between Ditch Creek and Slate Creek. Implementation covered several years, and appears to have been successful in enhancing forage and setting back succession. Planning is currently ongoing for Upper Gros Ventre habitat enhancements.

### Pros:

- could reduce feeding duration and brucellosis prevalence
- would benefit many species of wildlife and, in some instances, cattle
- funding is available through government and non-government agencies

Cons:

- may have limited effectiveness in reducing dependency on supplemental feed in years of average or greater snow accumulations that make forage unavailable.
- elk may not be tolerated on treatment areas when in close proximity to livestock
- requires changes in post-treatment wildlife and livestock management within the treatment area to ensure treatment effectiveness
- might increase likelihood of invasive species establishment
- would require approval of federal agencies for federal land, private landowners for private land, and the State Land Board for state land projects

8. Acquisition/Conservation Easements

Options 1 through 5 would facilitate implementation and effectiveness of this option. Risk of intraspecific brucellosis transmission on all feedgrounds in the JEH might be decreased by managing lands adjacent to, or connected with, areas used by wintering elk. With adequate intact, healthy, and accessible elk winter habitat available, elk feeding may be reduced in the JEH. This option also could be used to facilitate purchase of a forage reserve, securing habitat for wildlife species in addition to elk. The buying or long-term leasing of land to be managed commensurate with wildlife benefits is an option that can be used to maintain stability and health of all floral and faunal populations. Decision authority is with the private landowner. Land transactions involving the WGFD (e.g., conservation easements) would have to proceed ultimately through the WGFC.

Pros:

- secures habitat for all wildlife
- long-term solution
- helps secure future revenues for the WGFD
- may facilitate options 2 and 7
- could reduce brucellosis prevalence in elk
- agreeable among landowners and agencies

Cons:

- expensive
- limited availability of lands with high potential for wintering elk or connecting to existing or potential elk winter ranges
- requires landowner willingness

9. Continuation of Strain 19 Elk Vaccination Program

The WGFD initiated this program in 1985 on Greys River feedground and has vaccinated about 80,000 elk to date on 21 state operated feedgrounds and the NER. Elk cows and calves were vaccinated the first two years on each feedground, then calves only thereafter assuming adequate coverage is maintained. Dell Creek feedground within the Hoback EHU serves as a control population (i.e., no vaccination) to assess effectiveness of the vaccination program in reducing brucellosis seroprevalence in elk. Brucellosis seroprevalence data from Dell Creek and Greys River feedground elk indicate no significant difference, no downward trend, and that seroprevalence may fluctuate cyclically over time throughout both populations (WGFD 2010b, Figure 3).

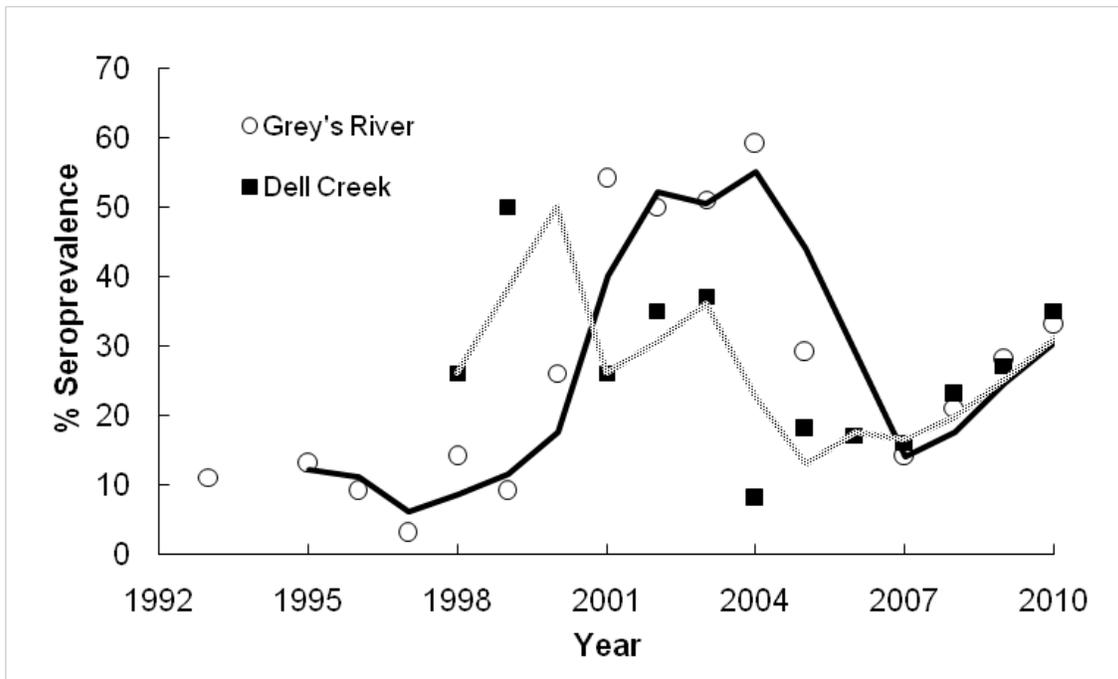


Figure 3. Seroprevalence levels in elk from Greys River and Dell Creek feedgrounds, 1993-2010. Trendlines depict moving averages within individual feedground.

In captive studies, Strain 19 prevents abortion in 29% (Roffe et al. 2004) to 62% (Herriges Jr. et al. 1989) of elk challenged with *Brucella* strain 2308. Protection from *Brucella* induced abortions afforded by strain 19 vaccination may not be sufficient to effectively reduce seroprevalence in elk on feedgrounds. This may be due to the potential for numerous elk to come into contact with a single infected fetus aborted on a feedground (Maichak et al. 2009), and the potential that the infectious dose may overwhelm antibody protection (Cook 1999). The decision authority lies with the WGFC.

This option is currently employed on the NER and the Gros Ventre feedgrounds. Disease transmission risk will likely not decrease significantly if this option is continued, based on previous controlled studies and the program's evaluation to date between Grey's River and Dell Creek feedgrounds.

Pros:

- may be reducing total number of *Brucella* induced and infected elk fetuses aborted on feedgrounds
- perceived by many as an effective disease management tool

Cons:

- cost and logistics
- not shown to reduce seroprevalence in elk on feedgrounds
- elk must be concentrated on feedgrounds to ensure delivery is feasible

## **D. Coordination Meetings**

### 1. Producer Meeting

A meeting was held 15 December 2010 in Jackson to discuss the nine options among livestock producers and associated land and resource management agencies within the Jackson and Fall Creek EHUs. A presentation was given by WGFD that summarized brucellosis management and research strategies and their relation to the nine options. Seven producers, nine WGFD personnel, and USFS personnel attended the presentation. Several questions and comments were proposed by attending producers regarding habitat treatments, Strain 19 vaccination, Test & Removal, and brucellosis in elk and cattle outside of the feedground area. There was a comment of support from producers for landowner elk licenses in dealing with elk on private lands; discussion followed on the variety of methods WGFD has taken to increase harvest in Hunt Areas 84 and 85. No substantial changes or actions were made to the BMAP or management of the Jackson EHU feedgrounds following this meeting.

### 2. Interagency Meetings

A meeting was held 18 January 2011 between WGFD and USFS personnel to discuss the nine options. The same topics were covered among WGFD and personnel from GTNP and the NER on 20 January 2011. As with the producer meeting, WGFD began with a presentation covering brucellosis management strategies and research projects. Several questions arose regarding the future of Test & Removal, efficacy of *Brucella* Strain 19 vaccination and associated costs, and findings from ongoing brucellosis/feedground research projects. Cooperating agencies gave their general support for WGFD in research endeavors, habitat enhancement projects, and elk management strategies.

### 3. Public Meeting

A meeting was held 23 March 2011 between WGFD and concerned members of the public to discuss the nine options as they pertained to the Jackson, Fall Creek, and Afton Elk Herd Units. Seven public individuals, and four WGFD personnel attended the presentation which summarized WGFD brucellosis management and research strategies and their relation to the nine options. Several topics were discussed following the presentation including *B. abortus* in wolves, environmental persistence of *B. abortus*, impacts of wolves on feedground elk populations and management, strain 19 vaccination efficacy, and financial impacts of brucellosis. No major changes were proposed at that time for any Herd Unit, and members of the public found the presentation informative and useful.

Additional written comments were accepted from the public through 12 April 2011. Comments were received from one member of the public, and from representatives of the Greater Yellowstone Coalition (GYC) and Jackson Hole Conservation Alliance (JHCA). Principal comments pertinent to the JEH are collated below:

- Encouraged the WGFD to pursue erection of elk-proof fencing around winter livestock feeding areas in order to maintain separation between elk and livestock.
- Urged the WGFD to re-evaluate phasing out some feedgrounds.

- Stressed the importance of diseases other than brucellosis in feedground management (e.g., CWD).
- Questioned effectiveness of *Brucella* strain 19 vaccination for reducing seroprevalence of elk.
- Commended the WGFD for brucellosis research being conducted, and for the Target Feedground Project.

## **E. Proposed Management Actions**

### **1. Feedground Relocation**

The WGFD will not pursue relocation of any of its feedgrounds in the JEH in the immediate future.

### **2. Feedground Elimination**

The WGFD assembled a document evaluating the proposal for a phase-out of elk feeding in the Gros Ventre drainage in April of 2006 (WGFD 2006). The WGFD concluded that the only way a trial phase-out of feeding could be attempted is if the current population of elk wintering in the Gros Ventre were reduced by 1,000-1,500 animals, mitigation measures to prevent livestock and elk commingling were implemented by landowners in areas of highest potential for damage and commingling, and the NER agreed to accommodate any additional elk that would move from the Gros Ventre winter range to the NER.

Some conditions have changed in the Gros Ventre since 2006. Most notably, the elk population in the Gros Ventre decreased from 3,796 during February, 2006 to 2,775 in February, 2011. However, low tolerance for elk-cattle commingling and the potential for elk damage to stored crops on private lands in the Gros Ventre remain the dominant drivers in the decision to continue supplemental feeding. If private landowners and the cattle operator in the Gros Ventre were to modify their operations which reduced the potential for elk damage and elk-cattle commingling, the Department may reevaluate the proposal.

### **3. Elk Reduction**

The WGFD manages for current, WGFC-established, elk herd unit population objectives. The current population objective for the JEH is 11,000. Reductions beyond the current population objectives would require a public input process to discuss the issue and determine the level of support. Authority over this option ultimately lies with the WGFC. The WGFD will continue to design and implement harvest strategies to ensure elk populations are maintained at established herd unit objectives.

### **4. Cattle Producer Change of Operation**

The WGFD will work with cattle producers and other agencies (e.g., NRCS, Teton Conservation District, USFS, WLSB) in the JEH to implement any changes to their operations that decrease the risk of interspecific disease transmission.

## 5. Fencing

The WGFD will encourage cattle producers in the JEH to fence areas where hay is stored (stackyards) for winter-feeding operations and continue delivery of materials for stackyard construction. As opportunities arise for additional fencing projects (e.g., winter cattle feeding enclosures), WGFD will assess those opportunities on a case-by-case basis.

## 6. Elk Test and Removal

The WGFD implemented the pilot Test & Removal project in the Pinedale EHU from 2006 through 2010. The WGFD does not plan to implement this Option in the JEH in the foreseeable future.

## 7. Habitat Enhancement

The WGFD will continue to coordinate with private landowners, federal land managers, and livestock permittees to develop and implement habitat improvements that may reduce elk dependency on supplemental feed in the JEH (WGFD 2010b). WGFD will emphasize coordination among NER, BTNF, GTNP, and WGFD through JIHI. These projects will focus on areas designated as winter and transitional ranges, while working within the constraints of sensitive-species management and funding.

## 8. Acquisition/Conservation Easements

The WGFD will attempt to identify and pursue opportunities to implement this option. As projects are identified, proposals will be drafted and submitted, either through the Department's process of obtaining less than fee-title lands, or to various funding agencies to facilitate implementation of this option.

## 9. Vaccination of Elk Calves

The WGFD will continue the ballistic strain 19 elk vaccination program until adequate data are collected to determine efficacy of the program in reducing brucellosis seroprevalence in elk on feedgrounds. WGFD will continue to work with the NER, through their feeding operations, to deliver strain 19 vaccine to elk wintering there.

## **F. Best Management Practices**

In addition to the above options and commensurate with their short and long term goals, the following best management practices should be considered for elk feedgrounds. Some may be currently employed, and should be maintained. Others may or may not be viable options for individual feedgrounds and livestock producers.

### Feedground Management

1. Feed on clean snow whenever possible
2. Report abortions to WGFD
3. Minimize feeding season to the extent possible
4. Low Density feeding methods
5. No harassment/harvest of scavengers on feedgrounds

## **G. Additional Actions**

### **Brucellosis Surveillance**

WGFD currently captures (trap or dart) and tests elk for exposure to brucellosis on 7 to 15 feedgrounds annually. This practice should continue on as many feedgrounds as possible annually to assess efficacy of the Strain 19 vaccination program and monitor prevalence of the disease. To assess efficacy of Target Feedground Project activities such as Low Density feeding and early end date (WGFD 2008), sufficient number of elk should be captured and tested for brucellosis prior to or during inception of those activities for comparison to elk tested eight to 10 years (Cross et al. 2007) following inception of those activities. Additionally, hunter-harvested elk brucellosis surveillance will occur annually in an effort to survey the entire state over a 4-year period.

### **Information and Education**

BFH and other WGFD personnel regularly inform and educate various public factions about wildlife diseases, including brucellosis. Educational outreach has included group presentations, news releases, interpretive signs at feedgrounds and crucial winter ranges, and various brochures and publications. The importance of quality wildlife habitat and substantial role that disturbance (e.g., fire) plays in natural ecosystems are also stressed during public forums. BFH and other WGFD field staff make numerous private landowner contacts regarding habitat improvement projects, wildlife-friendly management techniques, or ways to prevent commingling of elk and livestock. Additional efforts are focused on area school groups and events such as the WGFD's annual Hunting and Fishing EXPO to inform children and their parents on brucellosis. These efforts should be continued to inform the public of the WGFD's role in brucellosis research and management and relay consequences of the disease to the State's economy. Additionally, should any of the aforementioned Options be officially adopted, I&E efforts should focus on why the Option(s) was (were) pursued and what benefits may be realized. The public should be made aware of any proactive management embarked upon by the WGFD, and their interests in the actions should be heard.

### **Research**

Sound management of brucellosis in elk on feedgrounds and the risk of transmission from elk to cattle necessitate accurate and reliable data to facilitate decisions. Most research concerning brucellosis, feedground elk, and feedground management has focused on elk vaccination and its impacts to seroprevalence of the disease at the population level. More recently, the Brucellosis-Feedground-Habitat (BFH) Program of WGFD in cooperation with Iowa State University, Montana State University, and the University of Wyoming has conducted and published several epidemiological studies regarding transmission at the elk-to-fetus level on and off feedgrounds. Summaries of unique research projects and their findings are listed below.

#### **1. Effects of management and climate on brucellosis seroprevalence of feedground elk**

Cross et al (2007) compiled 16 years of seroprevalence data from feedground elk and 54 years of feeding and climate data from feedgrounds and local weather stations

throughout the Greater Yellowstone Ecosystem. They found that brucellosis seroprevalence was positively correlated to length of feeding season and end date of feeding, with feeding seasons lasting longer during years of increased snow. However, host (feedground) population size or density (animals per unit area of feedground) had little to no influence on seroprevalence. Therefore, they suggested management strategies to reduce length of feeding season (e.g., early end date) to reduce potential elk-to-fetus contacts (transmission events), and ultimately, seroprevalence of the disease on feedgrounds.

## **2. Effects of management, behavior, and scavenging on risk of brucellosis transmission**

Maichak et al (2009) collected 48 culture-negative fetuses, fluids, and placentas (fetal units) from elk associated with the Test & Removal project and placed these on and adjacent to feedlines, as well as off feedgrounds and on native winter range (NWR) locations from 2005 through 2007. They found that elk density and elk-to-fetal unit contacts declined dramatically off feedlines (no contacts off feedgrounds), females were slightly predisposed to fetal unit investigations (greater time of investigation than males and juveniles), and that most elk did not investigate fetal units when  $\geq 2\text{m}$  from their line of travel, particularly off feedlines. Additionally, they found that scavengers remove fetal units faster from feedground than NWR locations and reduce numbers of elk contacting fetal units. Therefore, they suggested that reduction of elk densities on feedgrounds, time spent on feedlines (e.g., altered feeding patterns), and protection of scavengers on and adjacent to feedgrounds could reduce intraspecific transmission of brucellosis.

## **3. Target Feedground Project and effects of low-density feeding**

Based on the findings from the projects mentioned above, WGFD developed and implemented management actions pertaining to the Target Feedground Project (TFP) in 2008 (WGFD 2008). The two (2) primary objectives of the TFP are to increase dispersion of hay throughout the feedground (termed Low-Density feeding) and actively end feeding three (3) weeks prior to the current 10-year average. Creech et al. (In Review) compared Low-Density (LD) to traditional feedlines via data-logging radio collars and digital video cameras and found that LD feeding reduces elk-to-fetus contacts by 66%-75% and, based on an appropriate SIR disease model, may substantially reduce seroprevalence in elk if implemented over a decade or more. Active early termination of feeding is possible on some feedgrounds in light snow years, but the impacts of LD feeding and early termination of feeding on actual seroprevalence at the population level will require implementation of eight to 10 years (Cross et al. 2007).

## **4. Parturition/abortion ecology of feedground elk**

From 2006 through 2010, the BFH program of WGFD in conjunction with Iowa St University, University of WY, Montana St University, and USGS deployed and recovered 301 vaginal implant transmitters (VITs) in 19 feedground and 3 NWR elk populations as part of a multi-faceted project to identify and characterize elk parturition (269/301) and abortion (17/301) sites, potential overlap with current elk parturition ranges, and potential overlap with public grazing allotments. Barbknecht et al. (2009)

found that VITs were an effective tool for locating elk parturition sites. Furthermore, Barbknecht et al. (In Press) found that most elk tend to select parturition sites with substantial horizontal and overhead cover, often on gentle southern aspects in aspen or aspen/conifer stands, but that parturition sites range from low elevation willow/riparian to high-elevation alpine habitats. To date about 90% of parturition sites have occurred out of currently delineated parturition ranges, and several parturition events have occurred on active grazing allotments. WGFD in conjunction with USGS is currently compiling and drafting various GIS models based on VITs to help refine elk parturition ranges. Of the abortions, 20% (13/65) were from seropositive females, 2% (4/227) were from seronegative females, and these occurred from 17 Feb to 6 July. About half of the abortions occurred on feedgrounds. Based on current funding, the BFH program will continue to deploy VITs through 2014 to further refine parturition ranges of specific feedground populations and increase sample size of abortions.

Furthermore, many aspects of feedground elk ecology, brucellosis transmission and pathology, and feedground management have not been investigated. Potential research topics that could assist in management decisions include:

1. Influence of Target Feedground Project actions (active early end feeding date, Low- Density feeding, lower palatability feed) on seroprevalence in elk.
2. Relationship of seropositive vs. culture positive, and strain of *Brucella*, in feedground elk.
3. Feedground elk parturition habitat site characteristics and proximity to cattle.
4. Effects of habitat improvement projects near feedgrounds on minimizing feedground dependence of elk (i.e. distribution, dispersal, length of feeding season, brucellosis seroprevalence).
5. Disease presence (other than brucellosis) and parasite loads in elk on feedgrounds.
6. Relationship of local scavenger densities vs. scavenging rates on feedgrounds.
7. Abortion and viable birth rates, and temporal and spatial distribution of abortions and births, in seropositive feedground elk.
8. Influence of snow-water equivalent (SWE) and habitat enhancement on elk use and distribution.
9. Genetic comparison of seropositive elk that do or do not abort.
10. Potential aerosol transmission of brucellosis and impacts to sero- and culture prevalence in elk and livestock.
11. Potential for salt/mineral licks as sites of inter- and intraspecific brucellosis transmission

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