An Overview and the Economic Impacts Associated with Mandatory Brucellosis Testing in Wyoming Cattle

Economic Analysis Division
Buck McVeigh, Administrator

Prepared by Amy Bittner, Economist

June 10, 2004

Department of Administration and Information
Economic Analysis Division
1807 Capitol Ave., Suite 206
Cheyenne, WY 82002
Phone: (307) 777-7504
Fax: (307) 632-1819
E-mail: ead@state.wy.us
Website: http://eadiv.state.wy.us

Wyoming Agriculture

Historically, agriculture has been important to Wyoming's cultural identity and the quality of life of its citizens. The economic significance of Wyoming's agricultural sector has waned over the past century. Wyoming agriculture is such a small segment of the economy that it cannot compare to the importance of the mineral industry to the State. There are currently 9,200 agricultural producers operating in Wyoming. Overall Wyoming agricultural production in 2001 amounted to $1.057 billion and of that sum; gross value added to the economy was $471.2 million. Livestock production comprises the largest segment of Wyoming agriculture and accounted for $778.8 million of total agricultural production in 2001. However, overall net farm income was only $199.8 million. In 2002, Wyoming ranked twenty-sixth in overall American cattle production and there are 6,200 cattle operations in the State. Seventy-seven percent of Wyoming agricultural cash receipts were due to cattle production ($757.2 million). In 2004 the January 1st inventory of cattle and calves was 1.4 million, an increase of 110,000 head from the year before (Table 1). The historical peak of Wyoming's cattle supply was 1.69 million head in 1975. The largest cattle producing county in 2003 was Goshen County with 137,000 head, followed by Fremont County (96,000) and Platte County (95,000), see Figure 1 on page 2.

Table 1: Wyoming Cattle Inventory

	January 1, 2004	January 1, 2003	% Change from 2003-2004
All cattle and calves	1.4 million	1.29 million	8.5
All cows and heifers that have calved	760,000	710,000	7.0
Heifers (500 lb +)	310,000	270,000	14.8

Source: Wyoming Agricultural Statistics Service

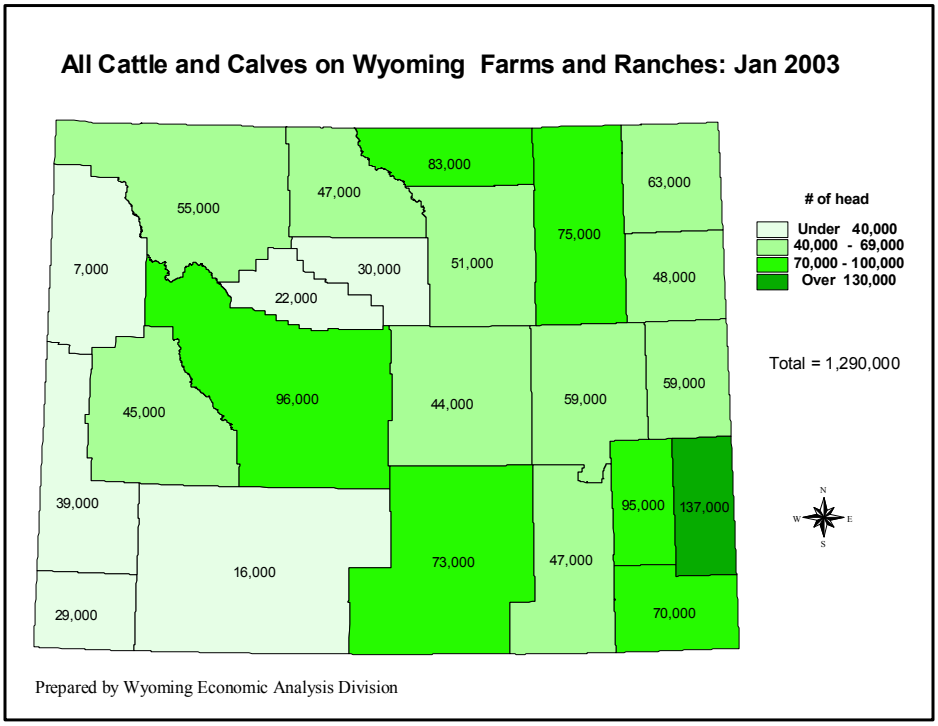
The agricultural sector has always been volatile and unpredictable. Market prices for agriculturally produced goods fluctuate from year to year. In the last year Wyoming producers have enjoyed relatively high cattle prices (Table 2). According to Table 3 on page 2, these prices were also higher than overall U.S. prices. High prices are a welcome relief from the hardship of recent years. In the past, Wyoming producers have had to contend with severe drought conditions in the region with many cutting back on calving numbers due to lack of forage or high prices for feed. The occurrence of high prices received may be attributed to the recent American diet trend of consuming more meat products. The December 2003 case of Mad Cow Disease detected in Washington State appears to have had little impact on U.S. beef consumption because cattle prices still remain above average.

Table 2: History of Wyoming Cattle Prices ($/100#)

Year*	Cows	Steer/Heifers	Calves
1998	34.80	71.80	84.90
1999	38.30	77.70	95.40
2000	39.70	87.50	107.00
2001	41.50	88.80	106.00
2002	38.00	79.50	92.60
Jan-03	39.00	83.30	101.00
Dec-03	49.80	104.00	124.00
Jan-04	47.10	92.50	118.00

*1998-2002 Mkt. Yr. Avg.
Source: Wyoming Agricultural Statistics Service

Figure 1: Cattle Inventory by County



As of February 13, 2004, the Federal government withdrew Wyoming's brucellosis-free status after finding animals in two herds, one in Sublette County and the other in Washakie County, infected with brucellosis. This means Wyoming is no longer classified as a brucellosis-free state. Brucellosis is a disease that has been a problem for U.S. cattle producers since the 1840's. Historically, it is believed that brucellosis once affected 10% of the U.S. cattle population and 30% of cattle herds. Overall, brucellosis costs U.S. dairy and beef producers $30 million annually. The important question to ask now is what does this change in brucellosis classification mean in terms of the future of Wyoming's cattle industry?

Table 3: WY Cattle Prices vs. U.S. ($/100#)

	Jan. 2003		Dec. 2003		Jan. 2004	
	WY	U.S.	WY	U.S.	WY	U.S.
Cows	39.00	36.90	49.80	49.40	47.10	46.10
Steers/Heifers	83.30	77.80	104.00	95.70	92.50	85.40
Calves	101.00	96.80	124.00	112.00	118.00	110.00

Source: Wyoming Agricultural Statistics Service

Brief Overview of Brucellosis

There are various types and strains of brucellosis that can affect not only cattle, but also other animals such as horses, swine, goats, elk, and bison. Brucellosis in cattle is caused by a specific bacterium, *Brucella abortus.* This bacterial infection occurs primarily in the reproductive track and lymph nodes of the animal. It is predominantly females that suffer the major effects of brucellosis and are the principal carriers of the disease. In cattle, bulls can be infected with brucellosis, but they do not spread the disease as readily as cows and heifers. The only way to identify brucellosis infection in cattle is through testing. Infected animals cannot

be detected by their appearance. The most obvious sign of infection is abortion and the birth of weak calves. An unvaccinated cow or heifer will have a 60-70% abortion rate due to the effects of brucellosis. The bacteria does not serve as a source of infection in the environment for more than a few weeks before it becomes sensitive to sunlight, heat, and drying, but it can survive in freezing conditions for over 100 days. The incubation period for the disease in cattle typically varies from two weeks to one year. There is no treatment for brucellosis and animals that are infected with the bacteria are considered life long carriers.

Over the past century, Federal and State governments, along with the livestock industry, have endured billions of dollars in direct losses and cost efforts to control and eliminate brucellosis. In 1951, U.S. dairy producers' production losses from brucellosis totaled $499 million (reported in 1993 dollars). The first efforts to fight the bacteria began in 1934 with the Cooperative State-Federal Brucellosis Eradication Program, also known as the National Brucellosis Eradication Program. Since the program began, $3.5 billion has been spent on eradication measures. The eradication program consists of various methods for controlling the disease, all used in conjunction: surveillance testing at farms, stock markets, and slaughter facilities, quarantine, herd depopulation, herd management, and vaccination efforts. For fiscal year (FY) 1994, the Federal government and the State spent $694,000 in Wyoming as part of the national eradication program. In 1957, there were approximately 124,000 cattle herds placed under quarantine in the U.S., but in 1995 that number fell to less than 100. In FY 2000 there were a total of twenty-four herds affected with brucellosis in the U.S. A year later (FY 2001) there were only six herds detected, which is a 75% decrease in herd infection. Around the U.S., cattle continue to be surveillance tested; 11.1 million were tested in FY 2001, a 2.8% increase from the year before.

Surveillance testing continues to be a big part of national brucellosis management because it sends a message to America's international trading partners that the country is free of the disease. Investigations have shown that if brucellosis eradication efforts were eliminated, the cost of producing beef and milk would increase by approximately $80 million annually in less than ten years. The Federal government also pays indemnity to owners with infected animals, which is a vital tool in encouraging owners to destroy infected and exposed animals in order to eliminate sources of infection. In FY 2001, three infected herds were depopulated in the U.S. at an indemnity expense of $211,153. A year earlier, FY 2000, over $1 million was paid in federal indemnity. Earlier this year in Wyoming, 360-365 head from the original infected herd in Sublette County were destroyed as a precautionary measure and the owner was compensated at "fair market value."

At the forefront of the brucellosis fight is the vaccination of both calves and adults. The vaccination of cattle to prevent brucellosis infection has been around since the 1940's. There are two vaccines available to combat brucellosis, Strain 19 and RB-51. More herds are becoming predominantly RB-51 vaccinated because cattle vaccinated with Strain 19 have a higher occurrence of testing false positive for brucellosis. However, neither vaccine is 100% effective. Vaccination alone is only 65-70% effective in protecting animals from the disease. In FY 2001, approximately 4.7 million calves were vaccinated in the U.S, an increase of 300,000 from the previous year.

There are five major areas of concern when it comes to determining the overall impact of brucellosis in cattle. First, livestock health affects human health because brucellosis can be transmitted to humans. Every year in U.S., 100-200 human cases of brucellosis infection are reported. Individuals most at risk include farmers and ranchers, veterinarians, artificial inseminators, meat inspectors, slaughterhouse workers, laboratory technicians, and sportsmen

and hunters. Brucellosis causes undulant fever and sufferers may develop influenza type symptoms such as fatigue, headaches, high fever, chills, drenching sweats, joint pain, and loss of weight and appetite. Human infection can last for months or even years. *Brucella abortus* is classified as a high category pathogen and is listed as a potential bioterrorism agent. Another major concern is the contagiousness of the disease. The bacteria are transmitted through milk, the aborted fetus, placenta, and reproductive track discharges of the infected animal. The odds of a herd contracting the disease from an infected herd located less than a half mile away is four times greater than that of other herds. Currently, 50% of bison in Yellowstone National Park (YNP) have tested positive for brucellosis. The bacteria are also found in high concentrations on Wyoming's elk feeding grounds.

Consumer and food safety is also an issue. What happens if an infected animal finds its way into the human food chain? The actual consumption of brucellosis-infected bovine is not an important food safety issue because transmission to humans usually occurs through direct contact with placental, fetal fluids, and tissues of infected animal. However, slaughterhouse workers are at risk for contracting the disease through infected carcasses. In addition, individuals that consume unpasteurized milk may also be susceptible to infection.

Brucellosis infection in cattle creates an increase in production costs through mandatory testing; reduced milk production; induced abortions; decreased fertility; arthritis and bursitis; and may produce non-viable or slow growing calves. There is also an increase in the cost of replacement animals because depopulation is the preferred method of managing infected herds. Cattle owners with infected animals are paid federal indemnity for all animals that are slaughtered; however, the genetic progress, quality of the herd, and the reputation of the owner may suffer. In 2003, the average value per head for Wyoming cattle was $760.

Cattle vs. Wildlife

In the past two decades one of the biggest impediments to eradicating brucellosis is the infection of bison and elk in the Greater Yellowstone Area (GYA). The GYA is the only known area in the U.S. that has wildlife infected with brucellosis. It is widely alleged that bison and elk are able to transmit brucellosis to domestic livestock. Transmission risk to cattle is greater with bison than elk due to bison behavior; they are social animals and are more likely to mingle with cattle. However, there is ample disagreement pertaining to the risk of transmission between wildlife and cattle because research is limited. All studies regarding wildlife to livestock brucellosis exposure have been conducted with captive bison and cattle under experimental and pasture conditions. There is inadequate information available pertaining to controlled field studies involving brucellosis transmission to domestic livestock in the GYA. Brucellosis infected bison in YNP have been a major concern since it was first reported in 1917. North America was most likely exposed to brucellosis through imported cattle. Ironically, through this introduction, it was eventually transmitted to the bison population. Prior to 1967, the risk of brucellosis transmission from bison to cattle was very small because bison numbers in GYA were controlled by periodic reductions. In 1967 there were only 400 bison in YNP, but then the number increased to about 3,900 recorded in 1995. Bison herds move from YNP to Montana and Wyoming in greater numbers than in the past, and this presents a major hurdle in controlling and eradicating brucellosis. These displaced animals tend to wander onto private lands, increasing the transmission risk to domestic livestock. Efforts are in place to capture and test bison that leave YNP boundaries for brucellosis, and animals that test negative for brucellosis are then hazed back into the park. This winter alone, 460 bison have been captured outside of YNP and 260 were sent to slaughter.

The latest brucellosis outbreak in Sublette County has been attributed to the herd's proximity to an elk feeding ground. Currently, the State of Wyoming operates twenty-two elk feeding grounds that support approximately 15,000 elk at a cost of $1.3 million annually. Since more elk congregate on feeding grounds, the disease is more concentrated, thus increasing the risk of transmission. Brucellosis infection has been detected in aborted fetuses on 18 of the 22 feeding grounds. The feeding grounds were established in response to the development and alterations to elk habitat and migration corridors around Wyoming. These feeding grounds in addition to the National Elk Refuge help maintain large populations of elk, prevent starvation, and avert wildlife damage to private property. There has been a great deal of controversy as to whether elk feeding grounds should be maintained because they provide an unnatural, but ideal haven for brucellosis infection. Under natural conditions, elk tend to isolate during calving and are fastidious with the removal of afterbirth so the transmission risk to cattle is minimal. Elk on feeding grounds are inclined to have a much higher brucellosis exposure rate than those animals not associated with feeding grounds. Results have revealed that 30% of female elk tested have been exposed to brucellosis even though these animals may not display outward clinical signs of the disease. Elimination of elk feeding grounds may not be an option because elk numbers in western Wyoming may decrease by 70-80% and create a loss of $22 million to the State's economy according to the Wyoming Game and Fish Department. The State of Wyoming is trying to curb the prevalence of brucellosis in wildlife through various management techniques, which include experimental vaccination for both bison and elk.

New Testing Requirements

For almost twenty years, since 1985, Wyoming had enjoyed the classification of being brucellosis-free. Now Wyoming is classified as a Class A state, which means the State cannot exceed a brucellosis herd infection rate of 0.25%. If Wyoming should exceed this rate, then a Class B or Class C status will be instated. The Class C status is designated for those areas with the highest rate of brucellosis infection. Any state that does not meet the minimum standards for a Class C type is then placed under Federal quarantine. Today all states except Wyoming and Texas are deemed brucellosis-free. In addition, both states fall under the Class A classification. A brucellosis-free classification means that there have been no brucellosis cases in the state twelve months prior to the Class Free designation. When an area loses its brucellosis-free status, it tends to be costly to the state's cattle industry because more thorough vaccinations and extensive testing must be done. If there are no other reported cases of brucellosis between now and February 2005, the Federal government will review Wyoming's case and the State may regain its brucellosis-free certification.

When Wyoming lost its brucellosis-free status earlier this year new emergency Federal requirements for mandatory brucellosis testing were put into place to prevent interstate transmission of brucellosis. Prior to these new testing rules, all brucellosis testing was done on a voluntary basis. Most of this voluntary surveillance was performed at livestock auction barns, such as the Torrington Livestock Market. In addition, Wyoming has executed whole-herd surveillance testing in risk areas near elk feeding grounds for the past three years. A total of 16,000 head were tested and all reported negative for brucellosis. The new requirements assert that all eligible Wyoming cattle must test negative for brucellosis within thirty days prior to ownership change or interstate movement. The eligibility requirement mainly affects Wyoming's breeding stock, which include all sexually intact vaccinated and non-vaccinated females 18 months and older; bulls 18 months and older, and all pregnant or post parturient cows and heifers, regardless of age. There are some exceptions to the mandatory brucellosis testing requirements: (1) Cattle being moved or sold for immediate slaughter or to quarantined feed lots or approved auction markets from ranch or farm of origin as long as origin identification is

maintained; (2) Cattle from herds already certified as brucellosis-free and (3) Steers and spayed heifers do not have to be tested. Brucellosis-free herd certification may occur when at least two negative whole herd blood tests have been performed approximately one year apart. In addition, annual testing is required for re-certification. Cattle simply moving through the State of Wyoming do not have to be tested as long as ownership has not changed. These new Class A testing stipulations also apply to domestic herds of bison that are sold or moved interstate.

Approximately 70% of Wyoming's cattle inventory is considered breeding stock and 10% of all cattle and calves move interstate. Currently there is not a rule in place pertaining to how long out of state cattle may reside in Wyoming before they need to be tested for brucellosis. The Wyoming Livestock Board (WLSB) will deal with out of state cattle grazing in Wyoming on a case-by-case basis. Additionally, cattle moving from Wyoming for seasonal grazing in other states may receive a test waiver from the state of destination, and this is also done on a case-by-case basis. In the past, some states have required that cattle from non-brucellosis-free states be quarantined and retested 45-120 days after initial testing because it can take an extended period of time for cattle to react to the test. States such as Nebraska, Colorado, Idaho, South Dakota, and California have already placed restrictions on Wyoming cattle imports. For example, the State of Nebraska has issued a requisition stating that any cattle and bison imported from Sublette, Lincoln, and Teton counties by Nebraskan producers must obtain a pre-entry permit through the Nebraska Department of Agriculture prior to importation. These restrictions are in addition to the mandatory brucellosis testing already in place in Wyoming due to its Class A standing.

Economic Impacts

There are serious economic consequences that brucellosis imposes on cattle producers. Currently in Wyoming there are 6,200 cattle producers and over 90% of them are considered small businesses. The most obvious economic impact of mandatory brucellosis testing in Wyoming cattle is the additional production cost of testing. Preliminary estimates suggest that the new emergency testing requirements on breeder cattle may cost producers $1-2 million annually. The WLSB and the Wyoming State Veterinary Laboratory (WSVL) calculate that 330,000 cattle will need to be tested for brucellosis this year. Currently, the WSVL performs brucellosis testing at no charge to cattle owners. The actual testing costs incurred pertain to veterinary fees and handling expenses and may range from $5.00-$15.00 per head. In the most recent budget session the Wyoming legislature appropriated $1.65 million for testing relief (House Bill 0054). This bill stipulates that accredited veterinarians will be reimbursed $3.50 per head for brucellosis testing. If the cost should exceed that amount, then the producer is responsible for paying the remaining balance. Even with a reimbursement, producers could be expected to pay a low-end cost of $1.50/head, which would total $495,000 versus a high-end total production cost of $3.795 million ($11.50/head). These testing costs do not cover the expenses of gathering, sorting, and handling the cattle that are sustained by the owner. If an animal should test positive during the initial screening, then additional tests will have to be performed for a more definitive diagnosis of brucellosis.

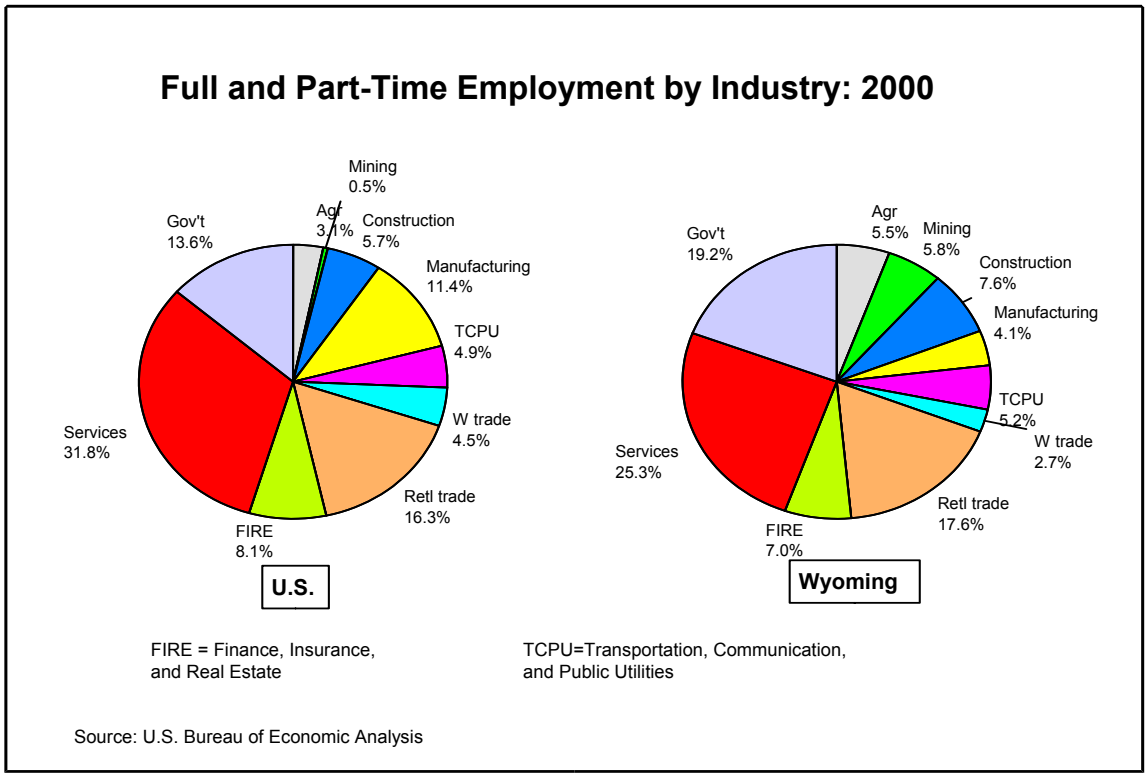
Employment Effects

Utilizing four different testing scenarios, brucellosis cost measures were modeled using Regional Economic Models, Inc. (REMI) to provide more detail into the potential employment repercussions induced by costs associated with mandatory testing. The scenarios were created using two different cost figures ($1.50/head vs. $11.50/head) and the duration of mandatory

testing (one year vs. seven years) with a total of 330,00 cattle being tested. The scenarios are listed as follows:

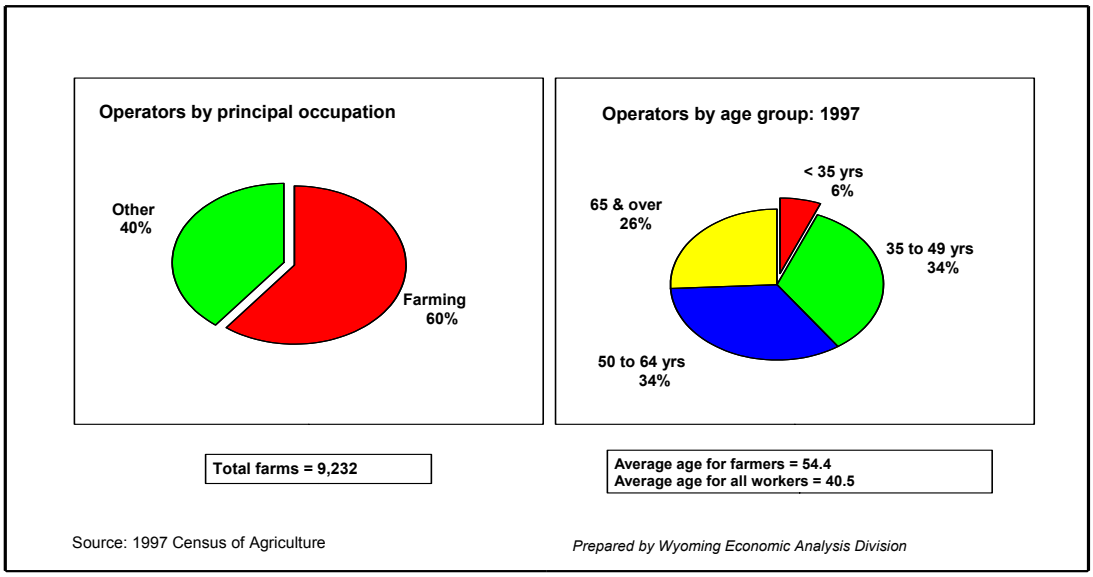
1. Best Case Scenario: 330,000 head tested at $1.50/head for one year, $495,000 lost in livestock sales for 2004.
2. Higher Cost Scenario: 330,000 head tested at $11.50/head for one year, $3.795 million lost in livestock sales for 2004.
3. Continual Annual Low Cost testing: 330,000 head tested annually at $1.50/head for seven years, a loss of $495,000 in livestock sales annually, total loss of $3.465 million.
4. Worst Case Scenario: 330,000 head tested annually at $11.50/head for seven years, a loss of $3.795 million in livestock sales annually, total loss of $26.565 million.

Figure 2: Industry Employment



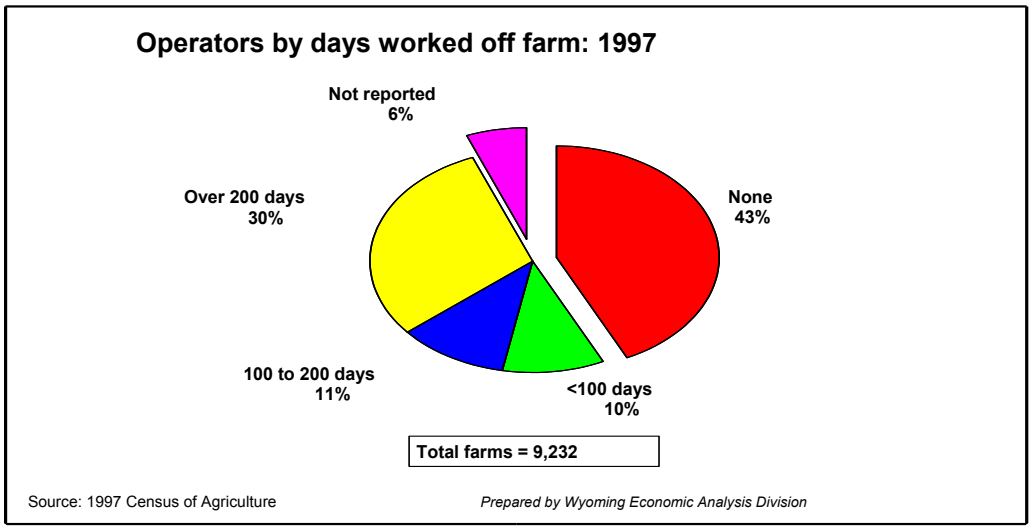
The estimated employment impacts due to mandatory testing would be approximately eleven farm jobs initially lost in 2004 at the low-end cost, while eighty-seven jobs are eliminated in the farm sector if a high cost testing scenario were to occur. Secondary affects from the mandatory testing measures may also include a reduction in private non-farm employment such as in the services and retail trade sectors. It is important to note that the farm sector is an extremely difficult segment of the economy to model due to the fact that it comprises such a small part of the overall economy. Only 5.5% of Wyoming jobs were employed in the farm and agricultural services sector in 2000, see Figure 2. Overall employment nationally in the agricultural sector is also minimal, 3.1% in 2000 (Figure 2). The reduction in employment further shows that agriculture's importance to the overall economy continues to decline.

Figure 3: Farm Operators



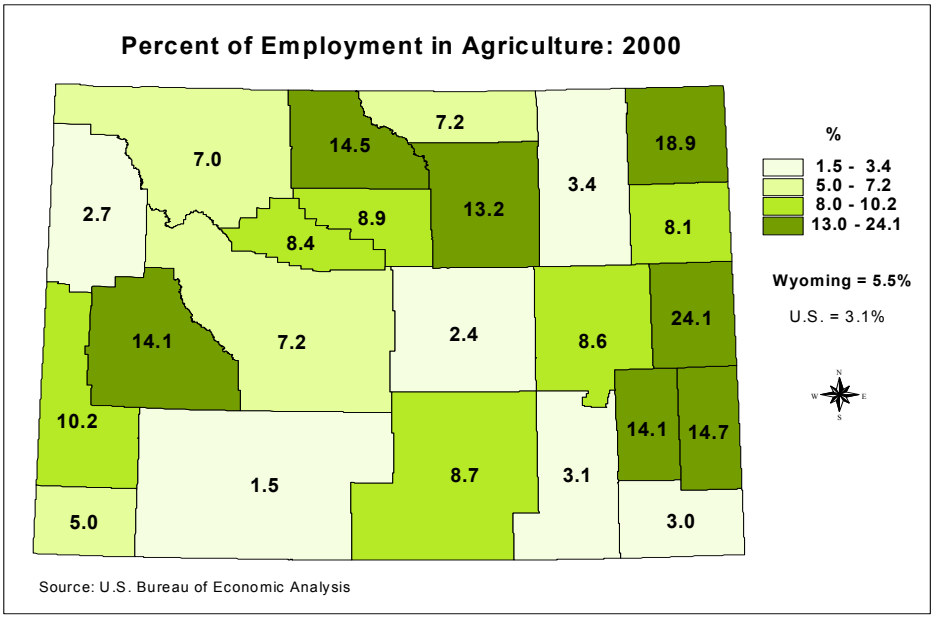
In 2001, only 12,346 were employed in the Wyoming farm sector while an even smaller number, 2,663 were employed in the forestry, fishing, hunting, and agriculture support services sector. Typically, many farm operators are employed in other occupations, which contributes to the uniqueness of the farm sector. Figure 3 provides a visual representation of the demographics of the farm sector. Farm operators tend to be older individuals; the average age of farmers according to the 1997 Census of Agriculture was 54.4 years. Approximately 40% of farmers do not consider farming their principal occupation. In addition, many of these producers spend a great deal of time working off the farm, see Figure 4. Thirty percent spend over 200 days working off the farm.

Figure 4: Days Worked off Farm



Even though the agricultural and farming sector is small in comparison to other industries, certain areas in Wyoming rely heavily upon agricultural production. In Niobrara, Goshen, Crook, and Big Horn counties there is a strong agricultural presence that helps sustain these areas. Many of these locales lack economic diversification, so agriculture plays a big role in the identity of these counties. These counties tend to have a larger percent of individuals employed in agriculture in comparison to other areas in the State, see Figure 5. Throughout Wyoming history, agriculture has been a basic source of income for many residents.

Figure 5: Agricultural Employment by County



Other Economic Impacts

According to the Federal agency, Animal and Plant Health Inspection Service (APHIS) the economic impact of the new mandatory brucellosis testing measures to the State may be minimal. When APHIS devises a work plan to deal with an issue such as a brucellosis outbreak it considers whether the rules will be "economically significant" to the parties or areas affected by the new policy. However, this assumption is based on the idea that an economically significant impact amounts to an annual cost of $100 million or more or that adversely affects certain facets of the economy "in a material way" such as productivity, competition, employment, environment and public health, government, and local communities. Wyoming's economy and population differ immensely in comparison to other states and the Federal government is not required to take into consideration the uniqueness of Wyoming's economy and demographic make-up when instituting these new testing regulations. A $1-2 million negative economic impact may not be considerable in other states, but it could be detrimental due to Wyoming's sparse population and lack of economic diversification.

Prior to the mandatory brucellosis testing requirements, the WSVL surveillance tested 50,000 samples annually using $65,000 appropriated from the Federal government. Now the WSVL is preparing to test 330,000 samples in this first year of required brucellosis testing. The estimated number of samples to be tested is 280,000 more than the previous year, but the amount of Federal assistance dedicated for testing costs is still the same, $65,000. An

important question to ponder is where will the additional money come from to cover the expense of testing and future testing if Wyoming does not regain its brucellosis-free status in February 2005? Potential sources of additional funds include the WLSB, Federal government, the State of Wyoming, and perhaps agricultural producers will have to pay more for testing. The amount of Federal money allocated for overall brucellosis management in the U.S. has been declining over time due to the success of the national eradication program.

There are other avenues to explore when it comes to determining the overall economic impact of brucellosis testing. Producers may lose sales of cattle to other states and foreign countries that do not want to take the risk of buying Wyoming cattle because it may jeopardize their brucellosis status. Even if Wyoming should regain its brucellosis-free status in February 2005, the testing expenses still may be a huge economic factor if the State chooses to intensify its surveillance testing. In a 1994 paper written by two University of Wyoming professors, Don McLeod and Larry Van Tassell, some estimates were provided pertaining to the specific economic losses related to brucellosis infection. In the first year of infection, a cost of $200 per infected cow would be incurred. Breeding problems, abortions, culling, weak calves and replacement rates could create a second year cost of $5.82 per infected animal. These examples are considered worst-case scenarios because they assume an unvaccinated and undetected herd.

Additional testing costs will most likely decrease producer profits. In 2001, the profit margin for all Wyoming agricultural producers totaled $74.3 million. Total profit was derived from total cash receipts, $982.5 million, less total farm and ranch production expenses, $908.2 million. There are approximately 9,200 agricultural operations in Wyoming. By dividing total profit, $74.3 million, by the total number of operations an $8,076 profit per producer for 2001 is obtained. Utilizing the total brucellosis testing cost figures discussed earlier, the low-end being $495,000 and high-end of $3.795 million; the profit margin for agricultural producers would be reduced to $73.8 million or $70.5 million, respectively. Annual individual producer profit would only be $8,022 or $7,663, respectively. These lower profit margins may also contribute to the issues discussed earlier in regards to farm employment. Many producers feel it necessary to have other occupations in addition to agricultural production.

On the other end of the spectrum, mandatory brucellosis testing may have a positive impact on the agricultural support services sector. An increase in the number of cattle that need to be tested could boost veterinary services. The reimbursement allocation from House Bill 0054 will make it easier for veterinarians to recover their brucellosis testing costs. Veterinarians may also increase their revenues since a greater number of animals need to be tested.

Points of Optimism

Brucellosis is a complex issue in which numerous stakeholders are involved. Currently, Governor Dave Freudenthal has created the Wyoming Brucellosis Coordination Team to aid in reaching the goal of reinstating Wyoming's brucellosis-free status in February 2005. The group is composed of veterinarians, legislators, ranchers, and agricultural officials that are attempting to find short and long-term solutions to dealing with brucellosis in the State. The four major issues the task force will examine include disease transmission, human health consequences, guidelines for future outbreaks, and brucellosis eradication from Wyoming's wildlife populations.

The recent discovery of brucellosis-infected animals in Sublette County has triggered additional research and investigation into the disease. Experts at the University of Wyoming (UW) will have a role in cutting-edge research as a part of a team of Federal and State officials

investigating the current outbreak. UW researchers were able to collect tissues from postmortem examinations performed on the infected animals to use in determining which of the three laboratory methods are most sensitive in the confirmation of brucellosis diagnosis in cattle. The research may also yield comparisons to *Brucella* strains from cattle to those found in elk near the infected area of Sublette County. This type of research has not been performed before because most brucellosis-infected cattle were typically sent to slaughter instead of collecting tissues for additional research.

The U.S. will continue its efforts to eradicate brucellosis and Wyoming will be a key player in this endeavor. When the State does finally regain its brucellosis-free status it does not mean the battle will be over. Brucellosis is a costly disease and with appropriate management measures, the economic impacts can be subdued. It is recommended that producers implement an overall brucellosis management plan where vaccination is just one component because even a small ingestion of brucellosis infected material from a recently expelled fetus or after birth will most likely overwhelm any animal's immune system protection. The management program should consist of testing procedures, vaccination, spatial and/or time separation of susceptible animals, and adequate sanitation practices. Brucellosis tends to be carried from one herd to another by an infected or exposed animal. This most often occurs when a replacement animal is integrated into the herd. All replacement animals should be tested when purchased, then isolated from the herd and retested 30-60 days before it is introduced to the new herd.

The State of Wyoming and the Federal government want to eliminate brucellosis from livestock, but at the same time desire to manage a viable free-roaming bison herd in the GYA. There are approximately 90,000 elk and 4,000 free-roaming bison in Wyoming. Appropriate ecosystem management will also play a vital role in the fight against brucellosis. Ten years ago, the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) was formed among the states of Wyoming, Idaho, and Montana, the U.S. Department of Agriculture, and the Department of Interior to aid in the development of brucellosis management plans to protect public interests and the livestock industry. In the past decade, numerous wildlife management measures have been undertaken to prevent brucellosis transmission. In that time, the Wyoming Game and Fish Department has vaccinated more than 45,000 elk. Overall the GYIBC and the National Park Service hope to eliminate brucellosis in YNP by the year 2010.

Synopsis of Economic Impacts

- Increased production costs from required brucellosis testing: may range from $1.50-11.50 per head with an estimated 330,000 cattle to be tested in 2004.
- Mandatory testing could result in the following scenarios:
  - $495,000 lost in livestock sales in 2004.
  - $3.795 million lost in livestock sales in 2004.
  - A total loss of $3.465 million in livestock sales over a seven-year time period.
  - A total loss of $26.565 million in livestock sales from 2004-2010.
- 11 farm jobs initially lost in 2004 at low-end cost.
- 87 jobs eliminated in farm sector if high cost scenario is imposed.
- Secondary employment effects: private non-farm employment reductions in retail and services sectors.
- Farm sector is a small part of the overall economy:
  - 2000: Only 3.1% of U.S. employment was in agriculture.
  - 2000: 5.5% of Wyoming jobs were in agriculture.
  - 2001: 12,346 employed in Wyoming's farm sector and 2,663 employed in forestry, fishing, hunting, and agricultural support services sector.
- 40% of farm operators do not consider farming their principal occupation.
- Farm operators tend to be older individuals, 60% are age 50 years and older.
- 30% of farm operators spend over 200 days working off the farm.
- Niobrara, Goshen, Crook, and Big Horn counties have the largest percentages of individuals employed in agriculture in comparison to the remaining counties.
- Wyoming has a unique economy due to its small population and lack of economic diversification.
  - Federal government is not required to consider the nature of Wyoming's economy when determining if new regulations will generate an "economically significant" impact to an area.
- Additional funds may be needed to cover increased testing: potential sources include WLSB, Federal government, State of Wyoming, and/or cattle producers.
- Other costs associated with unvaccinated and undetected herds:
  - First year of infection = $200 per infected animal.
  - Second year of infection = $5.82 per infected animal due to breeding problems, abortions, culling, weak calves, and replacement rates.
- Additional production costs associated with mandatory brucellosis testing may reduce producer already small profit margins.
- An increase in veterinary services and revenues from testing more animals for brucellosis exposure.

Sources:

Animal and Plant Health Inspection Service (APHIS), Federal Register: February 20, 2004 (Volume 69, Number 34).

APHIS website: www.aphis.usda.gov

Associated Press, "Ranchers say bison cull thwarting disease" CNN.com, March 31, 2004.

Census of Agriculture, 1997.

Cook, Linda. "Monitoring, Treating Brucellosis in Bison." Agricultural Research. November 1997.

Curran, Dennis. "Wyoming moves to regain brucellosis-free status." The Wyoming Business Report. March 2004

Gearino, Jeff. "Governor attends first brucellosis task force meeting." Casper Star-Tribune. March 18, 2004.

Gearino, Jeff. "Wanted: Longterm brucellosis solution." Casper Star-Tribune. March 19, 2004.

Governor's Brucellosis Coordination Team. Meeting minutes from March 17, 2004 and April 8, 2004.

Greater Yellowstone Interagency Brucellosis Committee (GYIBC). "White Paper." http://www.nps.gov/gyibc/whitepap.htm

Hamende, Vicki. "Brucellosis-infected cattle tested at state vet lab." Agademics – University of Wyoming.

McLeod, Donald M. and Larry W. Van Tassell. "Economic and Policy Implications of Brucellosis in the Greater Yellowstone Area." Rangelands 18(4). August 1996.

Nebraska Department of Agriculture.

Peterson, Eric. "Brucellosis Information – Strain 19 vs. RB51." University of Wyoming Cooperative Extension – Agriculture.

Ragan, DVM, Valerie E. and Michael J. Gilsdorf, DVM, MS. "Statistical Report – Fiscal Year 2001, Cooperative State-Federal Brucellosis Program."

Richey, E.J. and C. Dix Harrell. "Brucella Abortus Disease (Brucellosis) in Beef Cattle." University of Florida Cooperative Extension Service.

Urbigkit, Cat. "Brucellosis-free status does not mean disease gone." Casper Star-Tribune. December 6, 2003.

U.S. Bureau of Economic Analysis

U.S. Census Bureau

Willis, Rebecca A., Wyoming State Veterinary Laboratory

Wyoming Agricultural Statistics Service

Wyoming Game and Fish Department

Wyoming Livestock Board website: http://wlsb.state.wy.us/

Wyoming State Veterinary Laboratory (WSVL). "Brucellosis (Bang's Disease) in Cattle and Wildlife: Questions and answers from WSVL." December 2003.