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Bison 2014

Health and Management Practices on U.S. Ranched-Bison Operations, 2014

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Cover photograph by Jack Dykinga, Agriculture Research Service.

Items of Note

The Bison 2014 study was conducted in all States and provides information on health and management practices on U.S. ranched-bison operations to study participants, stakeholders, and the bison industry as a whole. Most estimates in this report refer to the reference period of July 1, 2013, through June 30, 2014.

For analysis, operations were divided into four geographic regions: Northeast, Southeast, North Central, and West (see map on p 3). The West region likely contains more climatic, environmental, and topographical diversity than the other three regions. Sample size limitations prevented further breakdown of regions. Operations also were divided into four size categories: very small (1 to 9 bison), small (10 to 24 bison), medium (25 to 99 bison), and large (100 or more bison). Again, sample size limitations prevented further breakdown by operation size.

The following items describe some specific data from the study to present a general overview of some of the results. For more information on each topic, please see the indicated page.

Inventory (as of July 1, 2014)

Overall, 56.0 percent of responding bison operations were in the West region, 24.0 percent in the North Central region, 11.2 percent in the Southeast region, and 8.8 percent in the Northeast region. By operation size, the highest percentage of operations (38.7 percent) were very small operations (1 to 9 bison) and the lowest percentage (14.1 percent) were large operations (100 or more bison). Slightly more than one-fourth of operations (25.7 percent) were medium operations (25 to 99 bison) and 21.6 percent were small operations (10 to 24 bison) [p 8].

Female bison composed two-thirds (66.6 percent) of the total bison inventory, with the percentage decreasing as the age of the bison decreased. Male bison composed one-third of the bison inventory, with only 3.7 percent of all bison being males more than 3 years old. Males aged 1 to 3 years composed a higher percentage of the total inventory (17.1 percent) than males less than 1 year old (12.6 percent) [p 10].

Note: The following results generally are for the study's reference period: July 1, 2013, through June 30, 2014.

Deaths

Overall, about two-fifths of operations (41.3 percent) had any bison die or be euthanized due to natural causes, including health problems, injury or trauma, predation, or handling- or weather-related problems. The percentage of operations that had bison die due to

natural causes increased as herd size increased, ranging from 12.6 percent of very small operations to 82.1 percent of large operations (p 26).

Overall, 2.3 percent of bison, as a percentage of the July 1, 2014, inventory, died of natural causes or were euthanized (p 27).

Reasons for keeping ranched bison

Many operations participate in multiple aspects of the industry. Nearly 70 percent of all operations (69.3 percent) were involved in bison cow-calf production. Approximately one-third of operations had bison for seedstock production (37.2 percent) or kept bison as a hobby or pasture pet (34.4 percent). Other common reasons for having bison included feedlot (15.8 percent), agritourism/ecotourism (15.7 percent), and conservation (14.4 percent) [p 34].

A lower percentage of very small operations kept bison for bison cow-calf production (41.0 percent), seedstock production (23.6 percent), or preparation/sale of byproducts (3.0 percent) compared with operations in all other size categories. A higher percentage of large operations (44.1 percent) kept bison for backgrounding/stocking than operations in the other size categories. A lower percentage of very small operations kept bison for backgrounding/stocking (1.2 percent) than medium operations (15.6 percent). A higher percentage of large operations (47.1 percent) kept bison for feedlot than operations in the three smaller size categories. The percentage of operations that kept bison for hobby/pasture pet decreased with operation size. A higher percentage of very small operations (12.1 percent) kept bison for “other” reasons than medium operations (3.1 percent). Of the “other” reasons for having bison, 60 percent of operations indicated that they kept bison for training cutting horses (p 34).

Operations typically had one purpose or product that was the focus of the business. Among all bison operations, more than half (54.0 percent) raised bison primarily for cow-calf production, and nearly one-fifth (18.6 percent) kept bison primarily as a hobby or pasture pet (p 38).

Number of years with ranched bison

The commercial bison industry is a relatively new business that, generally speaking, began in the late 1960s. Almost 20 percent of all bison operations (19.7 percent) had raised bison at the location for more than 20 years (p 45).

In general, larger operations had raised bison at the location longer than smaller operations, which might reflect the time required to build a large bison herd. Higher percentages of very small (27.3 percent) and small (18.1 percent) operations had raised bison at the location for 0 to 5 years compared with large operations (4.5 percent), and a

higher percentage of very small operations had raised bison at the location 0 to 5 years than medium operations (7.7 percent). A higher percentage of medium (50.6 percent) and large (56.4 percent) operations had raised bison at the location for 11 to 20 years compared with very small operations (29.4 percent), and a higher percentage of large operations had raised bison at the location for 11 to 20 years than small operations. A higher percentage of large operations (36.1 percent) than very small (8.6 percent) or small (18.0 percent) operations had raised bison at the location for more than 20 years. A higher percentage of medium operations (27.4 percent) than very small operations (8.6 percent) had raised bison on the operation more than 20 years (p 45).

Future plans

Of all operations, more than three-fourths planned to increase their herd size (25.7 percent) or maintain the same herd size (54.0 percent) over the upcoming year; on the other hand, 11.6 percent planned to decrease herd size and 8.7 percent planned to get out of the business. A higher percentage of large operations (40.5 percent) planned to increase herd size over the upcoming year compared with very small (22.9 percent) or medium (18.6 percent) operations. A higher percentage of very small operations (16.9 percent) planned to get out of the business in the next year compared with operations in the other size categories (p 48).

Contact with other farmed and wild animals

Overall, three-fourths of operations (75.6 percent) had other farmed animals present on the operation. Almost half of all operations (45.6 percent) had horses, donkeys, or other equids, and about two-fifths (39.8 percent) had beef or dairy cattle. Roughly one-fourth had farmed cervids (28.6 percent) and/or poultry (24.6 percent). About one-tenth of operations had goats (12.2 percent), swine (10.5 percent), and/or sheep or lambs (9.0 percent) [p 80].

A higher percentage of very small operations (84.9 percent) than small (67.5 percent) or medium operations (65.5 percent) had any other farmed animals present. A higher percentage of very small operations (53.5 percent) than operations in the other size categories had cattle on the operation. No large operations had sheep or lambs, whereas roughly 10 percent of operations in each of the other size categories did. A higher percentage of very small operations than medium or large operations had goats (p 82).

Overall, just over three-fourths of operations had neighboring operations with ranched bison, cattle, sheep or lambs, and/or farmed deer or elk within 1 mile of the operation's bison. Almost three-fourths of all operations (73.3 percent) had neighboring beef or dairy cattle within 1 mile of the operation's bison. Almost 16 percent of all operations had neighboring sheep or lambs within 1 mile of the operation's bison (p 85).

By operation size, some differences existed in the types of neighboring animals located within 1 mile of the operation's bison. For both cattle and any type of neighboring animal, a lower percentage of very small operations than medium or large operations had neighboring animals within 1 mile of the operation's bison (p 85).

Ranched-bison movements and operation practices for isolating new or returning bison

Overall, about one-fifth of operations (20.1 percent) had any new bison brought onto the operation or any bison leave and return. A higher percentage of large operations (44.5 percent) than operations in the other size categories brought any new bison onto the operation or had any bison leave and return. A higher percentage of medium operations than very small operations had brought any new bison onto the operation or had any bison leave and return (p 91).

For operations that brought any new bison onto the operation or had any bison leave and return, about one-fifth (18.4 percent) had temporarily brought bison from other herds onto the operation for breeding purposes. Across operation sizes, there were no differences by gender of bison in the percentage of operations that temporarily brought bison onto the operation for breeding purposes (p 93).

For operations that brought on any new bison or had any bison leave and return, nearly two-thirds of operations (65.6 percent) never isolated bison returning to the operation before commingling them with the rest of the operation's herd (p 97).

For operations that added new bison to the herd permanently or temporarily, about three-fifths of operations always (42.0 percent) or sometimes (18.4 percent) isolated bison before commingling them with the operation's herd (p 97).

Reproduction

Overall, 75.9 percent of operations had any bison bred on the operation. A lower percentage of very small operations (45.3 percent) had any bison bred on the operation compared with operations in the other size categories (p 105).

For the 75.9 percent of operations that bred any bison, 11.2 percent had used body-condition scoring during the most recent breeding season, 8.7 percent used breeding-soundness exams for bulls, 8.5 percent used palpation for pregnancy, 3.6 percent used ultrasound, and 3.4 percent used some "other" reproductive practice. A higher percentage of large operations used body-condition scoring (25.0 percent), breeding-soundness exams for bulls (30.8 percent), palpation for pregnancy (30.0 percent), and/or ultrasound (18.2 percent) than operations in the other size categories (p 108).

Overall, 62.6 percent of operations that bred any bison bred heifers on the operation during the most recent breeding season. A higher percentage of large operations (75.7 percent) than very small operations (50.3 percent) bred heifers (p 109).

For the 75.9 percent of operations that bred any bison, 15.0 percent of operations used random selection as the primary basis for selecting new breeding bison, 37.3 percent used size/conformation, 14.7 percent used behavior/manageability, 8.1 percent used genetics, and 24.9 percent used an "other" basis for selecting breeding bison. In many cases, "other" was selected by producers when they could not choose among two or more of the listed options and instead listed multiple bases (p 110).

Vaccination practices

Almost one-third of operations (29.1 percent) vaccinated at least some bison on pasture against a disease or pathogen. Roughly one-fifth of operations vaccinated bison on pasture against *Clostridium* species (21.9 percent) and/or brucellosis (17.0 percent). About one-tenth vaccinated bison on pasture against bovine viral diarrhea virus (12.4 percent), bovine respiratory syncytial virus (11.1 percent), leptospirosis (10.1 percent), and/or infectious bovine rhinotracheitis (10.0 percent) [p 139].

Overall, 38.3 percent of operations that had any bison in feedlot vaccinated any bison. About one-third of operations (33.8 percent) vaccinated bison against *Clostridium* species (e.g., tetanus, blackleg). About one-fifth vaccinated feedlot bison against bovine respiratory syncytial virus (19.1 percent) and/or bovine viral diarrhea virus (17.7 percent). Roughly one-seventh of operations vaccinated feedlot bison against infectious bovine rhinotracheitis (15.4 percent), *Pasteurella* species (13.9 percent), and/or brucellosis (13.6 percent). About one-tenth of operations vaccinated feedlot bison against *Mycoplasma bovis* (11.6 percent) and/or parainfluenza 3 virus (10.1 percent) [p 141)].

Producer-reported disease occurrence

Internal parasites were present in at least some bison on 19.0 percent of operations, and diarrhea was present in some bison on 13.3 percent of operations. Problems with being off feed/weight loss were present in bison on 9.2 percent of operations, and eye lesions occurred in some bison on 8.2 percent of operations. Pneumonia/respiratory problems were present in at least some bison on 6.3 percent of operations (p 144).

A higher percentage of operations had bison with arthritis/lameness and problems with being off feed/weight loss present in bison more than 3 years old (4.2 percent and 8.7 percent, respectively) than in bison less than 1 year old (1.3 percent and 3.9 percent, respectively) [p 144].

A higher percentage of operations in the North Central region than in the West region had internal parasites or diarrhea in any bison (p 147).

Death loss from disease

Overall, 15.0 percent of operations had bison die from unknown health problems, and 8.4 percent had bison die from “other” causes. Parasitism was a primary cause of bison deaths on 5.3 percent of operations, and other respiratory illness/pneumonia caused deaths on 4.3 percent of operations. Digestive illness caused bison deaths on 2.0 percent of operations, malignant catarrhal fever on 0.9 percent, and *Mycoplasma bovis* (confirmed by a veterinarian or laboratory) on 0.7 percent. It is important to note that although a cause of death might have occurred on a low percentage of operations, it could have affected a high percentage of the bison on those operations (p 148).

The percentage of operations that had any bison die because of the subject diseases differed little by age of bison affected. A higher percentage of operations had bison that were more than 3 years old (4.6 percent) or less than 1 year old (5.3 percent) than bison 1 to 3 years old (1.5 percent) die because of “other” causes. “Other” causes included low selenium, copper deficiency, and epizootic hemorrhagic disease/bluetongue (p 148).

Disease testing

About one-third of all operations (33.1 percent) had ever had any bison tested for brucellosis. The percentage of operations that had tested for brucellosis at some point increased, in general, as operation size increased; a higher percentage of large operations (60.2 percent) had ever tested bison for brucellosis than medium (40.4 percent) or small (35.4 percent) operations, and these percentages were higher than that for very small operations (15.8 percent) [p 166].

Association membership and sources of bison health information

About half of producers (49.4 percent) were in one or more bison or cattle associations. About one-third were in regional, State, and/or local bison associations (33.3 percent) and/or the National Bison Association (31.9 percent) [p 172].

The percentage of operations belonging to the National Bison Association generally increased with increasing operation size, from 5.7 percent of very small operations to 78.0 percent of large operations, although the percentages of small (30.6 percent) and medium (45.4 percent) operations did not differ from each other. The percentage of operations belonging to regional, State, and/or local bison associations increased with increasing operation size, from 6.4 percent of very small operations to 78.0 percent of large operations. The percentage of operations belonging to “any” of the subject associations increased with increasing operation size, from 20.0 percent of very small operations to 91.1 percent of large operations (p 172).

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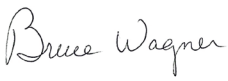
Acknowledgments

The Bison 2014 study was a cooperative effort between two U.S. Department of Agriculture (USDA) agencies: the National Agricultural Statistics Service (NASS) and Veterinary Services' National Animal Health Monitoring System (NAHMS) within the Animal and Plant Health Inspection Service (APHIS).

We would like to thank the NASS for allowing use of its list frame and mailing questionnaires to bison producers.

We also especially thank the bison producers whose voluntary efforts made the Bison 2014 study possible. Finally, we thank the National Bison Association for its instrumental help in promoting the study and reviewing the questionnaire and report.



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Feedback
Feedback, comments, and suggestions regarding Bison 2014 study reports are welcomed. You may submit feedback via online survey at: http://www.aphis.usda.gov/nahms (Click on “Provide FEEDBACK on NAHMS reports.”)

Introduction

The Bison 2014 study was conducted by the National Animal Health Monitoring System (NAHMS) with assistance from the National Agricultural Statistics Service (NASS). NAHMS is a nonregulatory program within the USDA Animal and Plant Health Inspection Service (APHIS) that gathers and disseminates animal health information. NAHMS is designed to help meet the Nation's animal health information needs.

The NAHMS program collects and analyzes animal health data to provide scientifically sound and current information on the health status and health management practices of U.S. livestock, poultry, and aquaculture. The information is intended to benefit both producers (by enhancing health management and efficient production) and the general public (by facilitating a safe and high quality food supply). Special emphasis is placed on obtaining valid estimates of management practices, production levels, and disease status of national herds and flocks.

The NAHMS program is not designed to detect, regulate, or eradicate major epidemic diseases, but rather to learn about health problems, possible risk factors, and food safety and quality issues. As the food-animal industry grows more sophisticated, and production for some species becomes more concentrated in large confined facilities, demand increases for information on the impact of health problems. These problems are often related to animal genetics, management practices, the environment in which the operation is located, and exposure to infectious agents. The NAHMS program attempts to measure the occurrence of these conditions, and to report the findings to the food industry as well as to the general public. Additionally, as the livestock industry addresses concerns with food quality and food safety, it needs valid information on which to base decisions.

The NAHMS program compiles some of its information from sources other than producer surveys. These sources include other government agencies, livestock industry organizations, and universities. Surveys of livestock producers are conducted to assemble data that are not available elsewhere.

NAHMS was started in 1983. In the first few years after it was established, animal health and economic data were collected for various types of livestock through several State programs. Since 1989, surveys have been national in scope and have focused on hogs from farrowing to market, dairy cattle, cow-calf operations, cattle-on-feed operations, equine, catfish, poultry, sheep, goats, and, recently, farmed cervids and ranched bison. NASS State offices and field enumerators from NASS and the National Association of State Departments of Agriculture (NASDA) were involved in most of these projects.

The Bison 2014 study is the first time that NAHMS has conducted a survey of the U.S. ranched-bison industry. The study was designed and conducted in response to a request from the National Bison Association to do an epidemiological investigation of *Mycoplasma bovis* in bison. It was determined that the first step was to conduct a study to develop baseline information about the bison industry and the health of ranched bison.

The purpose of the Bison 2014 study was to compile the most-needed information about the industry with regard to animal health and production management. To meet these information needs, the Bison 2014 study had the following objectives:

- **Provide a baseline description of the U.S. bison industry, including basic characteristics of operations, such as inventory, size, and type.**
    - Describe characteristics of bison operations, including animals on hand, inventories, productivity, mortality, marketing of meat or animals (including niche markets, such as grass fed, natural, organic, etc.), slaughter practices, etc.
- **Describe current U.S. bison industry production practices and challenges, including identification, confinement and handling, animal care, and disease testing.**
    - Describe current U.S. bison production practices, including general management, record keeping, housing practices, weaning, mineral supplementation, disease prevention, etc.
- **Describe health management and biosecurity practices important for the productivity and health of ranched bison.**
    - Describe movements of animals, people, waste products, vehicles, and equipment on and off operations.
    - Describe current biosecurity practices and producer motivation for implementing or not implementing biosecurity practices.
    - Describe vaccination usage patterns in ranched bison.
    - Describe treatment patterns used to control and treat disease and promote growth in ranched bison.
    - Describe practices important for controlling internal parasites and reducing anthelmintic resistance.

- Describe producer awareness of Veterinary Services program diseases or other economically important diseases.

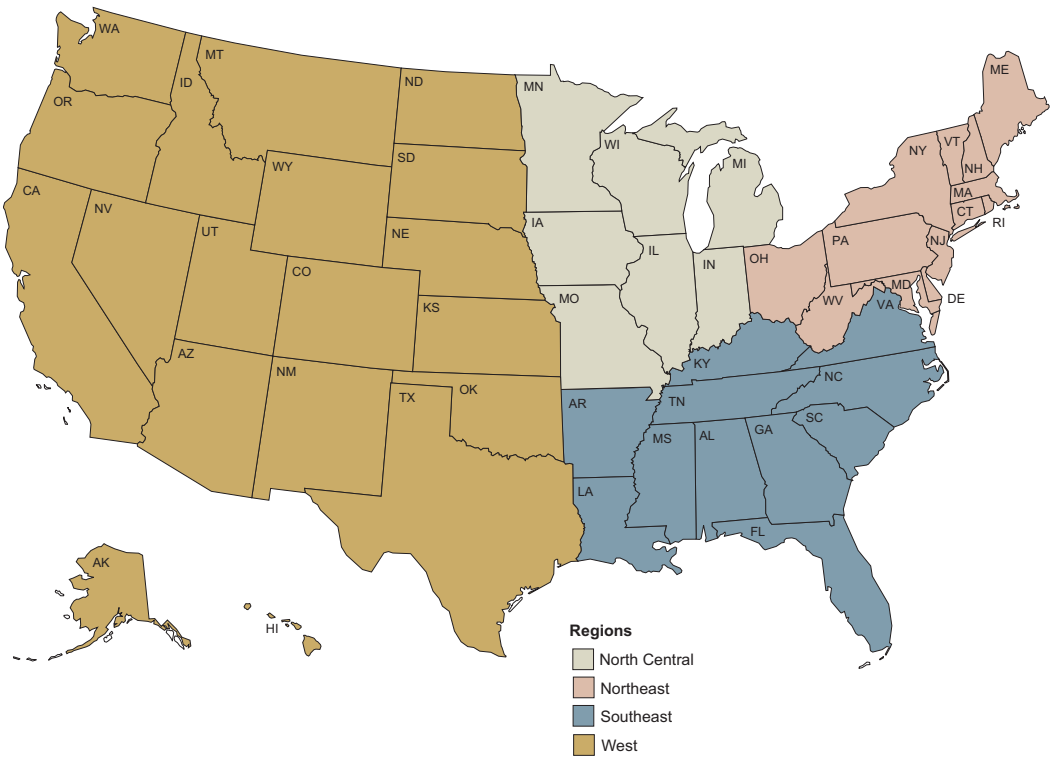
- **Describe producer-reported occurrence of select health problems and evaluate potentially associated risk factors.**

  - Better understand potential risk factors for certain diseases associated with exposure to other animals (e.g., cattle, cervids, etc.), environmental conditions, and/or geography.

  - Estimate the producer-reported prevalence of *Mycoplasma bovis* in ranched-bison herds and estimate associated costs.

A questionnaire was developed to obtain as much information as possible and mailed to U.S. producers with bison. In general, study questions covered the period from July 1, 2013, through June 30, 2014. Additional information about methods used and the number of respondents in the study can be found in the Methodology section on p 179.

Bison 2014 participating States



Terms Used in This Report

Auction/sale barn: A location where livestock are bought and sold. This might include association-sponsored sales.

Biosecurity: Specific practices and procedures used by an operation to limit the spread of diseases. Examples of biosecurity include restricting visitors from physical contact with bison or quarantining new bison before they are commingled with the operation's herd.

Brucellosis: A contagious, costly reproductive disease of ruminant animals that also affects humans. Although brucellosis can affect other animals, its main threat is to cattle, bison, cervids, and swine. The disease is also known as contagious abortion or Bang's disease and is caused by a group of bacteria known scientifically as the genus *Brucella.*

Cervid: A mammal of the deer family (*Cervidae*). Common examples include deer, elk, moose, and reindeer.

Diatomaceous earth: The remains of fossilized marine algae called diatoms; considered by some to be a natural dewormer for livestock.

Epizootic hemorrhagic disease (EHD): A hemorrhagic disease caused by a virus spread by a biting midge. Clinical signs and the severity of disease vary from mild to fatal. White-tailed deer are especially susceptible.

Extension agent/service: A person or service provided by a State entity or local university in association with the USDA National Institute of Food and Agriculture that provides agricultural production expertise to operators either on a regular basis or upon request.

Isolate (isolation of animals)**:** For this survey, isolate means to prevent nose-to-nose contact and to prevent the sharing of feed, drinking water, and equipment with other animals already present on the operation.

Livestock: Cattle, bison, poultry, goats, sheep, swine, horses, other equids, cervids, aquaculture species, bees, and other farm animals raised for home use and/or sale.

Malignant catarrhal fever (MCF): An infectious disease of ruminants caused by a gammaherpesvirus. The sheep-associated form of the disease is infectious to and fatal in bison.

***Mycoplasma bovis*:** A bacterial pathogen that has become a major concern in the North American bison industry because of the high rates of illness and death it can cause in bison herds. *Mycoplasma bovis* occurs in cattle and, often in conjunction with other pathogens, may cause disease, including pneumonia, mastitis, arthritis, and ocular infection. In bison, *Mycoplasma bovis* appears to be a primary pathogen, causing severe pneumonia, pleuritis, polyarthritis, and other problems associated with disseminated infection, especially in cows and in bison on feedlot. In this report, *Mycoplasma bovis* will always be spelled out to preclude confusion with a different pathogen, *Mycobacterium bovis* (bovine tuberculosis).

National Agricultural Statistics Service (NASS): A USDA agency responsible for collecting, estimating, and publishing statistics on the Nation's agriculture.

Operation: This is the overall business and top-level management unit for a bison ranch or farm. For the purposes of the Bison 2014 study, an operation was defined as a group of ranched or farmed bison under common ownership and managed on one or more locations. For example, a single "operation" might consist of both a cow-calf breeding site and a feedlot.

Operation size: Number of ranched or farmed bison on an operation. The four categories were very small (1 to 9 bison), small (10 to 24), medoim (25 to 99), and large (100 or more).

Pasture: An enclosed area of untilled ground covered with vegetation and grazed by animals.

Population estimates: Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. An estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). An estimate of 3.4 with a standard error of 0.3 results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported as (0.0). If there were no reports of the event, no standard error was reported (—).

Reference period: The yearlong period from July 1, 2013, through June 30, 2014. Many questions in the Bison 2014 questionnaire referred to or quantified activities or events that occurred during this period.

Regions:

Northeast: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia

Southeast: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia

North Central: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Wisconsin

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming

Renderer: A renderer collects waste animal tissues (such as bones, fat, blood, scraps, some internal organs, etc.) for recycling into high-quality fat, such as lard or tallow, and protein products, such as meat and bone meal. The most common animal sources are beef, pork, sheep, and poultry.

Sales barn: (See Auction/sale barn.)

Tuberculosis (TB): An infectious disease of humans and other animals, in many cases fatal, that is caused by various strains of mycobacteria, usually *Mycobacterium bovis* in cattle, bison, and other ruminants. Tuberculosis typically affects the lungs, but can also affect other parts of the body.

Section I: Population Estimates

Note: Where appropriate, column or row totals are shown as 100.0 to aid in interpretation; however, estimates may not sum to 100.0 due to rounding.

Note: Because large operations (100 or more bison) had a smaller sample size and also had no upper limit, there was much greater variability in this category, and the standard errors were sometimes much larger. This means that in some cases, results that seem as though they should be considered different from those for the smaller size categories cannot be considered different because of the large standard errors.

Note: Unless otherwise noted, tables in this section refer to the period July 1, 2013, through June 30, 2014.

A. Inventory, Additions, and Removals

1. Operation bison inventory—July 1, 2014

Overall, 56.0 percent of operations were in the West region, 24.0 percent in the North Central region, 11.2 percent in the Southeast region, and 8.8 percent in the Northeast region. By operation size, the highest percentage (38.7 percent) were very small operations and the lowest percentage (14.1 percent) were large operations. Medium operations accounted for slightly more than one-fourth of operations (25.7 percent), and about one-fifth (21.6 percent) were small operations.

In the Northeast and North Central regions, a lower percentage of operations had 100 or more bison than operations in the other size categories. In the Southeast and West regions, a higher percentage of operations had 1 to 9 bison than operations in the other size categories.

A.1.a. Percentage of operations by region and by size (total number of bison on July 1, 2014):

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Region	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Northeast	3.3	(0.7)	2.7	(0.6)	2.4	(0.6)	0.4	(0.2)	8.8	(1.0)
Southeast	6.0	(1.1)	2.2	(0.7)	2.0	(0.6)	0.6	(0.3)	11.2	(1.3)
North Central	6.9	(1.0)	7.1	(1.0)	7.0	(1.0)	3.0	(0.7)	24.0	(1.6)
West	22.5	(1.7)	9.6	(1.2)	14.2	(1.4)	10.1	(1.2)	56.0	(1.9)
All operations	38.7	(2.0)	21.6	(1.6)	25.7	(1.7)	14.1	(1.4)	100.0	(—)

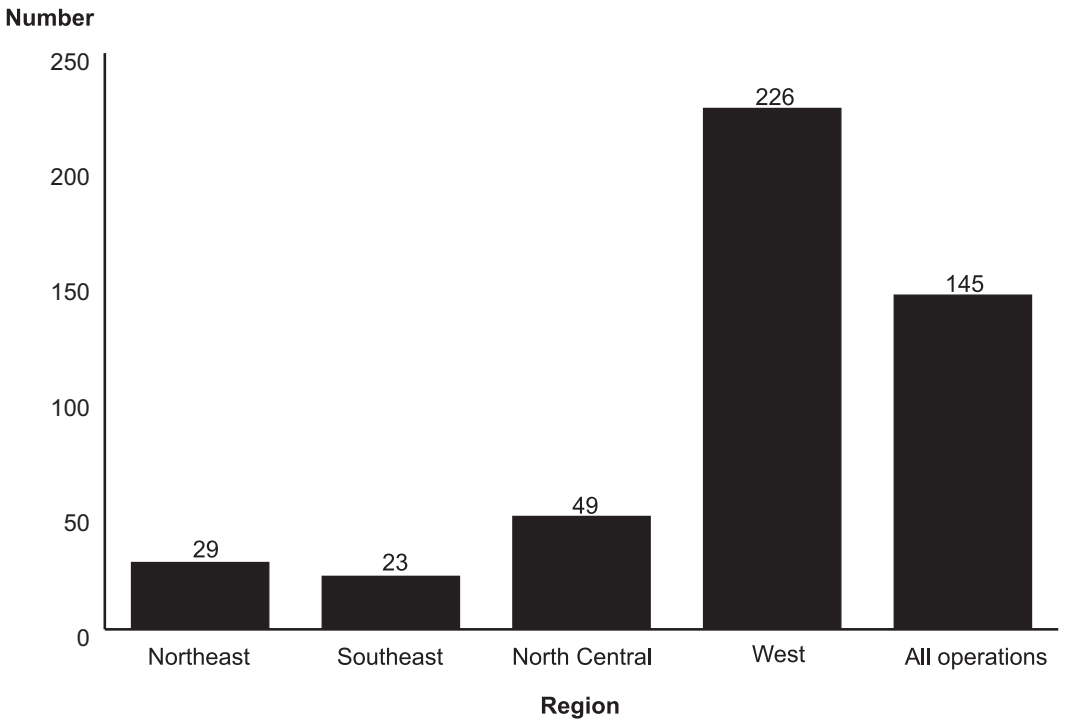
Overall, the operation average total number of bison on responding operations was 145, ranging from an average of 23 bison on operations in the Southeast region to 226 in the West region.

A.1.b. Operation average total number of bison on July 1, 2014, by region:

Region	Operation average number of bison*	Std. error
Northeast	29	(7.0)
Southeast	23	(5.8)
North Central	49	(7.7)
West	226	(123.4)
All operations	145	(70.2)

*Rounded to nearest whole number.

Operation average total number of bison on July 1, 2014,* by region



*Rounded to nearest whole number.

Overall, more than 98 percent of responding operations had one or more bison on July 1, 2014. A few operations (1.3 percent) had bison during the study reference period of July 1, 2013, through June 30, 2014, but had no bison on July 1, 2014. About 95 percent of operations had female bison, and about 86 percent had male bison. For both male and female bison, a higher percentage of operations had bison more than 3 years old than bison 1 to 3 years old or less than 1 year old.

A.1.c. Percentage of operations by gender and by age of bison:

Percent Operations

Age (years)

	More than 3		1 to 3		Less than 1		Total	
Gender	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Female	88.8	(1.3)	68.4	(1.9)	60.4	(2.0)	95.2	(0.9)
Male	75.6	(1.7)	62.2	(2.0)	56.5	(2.0)	86.1	(1.4)
Either	92.1	(1.1)	77.0	(1.7)	68.5	(1.9)	98.7	(0.4)

Female bison composed two-thirds (66.6 percent) of the total bison inventory, with the percentage decreasing as the age of the bison decreased. Male bison composed one-third of the bison inventory, with only 3.7 percent of all bison being males more than 3 years old. Males aged 1 to 3 years composed a higher percentage of the total inventory (17.1 percent) than males less than 1 year old (12.6 percent).

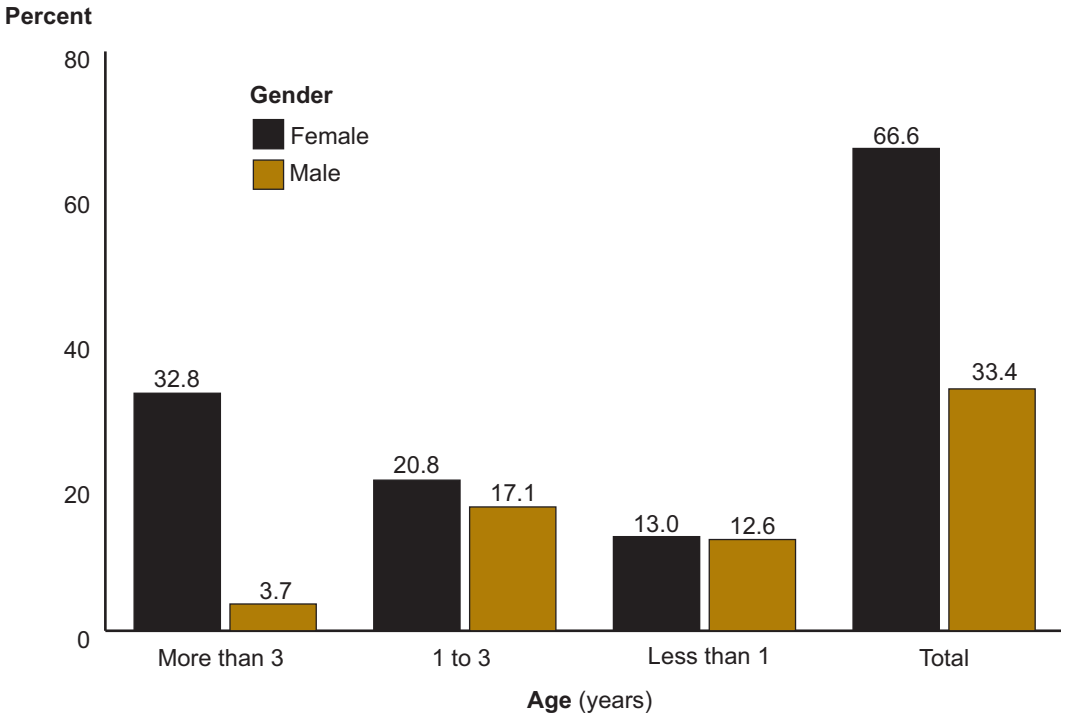
A.1.d. Percentage of July 1, 2014, bison inventory, by gender and by age of bison:

Percent Bison

Age (years)

	More than 3		1 to 3		Less than 1		Total	
Gender	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Female	32.8	(1.6)	20.8	(1.7)	13.0	(0.3)	66.6	(0.6)
Male	3.7	(0.3)	17.1	(0.9)	12.6	(0.3)	33.4	(0.6)
Either	36.5	(1.9)	37.9	(2.2)	25.6	(0.6)	100.0	(0.0)

Percentage of July 1, 2014, bison inventory, by gender and by age of bison



Not surprisingly, large operations accounted for a much higher percentage of the bison inventory (87.6 percent) than operations in smaller size categories.

A.1.e. Percentage of total bison inventory on July 1, 2014, by size of operation:

Percent Bison Inventory								
Size of Operation (number of bison)								
Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Total**
1.1	(0.5)	2.2	(1.1)	9.1	(4.5)	87.6	(6.1)	100.0

The West region accounted for a much higher percentage of the bison inventory (88.5 percent) than operations in the other regions.

A.1.f. Percentage of total bison inventory on July 1, 2014, by region:

Percent Bison Inventory								
Region								
Northeast		**Southeast**		**North Central**		**West**		
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Total**
1.8	(1.0)	1.7	(1.0)	8.0	(4.1)	88.5	(5.7)	100.0

2. Operation location

Overall, 9.3 percent of operations had bison at more than one location from July 1, 2013, through June 30, 2014. About one-third of large operations (33.1 percent) had bison at more than one location, which is a higher percentage than estimated for operations in the smaller size categories.

A.2.a. Percentage of operations with bison at more than one location during the reference period, by size of operation:

Percent Operations									
Size of Operation (number of bison)									
Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
3.1	(1.2)	4.3	(1.9)	9.5	(2.3)	33.1	(5.1)	9.3	(1.2)

The percentage of operations with bison at more than one location did not differ by region.

A.2.b. Percentage of operations with bison at more than one location, by region:

Percent Operations

Region

Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
5.6	(3.1)	8.7	(4.1)	4.8	(1.8)	12.0	(1.8)

3. Bison added to the operation

About one-fifth of all operations (18.4 percent) added any bison to the herd during the reference period. A higher percentage of large operations added any bison than operations in the three smaller size categories. A higher percentage of medium operations than very small operations added any bison.

A.3.a. Percentage of operations that added any bison to the herd during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
9.3	(1.9)	16.4	(3.2)	20.6	(3.2)	41.8	(5.2)	18.4	(1.6)

The percentage of operations that added any bison to the herd did not differ by region.

A.3.b. Percentage of operations that added any bison to the herd, by region:

Percent Operations							
Region							
Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
23.7	(5.5)	16.9	(5.1)	21.0	(3.4)	16.7	(2.0)

Overall, operations that added any bison added a number of animals roughly equal to one-third (34.1 percent) of the July 1, 2014, inventory. Very small operations added a number of animals equal to 58.7 percent of the July 1, 2014, inventory, which was a higher percentage than for medium operations, which added a number of bison equal to 18.1 percent of the July 1, 2014, inventory.

A.3.c. For the 18.4 percent of operations that added any bison to the herd (table A.3.a), percentage of bison added, by size of operation:

Percent Bison Added*									
Size of Operation (number of bison)									
Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
58.7	(8.4)	29.5	(6.3)	18.1	(6.1)	35.8	(7.9)	34.1	(7.1)

*As a percentage of bison inventory on July 1, 2014.

For operations that added any bison, operations in the North Central region added a higher percentage of the July 1, 2014, inventory (46.8 percent) than operations in the Southeast region (15.4 percent).

A.3.d. For the 18.4 percent of operations that added any bison to the herd (table A.3.a), percentage of bison added, as a percentage of July 1, 2014, inventory, by region:

Percent Bison Added*

Region

Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
17.6	(4.6)	15.4	(1.5)	46.8	(12.3)	33.1	(8.8)

*As a percentage of bison inventory on July 1, 2014.

For all operations that added any bison during the reference period, 69.9 percent of operations obtained bison through private sale, 29.3 percent from auctions/sale barns, and 11.4 percent through trade. Less than 7 percent of operations obtained bison from either “other” sources or dealers.

There were few differences by operation size in the sources of bison added. A higher percentage of large operations (43.1 percent) than very small operations (9.5 percent) added bison from auctions or sale barns.

A.3.e. For the 18.4 percent of operations that added any bison to the operation’s herd (table A.3.a), percentage of operations that added bison, by source of bison and by operation size:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Private sale	67.2	(10.2)	55.3	(11.8)	65.5	(8.4)	83.3	(6.2)	69.9	(4.5)
Trade	18.6	(8.4)	12.4	(8.2)	12.2	(5.7)	5.6	(3.9)	11.4	(3.1)
Auction/ sale barn	9.5	(6.4)	16.0	(8.5)	34.8	(8.5)	43.1	(8.3)	29.3	(4.4)
Dealer	4.7	(4.6)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.9	(0.9)
Other	4.7	(4.6)	16.3	(8.6)	3.1	(3.0)	5.6	(3.9)	6.5	(2.4)

A higher percentage of operations added bison aged 1 to 3 years than added bison in the other age groups. Overall, 69.8 percent of operations that added bison added 1 to 3 year olds, whereas 34.9 percent added bison aged more than 3 years, and 30.3 percent added bison less than 1 year old. Of operations that added bison, about half (49.8 percent) added bison aged 1 to 3 years that were obtained through private sales.

A.3.f. For the 18.4 percent of operations that added any bison to the operation's herd (table A.3.a), percentage of operations that added bison, by source and by age of added bison:

Percent Operations

Age (years)

	More than 3		**1 to 3**		**Less than 1**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Private sale	26.3	(4.3)	49.8	(4.9)	19.9	(3.8)
Trade	2.8	(1.6)	4.9	(2.1)	3.7	(1.8)
Auction/sale barn	8.5	(2.7)	21.9	(4.0)	10.6	(3.0)
Dealer	0	(—)	0	(—)	0.9	(0.9)
Other	1.9	(1.3)	1.8	(1.3)	3.7	(1.8)
Any	34.9	(4.6)	69.8	(4.5)	30.3	(4.4)

For operations that added bison, and for all bison added, 85.5 percent were obtained through private sale and 12.2 percent came from auction/sale barn sources. Only 2.3 percent of bison added came from the other sources listed in the table below. More than 94 percent of bison added were 1 to 3 years old (51.1 percent) or less than 1 year old (43.2 percent). Only 5.7 percent of bison added were more than 3 years old.

A.3.g. For the 18.4 percent of operations that added any bison to the operation's herd (table A.3.a), percentage of bison added, by source and by age of added bison:

Percent Bison Added*

Age (years)

	More than 3		1 to 3		Less than 1		Total	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Private sale	4.7	(2.8)	46.2	(8.6)	34.5	(7.7)	85.5	(7.2)
Trade	0.2	(0.1)	0.5	(0.3)	1.0	(0.8)	1.7	(0.9)
Auction/ sale barn	0.6	(0.4)	4.2	(1.9)	7.3	(4.4)	12.2	(6.3)
Dealer	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Other	0.2	(0.2)	0.1	(0.1)	0.3	(0.2)	0.6	(0.4)
Total	5.7	(3.0)	51.1	(7.7)	43.2	(7.9)	100.0	(0.0)

*As a percentage of bison added.

Respondents who had added bison were also asked whether they had imported live bison from other countries. Four operations had imported bison from another country; all four had imported bison from Canada. In addition, all four were large operations from the West region.

4. Bison permanently removed from the operation

Overall, three-fifths of all operations (60.4 percent) had any live bison permanently leave the operation (including bison slaughtered on the ranch). More than four-fifths of medium and large operations had bison permanently leave the operation. Higher percentages of medium and large operations than very small and small had any bison permanently leave the operation. A higher percentage of small operations (65.0 percent) than very small operations (29.7 percent) had live bison permanently leave the operation.

A.4.a. Percentage of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
29.7	(3.0)	65.0	(4.1)	84.7	(2.9)	91.0	(3.0)	60.4	(2.0)

A higher percentage of operations in the North Central region (70.9 percent) than in the Southeast region (38.8 percent) had any live bison permanently leave the operation's herd.

A.4.b. Percentage of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) during the reference period, by region:

Percent Operations

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
57.6	(6.4)	38.8	(6.6)	70.9	(3.8)	60.7	(2.6)

Overall, for operations that had any live bison permanently leave (including bison slaughtered on the ranch), the bison that left equaled 31.3 percent of the bison inventory on July 1, 2014. Not surprisingly, the bison leaving very small operations (74.7 percent) represented a higher percentage of the July 1, 2014, inventory than the bison leaving operations in the three larger size categories.

A.4.c. For the 60.4 percent of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) [table A.4.a], percentage of bison removed, by size of operation:

Percent Bison*

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
74.7	(12.3)	32.1	(3.9)	25.9	(1.9)	31.6	(2.6)	31.3	(2.3)

*As a percentage of bison inventory on July 1, 2014.

For operations that had bison permanently leave the operation, there were no differences by region in the percentage of July 1, 2014, inventory represented by the departing bison.

A.4.d. For the 60.4 percent of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) [table A.4.a], percentage of bison removed, by region:

Percent Bison*

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
26.8	(4.6)	23.1	(2.3)	31.7	(5.0)	31.5	(2.6)

*As a percentage of bison inventory on July 1, 2014.

For all operations that had any bison permanently leave the operation, about two-fifths had bison leave by being slaughtered on the ranch (40.7 percent) or being sent directly to offsite slaughter/packer (39.1 percent).

There were few differences by size of operation, although a higher percentage of large operations than very small and small operations sent bison directly to offsite slaughter/packer, and a higher percentage of medium operations sent bison directly to offsite slaughter than very small operations. Also, a higher percentage of large operations than operations in the other three size categories sent bison directly to a feedlot.

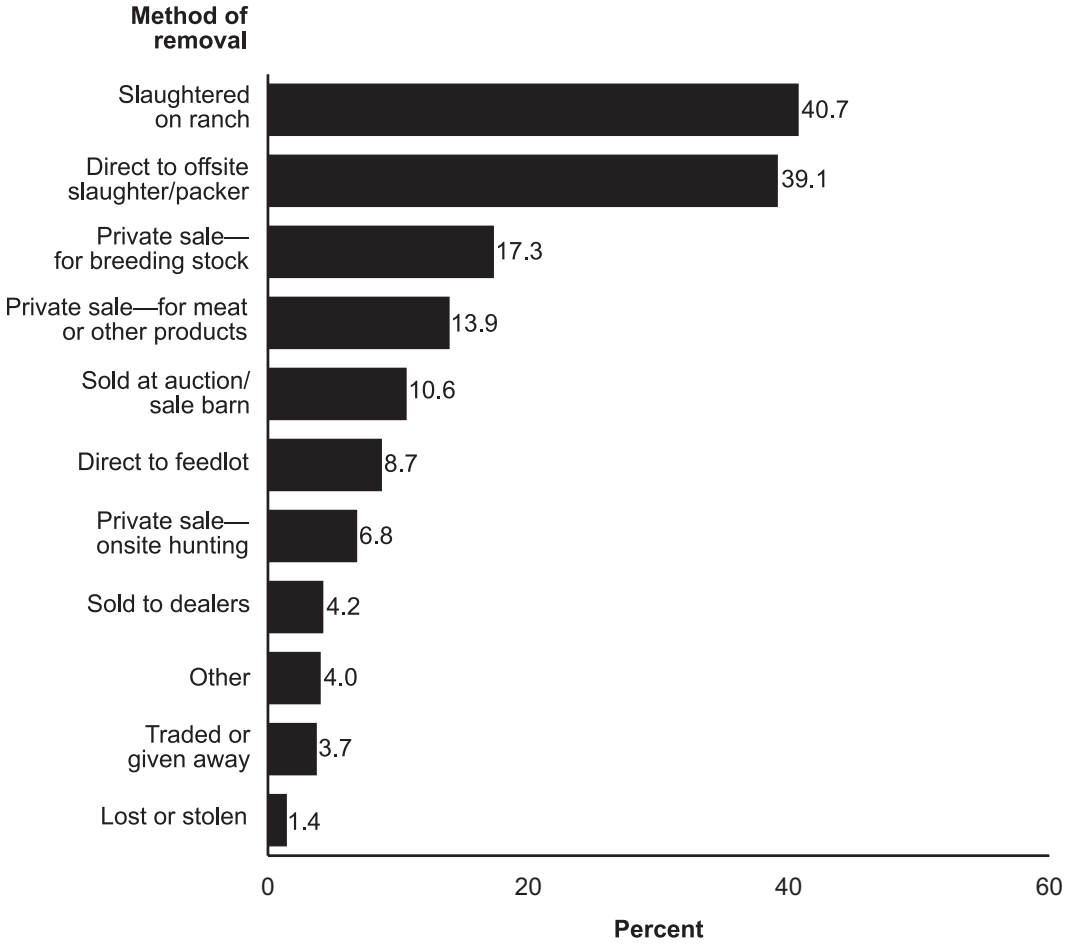
A.4.e. For the 60.4 percent of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) [table A.4.a], percentage of operations by method of bison removal and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Method of removal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Slaughtered on ranch	46.9	(6.1)	38.8	(5.3)	42.8	(4.4)	33.5	(5.4)	40.7	(2.6)
Direct to offsite slaughter/ packer	17.8	(4.7)	34.0	(5.2)	42.4	(4.4)	58.3	(5.6)	39.1	(2.6)
Direct to feedlot	1.5	(1.5)	0.0	(—)	9.2	(2.5)	24.3	(4.9)	8.7	(1.5)
Sold at auction/ sale barn	4.4	(2.5)	11.8	(3.5)	9.3	(2.6)	16.8	(4.3)	10.6	(1.6)
Sold to dealers	7.1	(3.1)	6.0	(2.6)	3.8	(1.7)	0.0	(—)	4.2	(1.1)
Private sale— for breeding stock	19.0	(4.7)	15.7	(4.0)	13.5	(3.0)	24.3	(4.9)	17.3	(2.0)
Private sale— onsite hunting	5.8	(2.8)	4.6	(2.3)	4.1	(1.8)	15.1	(4.0)	6.8	(1.3)
Private sale— for meat or other products	4.3	(2.4)	16.5	(4.0)	15.5	(3.2)	16.6	(4.2)	13.9	(1.8)
Traded or given away	6.3	(3.0)	2.3	(1.6)	2.3	(1.3)	5.3	(2.6)	3.7	(1.0)
Lost or stolen	0.0	(—)	1.1	(1.1)	3.1	(1.5)	0.0	(—)	1.4	(0.6)
Other	2.9	(2.0)	1.1	(1.1)	6.2	(2.1)	4.3	(2.4)	4.0	(1.0)

For the 60.4 percent of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch), percentage of operations by method of bison removal*



*Sorted high to low.

Overall, for operations that had any bison permanently leave the operation (including bison slaughtered on the ranch), the percentage of operations that had bison leave differed with the age of bison that left. More than 70 percent of operations (71.3 percent) had bison 1 to 3 years old leave, whereas a lower percentage (54.0 percent) had bison more than 3 years old permanently leave the operation. The lowest percentage of operations (23.3 percent) had bison less than 1 year old leave.

For bison aged more than 3 years old or 1 to 3 years old, the methods of removal used by the highest percentages of operations were slaughtered on ranch and direct to offsite slaughter/packer. For bison less than 1 year old, the methods of removal used by the highest percentages of operations were private sale—for breeding stock, sold at auction/sale barn, and direct to feedlot.

A.4.f. For the 60.4 percent of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) [table A.4.a], percentage of operations by method of removal and by age of bison removed:

	Percent Operations					
	Age (years)					
	More than 3		**1 to 3**		**Less than 1**	
Method of removal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Slaughtered on ranch	25.9	(2.3)	22.5	(2.2)	0.8	(0.5)
Direct to offsite slaughter/packer	19.2	(2.1)	28.2	(2.4)	0.5	(0.4)
Direct to feedlot	0.8	(0.5)	4.3	(1.1)	4.7	(1.1)
Sold at auction/sale barn	3.1	(0.9)	4.4	(1.1)	6.7	(1.3)
Sold to dealers	1.4	(0.6)	2.5	(0.8)	2.2	(0.8)
Private sale— for breeding stock	6.5	(1.3)	9.9	(1.6)	6.8	(1.3)
Private sale—onsite hunting	5.2	(1.2)	3.4	(1.0)	0.3	(0.3)
Private sale— for meat or other products	3.6	(1.0)	9.7	(1.6)	1.9	(0.7)
Traded or given away	1.2	(0.6)	1.4	(0.6)	1.7	(0.7)
Lost or stolen	0.6	(0.4)	0.3	(0.3)	0.6	(0.4)
Other	1.7	(0.7)	1.2	(0.6)	1.4	(0.6)
Any	54.0	(2.6)	71.3	(2.4)	23.3	(2.2)

Overall, for operations that had any bison permanently leave the operation, a higher percentage of bison removed (71.8 percent) were aged 1 to 3 years than more than 3 years (16.1 percent) or less than 1 year (12.1 percent).

Almost two-thirds of bison removed (62.4 percent) consisted of bison aged 1 to 3 years going directly to offsite slaughter/packer.

A.4.g. For the 60.4 percent of operations that had any live bison permanently leave the operation (including bison slaughtered on the ranch) [table A.4.a], and for the 31.3 percent of bison that were removed (table A.4.c), percentage of bison removed, by method of removal and by age of bison:

	Percent Bison*							
	Age (years)							
	More than 3		**1 to 3**		**Less than 1**		**Total**	
Method of removal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Slaughtered on ranch	1.6	(0.9)	1.7	(0.9)	0.0	(0.0)	3.3	(1.8)
Direct to offsite slaughter/packer	12.5	(2.0)	62.4	(11.6)	1.0	(1.0)	76.0	(12.5)
Direct to feedlot	0.3	(0.3)	3.5	(2.4)	4.1	(2.6)	7.9	(4.6)
Sold at auction/ sale barn	0.2	(0.1)	0.5	(0.4)	2.0	(1.5)	2.7	(1.8)
Sold to dealers	0.0	(0.0)	0.2	(0.1)	0.4	(0.3)	0.6	(0.4)
Private sale— for breeding stock	0.5	(0.3)	1.0	(0.6)	2.3	(1.8)	3.7	(2.4)
Private sale— onsite hunting	0.6	(0.2)	0.8	(0.7)	0.0	(0.0)	1.4	(0.8)
Private sale— for meat or other products	0.2	(0.1)	1.2	(0.8)	2.0	(1.7)	3.4	(2.3)
Traded or given away	0.1	(0.1)	0.3	(0.3)	0.1	(0.1)	0.6	(0.4)
Lost or stolen	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Other	0.0	(0.0)	0.1	(0.1)	0.3	(0.2)	0.4	(0.3)
Total	16.1	(1.6)	71.8	(7.0)	12.1	(6.7)	100.0	(0.0)

*As a percentage of bison removed.

Overall, 10.6 percent of operations that had any bison permanently leave the operation used mobile units for slaughtering bison. The percentage of operations using mobile slaughter units did not differ by size of operation.

A.4.h. For the 60.4 percent of operations that had any live bison permanently leave the operation's herd (including bison slaughtered on the ranch) [table A.4.a], percentage of operations that used mobile units for slaughtering bison, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
18.9	(4.9)	5.9	(2.6)	10.7	(2.7)	8.7	(3.2)	10.6	(1.6)

The percentage of operations that used mobile slaughter units did not differ by region, with the exception of the Northeast region, where operations did not use mobile slaughter units.

A.4.i. For the 60.4 percent of operations that had any bison permanently leave the operation's herd (including bison slaughtered on the ranch) [table A.4.a], percentage of operations that used mobile units for slaughtering bison, by region:

Percent Operations

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	5.0	(4.9)	7.2	(2.6)	14.4	(2.4)

Respondents who had bison permanently leave the operation were asked whether they had exported live bison or bison products to other countries. No operations reported exporting to other countries.

5. Bison deaths due to natural causes

Producers were asked to report the number of bison that died or were euthanized because of natural causes, such as disease, injury, or weather-related problems. Overall, about two-fifths of operations (41.3 percent) had any bison die due to natural causes. The percentage of operations that had bison die due to natural causes increased as herd size increased, ranging from 12.6 percent of very small operations to 82.1 percent of large operations.

A.5.a. Percentage of operations on which any bison died or were euthanized due to natural causes, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
12.6	(2.2)	37.3	(4.2)	65.3	(3.8)	82.1	(4.1)	41.3	(2.0)

A higher percentage of operations in the North Central region (49.2 percent) than in the Southeast region (27.7 percent) had any bison die or be euthanized because of natural causes.

A.5.b. Percentage of operations on which any bison died or were euthanized due to natural causes, by region:

Percent Operations

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
37.9	(6.4)	27.7	(6.1)	49.2	(4.2)	41.2	(2.6)

Overall, 2.3 percent of bison, as a percentage of the July 1, 2014, inventory, died or were euthanized due to natural causes. Large operations had a lower percentage of bison die (2.1 percent) than small (4.9 percent) or medium (3.8 percent) operations. In part, this might reflect that bison on large operations could be spread over a larger land area and thus might experience less stress and/or might be more difficult to monitor.

A.5.c. For the 41.3 percent of operations on which any bison died or were euthanized due to natural causes (table A.5.a), percentage of bison that died, by size of operation:

Percent Bison*

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
4.2	(0.9)	4.9	(1.0)	3.8	(0.4)	2.1	(0.2)	2.3	(0.3)

*As a percentage of bison inventory on July 1, 2014.

Operations in the West region had a lower percentage of bison die (2.2 percent) than operations in the Northeast region (6.6 percent) or Southeast region (5.3 percent).

A.5.d. For the 41.3 percent of operations on which any bison died or were euthanized due to natural causes (table A.5.a), percentage of bison that died, by region:

Percent Bison*

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
6.6	(1.6)	5.3	(1.3)	2.7	(0.4)	2.2	(0.2)

*As a percentage of bison inventory on July 1, 2014.

Overall, of operations that had any bison die, three-fifths (60.6 percent) attributed bison deaths or euthanizations to disease, disorder, or other health problem. About one-fifth of operations had bison die because of injury or trauma not related to predation or handling (22.5 percent) or from unknown causes (18.2 percent). About one-tenth of operations had bison die because of handling-related problems (12.8 percent) or weather-related problems (10.7 percent), and 3.9 percent had bison die because of predation. About one-seventh of operations (15.4 percent) had bison die because of "other" causes.

There were few differences in natural causes of death by operation size, although a higher percentage of large operations than operations in the three smaller size categories had bison die because of handling-related problems. No very small operations lost bison to predation.

A.5.e. For the 41.3 percent of operations on which any bison died or were euthanized due to natural causes (table A.5.a), percentage of operations by cause of death and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Cause of death	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Disease, disorder, or other health problem	52.0	(9.3)	48.1	(7.1)	62.3	(4.8)	70.6	(5.3)	60.6	(3.1)
Injury/trauma (not related to predation or handling)	21.6	(7.8)	23.2	(6.1)	19.6	(3.9)	26.6	(5.2)	22.5	(2.7)
Predation	0.0	(—)	4.0	(2.8)	2.9	(1.7)	6.8	(2.9)	3.9	(1.2)
Handling-related problem	6.8	(4.7)	4.0	(2.8)	8.6	(2.7)	27.5	(5.3)	12.8	(2.1)
Weather-related problem (e.g., lightning, flood)	3.4	(3.4)	16.4	(5.3)	9.1	(2.9)	11.9	(3.7)	10.7	(1.9)
Other	17.5	(7.1)	15.8	(5.2)	14.7	(3.5)	15.3	(4.3)	15.4	(2.3)
Unknown	10.9	(6.0)	10.6	(4.5)	19.4	(3.9)	24.8	(5.1)	18.2	(2.4)

There were few differences by region in the percentage of operations on which any bison died or were euthanized due to natural causes. No bison died because of predation in the Northeast or Southeast regions. A higher percentage of operations in the West region (17.3 percent) than in the North Central region (4.4 percent) had bison die because of handling-related problems.

A.5.f. For the 41.3 percent of operations on which any bison died or were euthanized due to natural causes (table A.5.a), percentage of operations by cause of death and by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Cause of death	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Disease, disorder, or other health problem	68.1	(9.9)	73.2	(11.5)	60.5	(5.8)	58.0	(4.1)
Injury/trauma (not related to predation or handling)	14.3	(7.6)	39.9	(12.6)	23.6	(5.2)	20.8	(3.3)
Predation	0.0	(—)	0.0	(—)	1.5	(1.5)	6.1	(2.0)
Handling-related problem	9.5	(6.4)	13.2	(8.7)	4.4	(2.5)	17.3	(3.1)
Weather-related problem (e.g., lightning, flood)	9.5	(6.4)	13.4	(8.8)	8.8	(3.4)	11.3	(2.6)
Other	9.5	(6.4)	6.6	(6.4)	17.7	(4.6)	16.3	(3.0)
Unknown	14.3	(7.6)	20.0	(10.3)	16.2	(4.5)	19.5	(3.3)

Overall, for operations that had any bison die or be euthanized due to natural causes, a higher percentage of operations lost bison more than 3 years old (61.7 percent) than lost bison in the other two age categories.

For all three age categories, the highest percentage of operations lost bison due to disease, disorder, or other health problem.

A.5.g. For the 41.3 percent of operations on which any bison died or were euthanized due to natural causes (table A.5.a), percentage of operations by cause of death and by age of bison:

	Percent Operations					
	Age (years)					
	More than 3		**1 to 3**		**Less than 1**	
Cause of death	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Disease, disorder, or other health problem	38.1	(3.2)	19.5	(2.6)	27.5	(3.0)
Injury/trauma (not related to predation or handling)	12.9	(2.2)	7.1	(1.7)	7.9	(1.8)
Predation	0.4	(0.4)	1.3	(0.7)	2.6	(1.1)
Handling-related problem	6.9	(1.7)	4.3	(1.3)	5.6	(1.5)
Weather-related problem (e.g., lightning, flood)	6.7	(1.7)	3.0	(1.1)	6.0	(1.6)
Other	7.5	(1.8)	0.9	(0.6)	0.9	(0.6)
Unknown	9.0	(1.9)	4.4	(1.4)	5.3	(1.5)
Any	61.7	(3.2)	32.8	(3.1)	44.6	(3.3)

Photograph courtesy of Matthew S. Patyk.

Overall, of bison that died or were euthanized due to natural causes, 72.5 percent died because of disease, disorder, or other health problem. About one-tenth (9.4 percent) died because of weather-related problems, and about 5 percent died because of handling-related problems (5.5 percent) or injury/trauma not related to predation or handling (5.1 percent). The majority of deaths occurred in bison aged 1 to 3 years (57.8 percent).

Within each age group, the highest percentage of deaths was caused by disease, disorder, or other health problem. Almost half of all deaths (47.8 percent) were in bison aged 1 to 3 years that died from disease, disorder, or other health problem.

A.5.h. For the 41.3 percent of operations on which any bison died or were euthanized due to natural causes (table A.5.a), percentage of bison deaths by cause of death and by age of bison:

Percent Bison*

Age (years)

	More than 3		1 to 3		Less than 1		All operations	
Cause of death	**Pct.**	**Std. error**	**Pct.**	**Pct.**	**Std. error**	**Pct.**	**Pct.**	**Std. error**
Disease, disorder, or other health problem	15.4	(1.9)	47.8	15.4	(1.9)	47.8	72.5	(9.7)
Injury/trauma (not related to predation or handling)	2.3	(0.7)	1.5	2.3	(0.7)	1.5	5.1	(1.9)
Predation	0.2	(0.2)	0.4	0.2	(0.2)	0.4	1.1	(0.6)
Handling-related problem	2.3	(0.5)	2.0	2.3	(0.5)	2.0	5.5	(0.8)
Weather-related problem (e.g., lightning, flood)	3.3	(2.1)	4.8	3.3	(2.1)	4.8	9.4	(5.6)
Other	1.7	(0.9)	0.1	1.7	(0.9)	0.1	2.1	(1.1)
Unknown	2.0	(1.0)	1.1	2.0	(1.0)	1.1	4.4	(2.0)
Total	27.2	(5.1)	57.8	27.2	(5.1)	57.8	100.0	(0.0)

*As a percentage of bison that died.

B. Operation Management

Note: Unless otherwise noted, tables in this section refer to the period July 1, 2013, through June 30, 2014.

1. Reasons for having bison and plans for herd

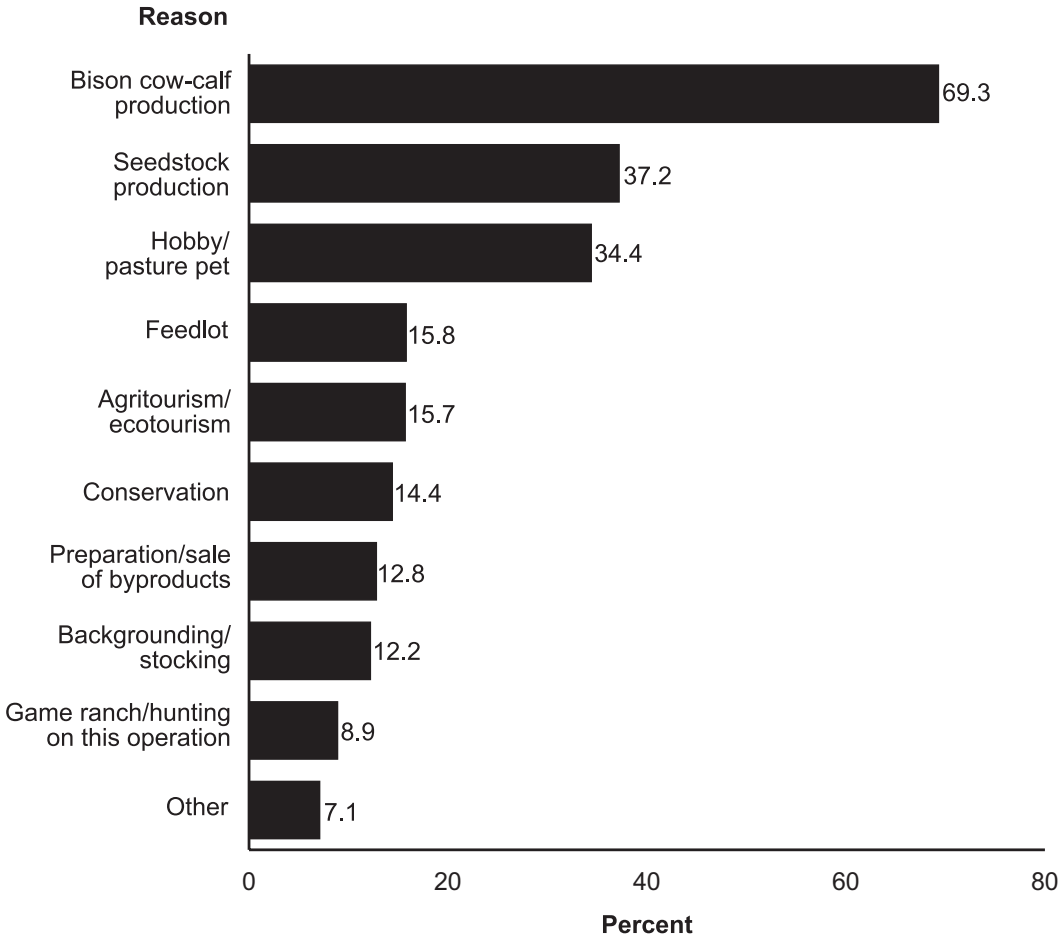
The bison industry is exceptionally diversified. Many operations participate in multiple aspects of the business. Nearly 70 percent of all operations (69.3 percent) were involved in bison cow-calf production. Approximately one-third of operations had bison for seedstock production (37.2 percent) and/or kept bison as a hobby or pasture pet (34.4 percent). Other common reasons for having bison included feedlot (15.8 percent), agritourism/ecotourism (15.7 percent) and conservation (14.4 percent).

A lower percentage of very small operations kept bison for bison cow-calf production (41.0 percent), seedstock production (23.6 percent), and preparation/sale of byproducts (3.0 percent) compared with operations in all other size categories. A higher percentage of large operations (44.1 percent) kept bison for backgrounding/stocking than operations in the other size categories. A lower percentage of very small operations kept bison for backgrounding/stocking (1.2 percent) than medium operations (15.6 percent). A higher percentage of large operations (47.1 percent) kept bison for feedlot than operations in the three smaller size categories. The percentage of operations that kept bison for hobby/pasture pet decreased with increasing operation size. A higher percentage of very small operations (12.1 percent) kept bison for “other” reasons than medium operations (3.1 percent). Of operations that listed “other” reasons for having bison, three-fifths indicated that they kept bison for training cutting horses.

B.1.a. Percentage of operations by reason(s) bison were kept on the operation, and by size of operation:

	Percent Operations									
	Size of Operation (number of bison)									
	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bison cow-calf production (offspring intended for meat production)	41.0	(3.3)	79.0	(3.5)	90.3	(2.4)	92.1	(2.9)	69.3	(1.9)
Seedstock production (offspring intended for breeding purposes)	23.6	(2.8)	42.8	(4.3)	42.0	(3.9)	56.4	(5.3)	37.2	(2.0)
Backgrounding/ stocking (young bison prepared for a feedlot)	1.2	(0.7)	6.5	(2.1)	15.6	(2.9)	44.1	(5.3)	12.2	(1.3)
Feedlot (bison from this or other operations being finished for slaughter)	4.2	(1.3)	12.6	(2.9)	18.3	(3.0)	47.1	(5.3)	15.8	(1.5)
Game ranch/ hunting on this operation	5.0	(1.4)	10.5	(2.7)	9.7	(2.4)	15.4	(3.8)	8.9	(1.1)
Preparation/sale of byproducts (e.g., hides, skulls, horns, hair)	3.0	(1.1)	15.6	(3.1)	21.1	(3.2)	19.9	(4.3)	12.8	(1.4)
Conservation	10.8	(2.0)	15.4	(3.2)	16.3	(2.9)	19.2	(4.2)	14.4	(1.4)
Hobby/ pasture pet	56.6	(3.3)	37.9	(4.2)	16.5	(3.0)	2.2	(1.6)	34.4	(1.9)
Agritourism/ ecotourism	12.0	(2.2)	17.3	(3.3)	20.9	(3.2)	13.5	(3.7)	15.7	(1.5)
Other	12.1	(2.2)	4.6	(1.8)	3.1	(1.4)	4.6	(2.2)	7.1	(1.0)

Percentage of operations by reason(s) bison were kept on the operation*



*Sorted high to low.

A higher percentage of operations in the West region (15.5 percent) kept bison on the operation for backgrounding/stocking than operations in the Southeast region (3.9 percent). A lower percentage of operations in the Southeast region (3.9 percent) kept bison for feedlot than operations in the North Central (23.6 percent) or West (14.5 percent) regions.

B.1.b. Percentage of operations by reason(s) bison were kept on the operation, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Reason	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison cow-calf production (offspring intended for meat production)	70.7	(6.0)	58.8	(6.9)	77.7	(3.5)	67.6	(2.5)
Seedstock production (offspring intended for breeding purposes)	31.0	(6.1)	37.2	(6.8)	41.0	(4.1)	36.6	(2.6)
Backgrounding/ stocking (young bison prepared for a feedlot)	6.9	(3.3)	3.9	(2.7)	9.7	(2.5)	15.5	(1.9)
Feedlot (bison from this or other operations being finished for slaughter)	17.2	(5.0)	3.9	(2.7)	23.6	(3.5)	14.5	(1.8)
Game ranch/ hunting on this operation	5.2	(2.9)	5.9	(3.3)	4.2	(1.7)	12.0	(1.7)
Preparation/sale of byproducts (e.g., hides, skulls, horns, hair)	18.9	(5.1)	7.8	(3.7)	18.7	(3.3)	10.4	(1.6)
Conservation	8.6	(3.7)	11.8	(4.5)	9.0	(2.4)	18.0	(2.0)
Hobby/pasture pet	39.7	(6.4)	45.1	(7.0)	30.7	(3.8)	33.3	(2.5)
Agritourism/ ecotourism	20.7	(5.3)	23.5	(5.9)	15.3	(3.0)	13.7	(1.8)
Other	5.2	(2.9)	5.9	(3.3)	4.9	(1.8)	8.5	(1.5)

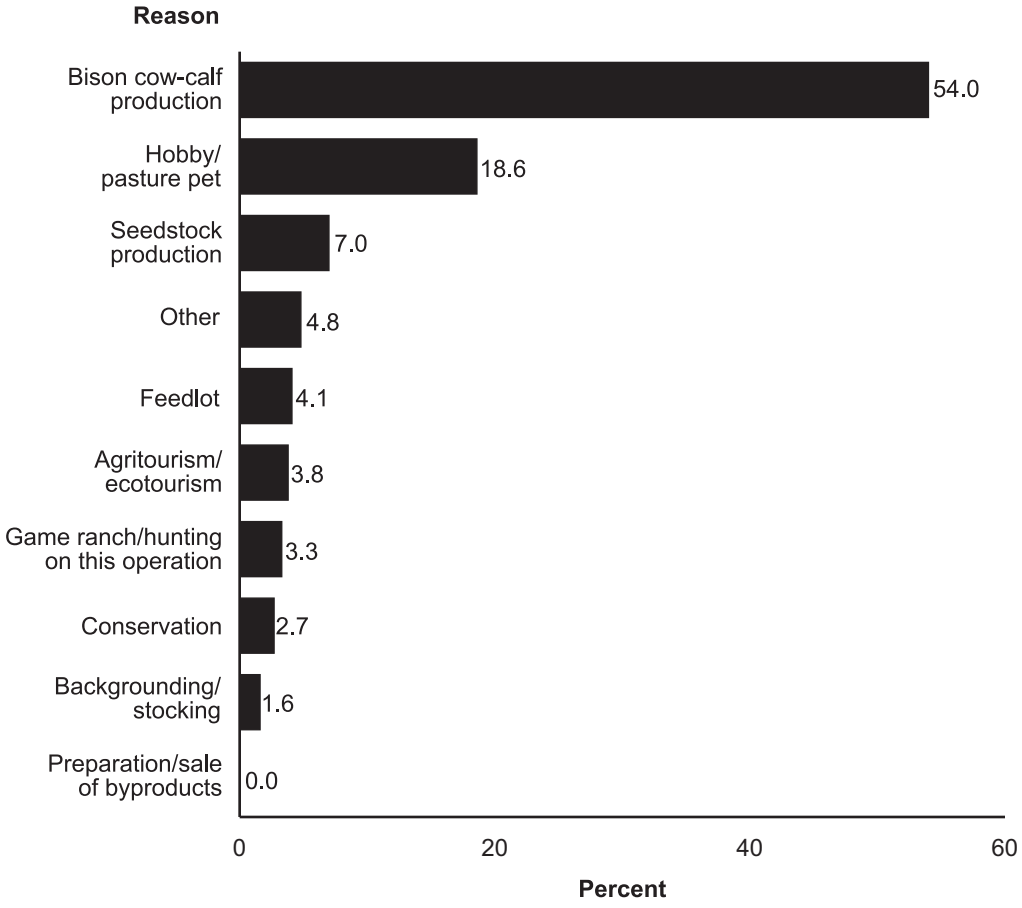
Although many respondents identified multiple reasons for having bison (table B.1.a), operations typically had one purpose or product that was the focus of the business. Among all bison operations, more than half (54.0 percent) raised bison primarily for cow-calf production, and nearly one-fifth (18.6 percent) kept bison primarily as a hobby or pasture pet.

A lower percentage of very small operations (29.3 percent) kept bison primarily for bison cow-calf production than operations in the three larger size categories. A higher percentage of large operations (13.0 percent) kept bison primarily for feedlot than very small operations (2.2 percent) or small operations (1.5 percent). No large operations kept bison primarily for hobby/pasture pet (0.0 percent) or agritourism/ecotourism (0.0 percent). A higher percentage of very small operations (37.8 percent) than operations in the other size categories kept bison primarily for hobby/pasture pet. A higher percentage of very small operations (9.8 percent) kept bison primarily for “other” reasons than small operations (2.2 percent) or medium operations (0.6 percent).

B.1.c. Percentage of operations by **primary** reason bison were kept on the operation, and by size of operation:

	Percent Operations									
	Size of Operation (number of bison)									
	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bison cow-calf production (offspring intended for meat production)	29.3	(3.0)	62.6	(4.2)	73.4	(3.5)	70.5	(5.0)	54.0	(2.0)
Seedstock production (offspring intended for breeding purposes)	7.7	(1.8)	8.6	(2.5)	6.4	(2.0)	3.6	(2.0)	7.0	(1.1)
Backgrounding/ stocking (young bison prepared for a feedlot)	0.4	(0.4)	1.5	(1.0)	1.9	(1.1)	4.7	(2.3)	1.6	(0.5)
Feedlot (bison from this or other operations being finished for slaughter)	2.2	(1.0)	1.5	(1.1)	4.2	(1.6)	13.0	(3.7)	4.1	(0.8)
Game ranch/ hunting on this operation	3.0	(1.1)	3.6	(1.6)	4.1	(1.6)	2.3	(1.6)	3.3	(0.7)
Preparation/sale of byproducts (e.g., hides, skulls, horns, hair)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Conservation	3.3	(1.2)	3.0	(1.5)	1.9	(1.1)	2.3	(1.6)	2.7	(0.7)
Hobby/ pasture pet	37.8	(3.3)	13.2	(3.0)	5.7	(1.9)	0.0	(—)	18.6	(1.6)
Agritourism/ ecotourism	6.5	(1.7)	3.8	(1.7)	1.9	(1.1)	0.0	(—)	3.8	(0.8)
Other	9.8	(2.0)	2.2	(1.2)	0.6	(0.6)	3.6	(2.0)	4.8	(0.9)
Total	100.0		100.0		100.0		100.0		100.0	

Percentage of operations by *primary* reason bison were kept on the operation*



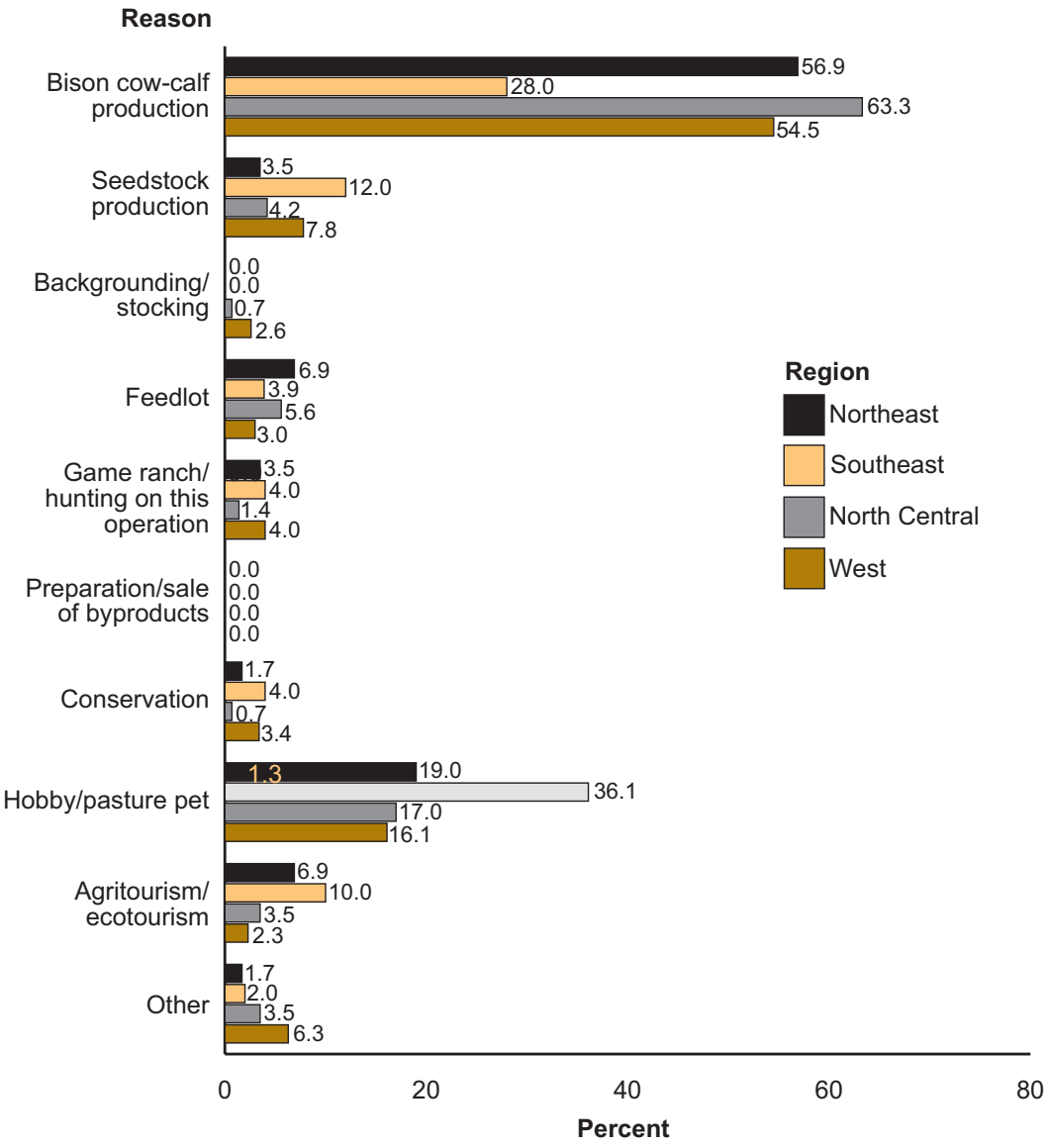
*Sorted high to low.

A lower percentage of operations in the Southeast region (28.0 percent) than operations in the other three regions kept bison primarily for bison cow-calf production. No operations in the Northeast (0.0 percent) or Southeast (0.0 percent) regions kept bison primarily for backgrounding/stocking.

B.1.d. Percentage of operations by **primary** reason bison were kept on the operation, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Reason	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison cow-calf production (offspring intended for meat production)	56.9	(6.5)	28.0	(6.3)	63.3	(4.0)	54.5	(2.7)
Seedstock production (offspring intended for breeding purposes)	3.5	(2.4)	12.0	(4.6)	4.2	(1.7)	7.8	(1.4)
Backgrounding/ stocking (young bison prepared for a feedlot)	0.0	(—)	0.0	(—)	0.7	(0.7)	2.6	(0.8)
Feedlot (bison from this or other operations being finished for slaughter)	6.9	(3.3)	3.9	(2.7)	5.6	(1.9)	3.0	(0.9)
Game ranch/ hunting on this operation	3.5	(2.4)	4.0	(2.8)	1.4	(1.0)	4.0	(1.1)
Preparation/sale of byproducts (e.g., hides, skulls, horns, hair)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Conservation	1.7	(1.7)	4.0	(2.8)	0.7	(0.7)	3.4	(1.0)
Hobby/pasture pet	19.0	(5.2)	36.1	(6.8)	17.0	(3.2)	16.1	(2.0)
Agritourism/ ecotourism	6.9	(3.3)	10.0	(4.3)	3.5	(1.6)	2.3	(0.8)
Other	1.7	(1.7)	2.0	(2.0)	3.5	(1.6)	6.3	(1.3)
Total	100.0		100.0		100.0		100.0	

Percentage of operations by *primary* reason bison were kept on the operation, and by region



The majority of bison on large operations (88.1 percent) were kept primarily for cow-calf production. A lower percentage of bison on very small operations (37.4 percent) were kept primarily for bison cow-calf production than on operations in the other size categories. A lower percentage of bison on large operations (0.6 percent) were kept primarily for seedstock production than bison on operations in the other size categories. No bison on large operations were kept primarily for hobby/pasture pet (0.0 percent) or agritourism/ecotourism (0.0 percent). Very small operations had the highest percentage of bison kept primarily for hobby/pasture pet (30.7 percent).

B.1.e. Percentage of bison by **primary** reason bison were kept on the operation, and by size of operation:

	Percent Bison*									
	Size of Operation (number of bison)									
	Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
Reason	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison cow-calf production (offspring intended for meat production)	37.4	(4.0)	64.9	(4.4)	74.7	(3.7)	88.1	(7.5)	85.9	(7.6)
Seedstock production (offspring intended for breeding purposes)	8.4	(2.2)	8.5	(2.6)	7.0	(2.2)	0.6	(0.5)	1.4	(0.8)
Backgrounding/ stocking (young bison prepared for a feedlot)	0.8	(0.8)	1.8	(1.2)	2.0	(1.2)	1.1	(0.9)	1.2	(0.8)
Feedlot (bison from this or other operations being finished for slaughter)	1.6	(0.9)	0.7	(0.7)	3.0	(1.3)	8.8	(6.1)	8.0	(5.0)
Game ranch/ hunting on this operation	2.5	(1.3)	4.7	(2.1)	3.7	(1.5)	0.7	(0.6)	1.0	(0.7)
Preparation/sale of byproducts (e.g., hides, skulls, horns, hair)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Conservation	3.7	(1.5)	3.2	(1.6)	2.5	(1.5)	0.4	(0.4)	0.7	(0.5)
Hobby/ pasture pet	30.7	(3.7)	10.8	(2.7)	5.3	(1.8)	0.0	(—)	1.0	(0.5)
Agritourism/ ecotourism	5.8	(1.8)	3.9	(1.7)	1.4	(0.8)	0.0	(—)	0.3	(0.2)
Other	9.0	(2.2)	1.6	(0.9)	0.4	(0.4)	0.3	(0.3)	0.5	(0.3)
Total	100.0		100.0		100.0		100.0		100.0	

*As a percentage of July 1, 2014, inventory.

A lower percentage of bison on operations in the Southeast region (39.5 percent) were kept primarily for bison cow-calf production than on operations in the Northeast (80.3 percent) or West (87.8 percent) regions.

B.1.f. Percentage of bison by **primary** reason bison were kept on the operation, and by region:

	Percent Bison*							
	Region							
	Northeast		Southeast		North Central		West	
Reason	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison cow-calf production (offspring intended for meat production)	80.3	(6.2)	39.5	(13.2)	75.0	(9.5)	87.8	(7.5)
Seedstock production (offspring intended for breeding purposes)	1.1	(0.9)	6.1	(3.5)	3.3	(2.1)	1.2	(0.7)
Backgrounding/ stocking (young bison prepared for a feedlot)	0.0	(—)	0.0	(—)	1.0	(1.0)	1.2	(1.0)
Feedlot (bison from this or other operations being finished for slaughter)	8.8	(5.1)	34.0	(17.3)	14.6	(9.9)	7.0	(5.1)
Game ranch/ hunting on this operation	1.0	(1.0)	6.0	(4.4)	0.7	(0.6)	1.0	(0.8)
Preparation/sale of byproducts (e.g., hides, skulls, horns, hair)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Conservation	0.2	(0.2)	0.5	(0.4)	0.2	(0.2)	0.8	(0.5)
Hobby/pasture pet	4.2	(1.9)	11.3	(4.9)	1.9	(0.6)	0.7	(0.4)
Agritourism/ ecotourism	3.4	(1.9)	2.4	(1.6)	1.5	(0.9)	0.1	(0.1)
Other	0.9	(0.9)	0.3	(0.3)	1.8	(1.7)	0.3	(0.3)
Total	100.0		100.0		100.0		100.0	

* As a percentage of July 1, 2014, inventory.

The American bison herd was nearly eliminated by the late 1880s. At that time, fewer than 1,000 animals remained. An effort was initiated to save the species from extinction both by saving the bison and by protecting grazing land. As a result, the number of bison on public lands began to increase, and private ranchers began to raise bison. The commercial bison industry is a relatively new business that, generally speaking, began in the late 1960s. Almost 20 percent of all bison operations (19.7 percent) had raised bison at the location for more than 20 years.

In general, larger operations had raised bison at the location longer than smaller operations, which might reflect the time required to build a large bison herd. Higher percentages of very small (27.3 percent) and small operations (18.1 percent) had raised bison at the location for 0 to 5 years compared with large operations (4.5 percent), and a higher percentage of very small operations had raised bison at the location 0 to 5 years than medium operations (7.7 percent). A higher percentage of medium (50.6 percent) and large operations (56.4 percent) had raised bison at the location for 11 to 20 years compared with very small operations (29.4 percent), and a higher percentage of large operations had raised bison at the location for 11 to 20 years than small operations (35.7 percent). A higher percentage of large operations (36.1 percent) than very small (8.6 percent) or small (18.0 percent) operations had raised bison at the location for more than 20 years. A higher percentage of medium operations (27.4 percent) than very small operations (8.6 percent) had raised bison on the operation more than 20 years.

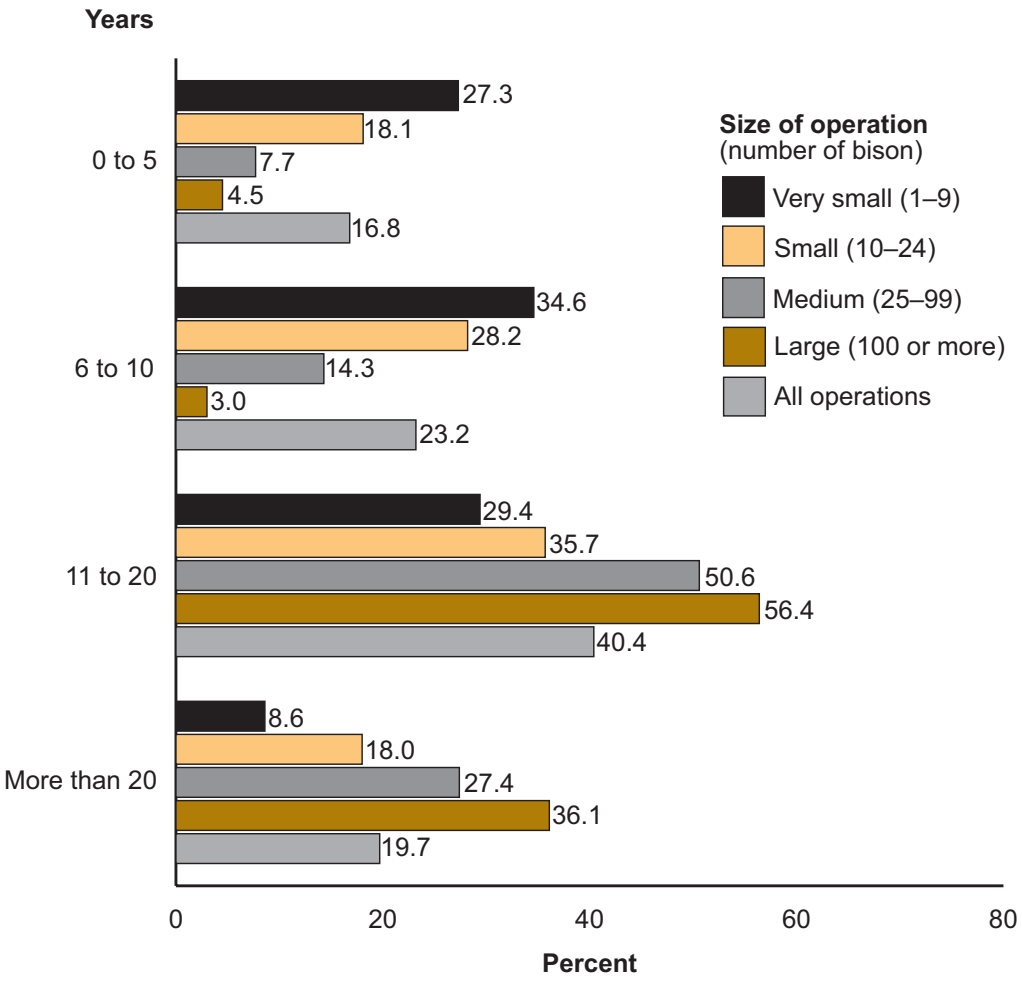
B.1.g. Percentage of operations by number of years bison had been raised at the current location, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Years	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0 to 5	27.3	(3.1)	18.1	(3.4)	7.7	(2.1)	4.5	(2.2)	16.8	(1.6)
6 to 10	34.6	(3.3)	28.2	(3.9)	14.3	(2.8)	3.0	(1.7)	23.2	(1.8)
11 to 20	29.4	(3.1)	35.7	(4.2)	50.6	(4.0)	56.4	(5.3)	40.4	(2.0)
More than 20	8.6	(1.9)	18.0	(3.3)	27.4	(3.6)	36.1	(5.1)	19.7	(1.6)
Total	100.0		100.0		100.0		100.0		100.0	

Percentage of operations by number of years bison had been raised at the current location, and by size of operation



There were no regional differences in the number of years bison had been raised at the location.

B.1.h. Percentage of operations by number of years bison had been raised at the current location, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Years	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
0 to 5	19.7	(5.3)	22.0	(5.9)	12.1	(2.8)	17.3	(2.1)
6 to 10	19.6	(5.3)	40.0	(6.9)	19.2	(3.3)	22.3	(2.3)
11 to 20	35.7	(6.4)	28.0	(6.3)	45.4	(4.2)	41.3	(2.7)
More than 20	25.0	(5.8)	10.0	(4.2)	23.3	(3.6)	19.1	(2.1)
Total	100.0		100.0		100.0		100.0	

Financial resources and time are needed to grow a bison herd. The industry as a whole experienced several ups and downs over the past few decades. The industry grew rapidly in the 1990s as bison prices increased during a difficult period for the cattle market. By the turn of the century, though, the price of live animals dropped during a period of low consumer demand for bison meat as well as a severe drought, creating challenges for the bison industry. Currently, the industry is experiencing a period of growth driven by consumer demand for bison meat.

Producers were asked about their plans for their bison herd for the following year. Of all operations, more than three-fourths planned to increase their herd size (25.7 percent) or maintain the same herd size (54.0 percent) over the upcoming year; on the other hand, 11.6 percent planned to decrease herd size and 8.7 percent planned to get out of the business. A higher percentage of large operations (40.5 percent) planned to increase herd size over the upcoming year compared with very small (22.9 percent) or medium (18.6 percent) operations. A higher percentage of very small operations (16.9 percent) planned to get out of the business in the next year compared with operations in the other size categories.

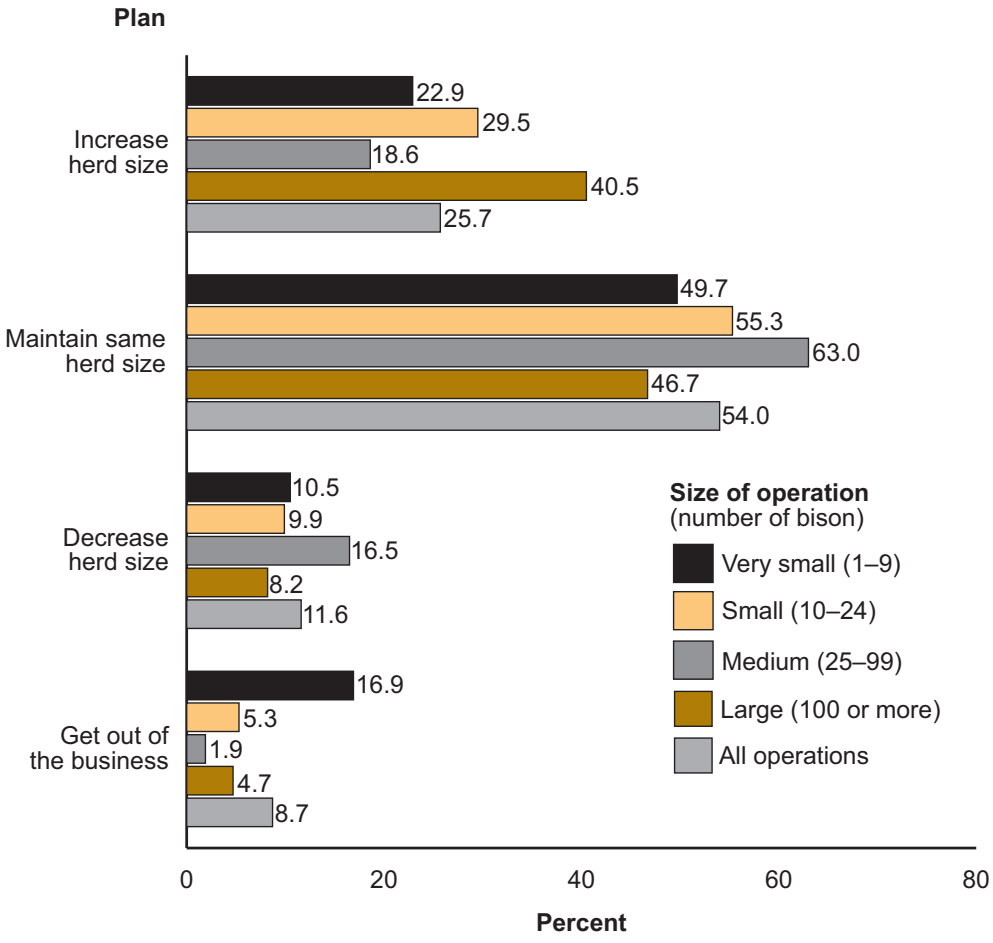
B.1.i. Percentage of operations by plan for the bison herd in the next year, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Plan	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Increase herd size	22.9	(2.8)	29.5	(4.0)	18.6	(3.1)	40.5	(5.3)	25.7	(1.8)
Maintain same herd size	49.7	(3.4)	55.3	(4.4)	63.0	(3.9)	46.7	(5.4)	54.0	(2.0)
Decrease herd size	10.5	(2.0)	9.9	(2.6)	16.5	(3.0)	8.2	(3.0)	11.6	(1.3)
Get out of the business	16.9	(2.5)	5.3	(2.0)	1.9	(1.1)	4.7	(2.3)	8.7	(1.2)
Total	100.0		100.0		100.0		100.0		100.0	

Percentage of operations by plan for the bison herd in the next year, and by size of operation



2. Pasturing and grazing practices

As ruminants, bison should have sufficient forage in their diets for rumination. Forage can be provided as part of a mixed ration, offered in a feeder, or provided through grazing. More than 85 percent of operations (87.9 percent) had at least some bison on range/pasture at some point during the reference period.

All large operations (100.0 percent) had bison on range/pasture. This percentage was higher than the percentages for the three smaller size categories. A higher percentage of medium operations (95.6 percent) had any bison on range/pasture compared with very small operations (78.3 percent).

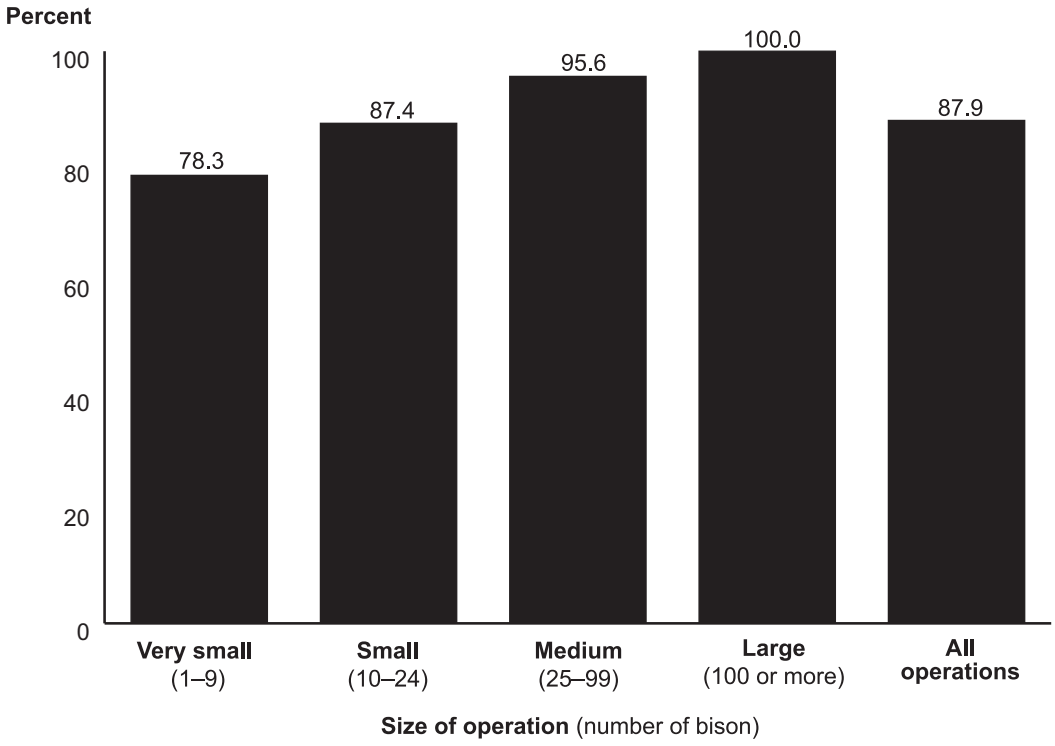
B.2.a. Percentage of operations that had any bison on range/pasture during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
78.3	(2.7)	87.4	(2.9)	95.6	(1.7)	100.0	(—)	87.9	(1.3)

Percentage of operations that had any bison on range/pasture, by size of operation



Grazing strategies are tied to many aspects of operation management, including available forage, pasture management practices, stocking rate and density, and the intended purpose of the bison. Of operations that had any bison on range/pasture, 71.4 percent had bison on range/pasture for 12 months, 21.4 percent for 6 to 11 months, and 7.2 percent for less than 6 months. There were no differences by size of operation in the number of months bison were on range/pasture.

B.2.b. For the 87.9 percent of operations that had any bison on range/pasture (table B.2.a), percentage of operations by number of months bison were on pasture, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Months	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 6	10.1	(2.3)	6.1	(2.2)	5.5	(1.9)	5.9	(2.6)	7.2	(1.1)
6 to 11	17.5	(2.9)	20.4	(3.8)	22.9	(3.5)	28.0	(4.9)	21.4	(1.8)
12	72.4	(3.5)	73.6	(4.2)	71.6	(3.7)	66.1	(5.1)	71.4	(2.0)
Total	100.0		100.0		100.0		100.0		100.0	

For operations that had any bison on range/pasture, a lower percentage of operations in the Southeast region (2.4 percent) than operations in the other regions kept bison on pasture 6 to 11 months. A higher percentage of operations in the Southeast region (95.2 percent) kept bison on pasture for 12 months compared with operations in the other regions.

B.2.c. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations by number of months bison were kept on pasture, and by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Months	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Less than 6	4.0	(2.8)	2.4	(2.4)	7.5	(2.4)	8.5	(1.6)
6 to 11	34.0	(6.7)	2.4	(2.4)	30.9	(4.2)	18.9	(2.3)
12	62.0	(6.9)	95.2	(3.3)	61.6	(4.4)	72.6	(2.6)
Total	100.0		100.0		100.0		100.0	

Of operations that kept any bison on range/pasture, 60.5 percent rounded up the majority of their pastured bison at least once (27.4 percent, one time; 17.2 percent, two times; 15.9 percent, three or more times). Almost two-fifths of operations that had any bison on range/pasture (39.5 percent) did not round up their bison.

Higher percentages of very small and small operations than medium or large operations did not round up bison on range/pasture. A higher percentage of medium operations (26.4 percent) than large operations (7.1 percent) did not round up any bison on range/pasture. A higher percentage of large operations (64.3 percent) than operations in the smaller size categories rounded up bison on range/pasture one time, and a higher percentage of medium operations (34.9 percent) than very small or small operations rounded up bison one time. A higher percentage of small operations (23.1 percent) than large operations (8.5 percent) rounded up bison on range/pasture three or more times.

B.2.d. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations by number of times the majority of pastured bison were rounded up as a group, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Number times	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	63.7	(3.9)	45.3	(4.8)	26.4	(3.7)	7.1	(2.8)	39.5	(2.2)
1	12.1	(2.6)	12.6	(3.2)	34.9	(4.0)	64.3	(5.2)	27.4	(2.0)
2	12.1	(2.6)	19.0	(3.7)	20.1	(3.3)	20.1	(4.4)	17.2	(1.7)
3 or more	12.2	(2.6)	23.1	(4.1)	18.6	(3.3)	8.5	(3.1)	15.9	(1.7)
Total	100.0		100.0		100.0		100.0		100.0	

Producers who kept any bison on range/pasture (87.9 percent) and rounded up the majority of pastured bison at least once (60.5 percent) were asked to provide the reason(s) that bison were rounded up most recently. Bison on all operations were most commonly rounded up for deworming (64.7 percent), vaccination (47.9 percent), tagging/identification (46.8 percent), weaning (44.3 percent), and shipping (41.0 percent).

A higher percentage of large operations (53.5 percent) than operations in the other size categories rounded up bison for pregnancy checking. The percentage of operations rounding up bison for weaning increased as operation size increased, from 7.6 percent of very small operations to 79.4 percent of large operations. A higher percentage of large (51.3 percent) and medium (49.2 percent) operations than very small operations (20.5 percent) rounded up bison for shipping (e.g., to slaughter, pasture).

B.2.e. For operations that rounded up the majority of pastured bison as a group at least once during the reference period (table B.2.d), percentage of operations by reason(s) bison were rounded up most recently, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Tagging/ identification	9.4	(3.4)	35.7	(6.0)	56.4	(4.7)	76.1	(4.7)	46.8	(2.8)
Vaccination	30.5	(5.6)	41.1	(6.2)	47.6	(4.7)	69.5	(5.1)	47.9	(2.8)
Deworming	60.0	(5.8)	64.3	(6.0)	64.8	(4.5)	69.2	(5.1)	64.7	(2.6)
Pregnancy checking	4.5	(2.5)	9.2	(3.6)	10.4	(2.9)	53.5	(5.5)	19.3	(2.2)
Disease testing	6.2	(3.0)	10.5	(4.0)	6.4	(2.4)	13.2	(3.7)	8.8	(1.6)
Other veterinary need (e.g., physical exam, treatment for illness)	11.6	(3.9)	8.4	(3.6)	10.7	(2.9)	14.6	(3.9)	11.4	(1.8)
Weaning	7.6	(3.3)	28.5	(5.7)	52.0	(4.7)	79.4	(4.4)	44.3	(2.7)
Shipping (e.g., to slaughter, pasture)	20.5	(4.8)	36.9	(6.0)	49.2	(4.7)	51.3	(5.5)	41.0	(2.7)
Other	21.2	(4.9)	23.5	(5.3)	9.5	(2.7)	4.9	(2.4)	13.7	(1.9)

Photograph courtesy of Dr. Meg Parker.

For the most recent time the majority of pastured bison were rounded up as a group, no operations in the Northeast region (0.0 percent) rounded up bison for disease testing. A higher percentage of operations in the West region (52.7 percent) than in the Northeast region (20.0 percent) rounded up pastured bison for weaning. A lower percentage of operations in the Southeast region (16.6 percent) rounded up pastured bison for shipping (e.g., to slaughter, pasture) compared with operations in the other size categories.

B.2.f. For operations that rounded up the majority of pastured bison as a group at least once during the reference period (table B.2.d), percentage of operations by reason(s) bison were rounded up most recently, and by region:

Percent Operations

Region

	Northeast		Southeast		North Central		West	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Tagging/ identification	48.0	(10.0)	26.5	(8.1)	49.3	(5.6)	49.7	(3.6)
Vaccination	40.0	(9.8)	46.7	(9.1)	40.4	(5.5)	52.2	(3.6)
Deworming	84.0	(7.3)	90.0	(5.5)	59.4	(5.5)	59.6	(3.5)
Pregnancy checking	12.0	(6.5)	9.9	(5.4)	12.6	(3.7)	24.9	(3.1)
Disease testing	0.0	(—)	20.0	(7.3)	12.6	(3.7)	6.1	(1.7)
Other veterinary need (e.g., physical exam, treatment for illness)	12.0	(6.5)	16.7	(6.8)	11.4	(3.6)	10.3	(2.2)
Weaning	20.0	(8.0)	33.2	(8.6)	36.5	(5.4)	52.7	(3.6)
Shipping (e.g., to slaughter, pasture)	52.0	(10.0)	16.6	(6.8)	45.5	(5.6)	42.6	(3.5)
Other	4.0	(3.9)	10.0	(5.5)	11.4	(3.6)	16.5	(2.7)

The bison carrying capacity of a farm or ranch depends on the forage production of the pasture(s) and can be determined by calculating a stocking rate. Stocking rate refers to the total number of animal units stocked on a farm/ranch in relation to the total number of acres available for grazing; data were collected in terms of acres per animal unit.

Of the 87.9 percent of operations that kept any bison on range/pasture, 21.6 percent had an average of less than 2 acres per animal unit, 38.6 percent of 2 to less than 6 acres, 17.0 percent of 6 to less than 15 acres, and 22.8 percent of 15 or more acres per animal unit. There were no differences in acres per animal unit by size of operation.

B.2.g. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations by acres per animal unit, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Acres per animal unit	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 2	20.1	(3.3)	25.8	(4.3)	24.2	(3.7)	14.9	(4.0)	21.6	(1.9)
2 to less than 6	40.2	(4.0)	40.5	(4.8)	39.2	(4.2)	32.3	(5.2)	38.6	(2.3)
6 to less than 15	13.8	(2.8)	15.5	(3.6)	19.1	(3.4)	21.5	(4.5)	17.0	(1.7)
15 or more	26.0	(3.6)	18.2	(3.8)	17.5	(3.3)	31.3	(5.1)	22.8	(1.9)
Total	100.0		100.0		100.0		100.0		100.0	

The number of acres needed for grazing bison depends on local conditions and specific characteristics of the pasture, such as soil conditions, climate, and plant species. These factors are taken into account in calculations of stocking rate to determine the number of acres needed for a herd or the carrying capacity of a pasture.

Of the 87.9 percent of operations that kept any bison on range/pasture, a higher percentage of operations in the Northeast region (47.8 percent) than in the Southeast (15.9 percent) or West (12.8 percent) regions had an average of less than 2 acres per animal unit. A higher percentage of operations in the West region (23.7 percent) than in the North Central region (6.9 percent) had an average of 6 to less than 15 acres per animal unit. A higher percentage of operations in the West region also had an average of 15 or more acres per animal unit (31.3 percent) compared with operations in the Northeast (8.7 percent) and North Central (7.8 percent) regions. It is important to note that the West region likely varies more than other regions in terms of geographic, range/pasture, and climatic conditions.

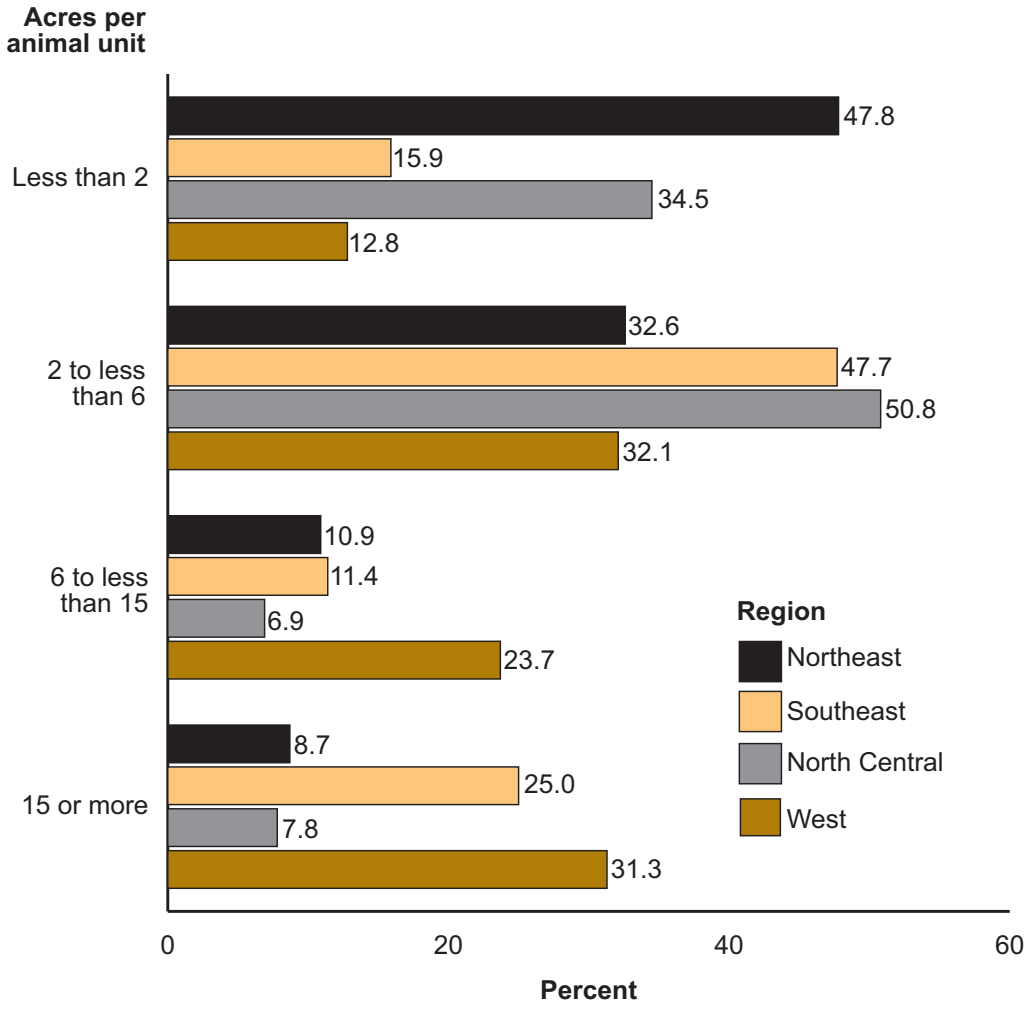
B.2.h. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations by acres per animal unit, and by region:

Percent Operations

Region

	Northeast		Southeast		North Central		West	
Acres per animal unit	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 2	47.8	(7.4)	15.9	(5.5)	34.5	(4.4)	12.8	(2.1)
2 to less than 6	32.6	(6.9)	47.7	(7.5)	50.8	(4.6)	32.1	(2.9)
6 to less than 15	10.9	(4.6)	11.4	(4.8)	6.9	(2.4)	23.7	(2.6)
15 or more	8.7	(4.2)	25.0	(6.5)	7.8	(2.5)	31.3	(2.8)
Total	100.0		100.0		100.0		100.0	

For the 87.9 percent of operations that kept any bison on range/pasture, percentage of operations by acres per animal unit, and by region



Grazing system refers to an operation's approach to managing bison on pasture. The objective is to optimize the productivity of the pasture while meeting the nutritional needs of the bison. Pasture management considers forage rest and recovery time and frequency of pasture rotation.

Among operations that kept any bison on range/pasture (87.9 percent), not quite half (46.3 percent) used a rotational system as their primary grazing system and half (50.5 percent) used a continuous grazing system.

A higher percentage of large operations (73.5 percent) than operations in the other size categories used a rotational grazing system as their primary grazing system. Also, a lower percentage of very small operations (30.8 percent) used a rotational grazing system as their primary grazing system than medium operations (50.1 percent). A higher percentage of very small operations (68.1 percent) than medium (43.3 percent) or large (22.3 percent) operations used continuous grazing as their primary grazing system. A lower percentage of large operations than operations in the other size categories used continuous grazing as their primary grazing system. A higher percentage of small operations (0.8 percent) used an "other" grazing system as their primary grazing system compared with medium operations (6.6 percent). "Other" systems generally were a combination of rotational and continuous systems.

B.2.i. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations by primary grazing system used and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Primary grazing system	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Rotational	30.8	(3.5)	44.8	(4.7)	50.1	(4.1)	73.5	(4.7)	46.3	(2.2)
Continuous	68.1	(3.6)	54.3	(4.7)	43.3	(4.0)	22.3	(4.4)	50.5	(2.2)
Other	1.1	(0.8)	0.8	(0.8)	6.6	(2.0)	4.2	(2.1)	3.1	(0.8)
Total	100.0		100.0		100.0		100.0		100.0	

The primary grazing system used by operations that kept any bison on range/pasture did not differ by region.

B.2.j. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations by primary grazing system used and by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Primary grazing system	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Rotational	59.1	(7.0)	34.6	(6.8)	55.1	(4.5)	43.1	(2.8)
Continuous	38.8	(7.0)	63.3	(6.9)	43.3	(4.4)	52.7	(2.9)
Other	2.0	(2.0)	2.0	(2.0)	1.6	(1.1)	4.2	(1.1)
Total	100.0		100.0		100.0		100.0	

Bison on pasture may be provided with additional nutrition based on energy requirements for growth, breeding, or gestation; climate characteristics such as temperature; the quality and productivity of soil/pasture; season; or marketing strategy (e.g., grain finishing). Of the 87.9 percent of operations that kept any bison on range/pasture, 92.9 percent ever provided hay/roughage and 89.9 percent provided mineral supplements to bison while they were on range/pasture. Not quite half (46.8 percent) provided vitamin supplements, and 41.7 percent provided energy/concentrates (such as grain).

A higher percentage of very small operations (52.9 percent) ever provided energy/concentrates to bison on range/pasture compared with medium operations (27.3 percent).

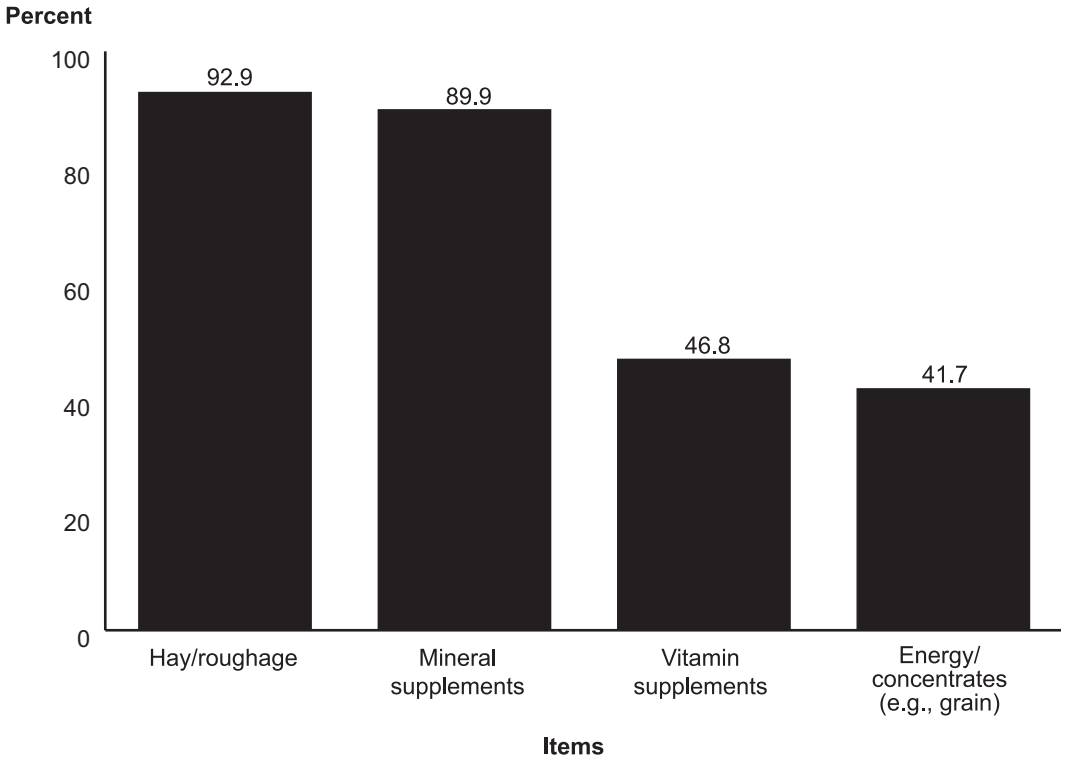
B.2.k. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations that ever provided the following items to pastured bison during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Items	Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Hay/roughage	93.5	(1.8)	94.7	(2.1)	94.9	(1.8)	85.7	(3.7)	92.9	(1.1)
Mineral supplements	84.8	(2.7)	92.4	(2.4)	93.5	(2.0)	91.1	(3.0)	89.9	(1.3)
Vitamin supplements	43.7	(3.7)	40.2	(4.6)	51.6	(4.1)	53.7	(5.3)	46.8	(2.2)
Energy/ concentrates (e.g., grain)	52.9	(3.8)	45.0	(4.7)	27.3	(3.6)	38.8	(5.2)	41.7	(2.1)

For the 87.9 percent of operations that kept any bison on range/pasture, percentage of operations that ever provided the following items to pastured bison during the reference period



Mineral supplementation may be needed in certain regions to meet bison requirements. For example, the soil composition in the Midwest and North Central regions is lower in selenium than other areas of the United States.

More than 85 percent of operations in each region ever provided hay/roughage and/or mineral supplements to pastured bison.

B.2.I. For the 87.9 percent of operations that kept any bison on range/pasture (table B.2.a), percentage of operations that ever provided the following items to pastured bison during the reference period, by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Items	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Hay/roughage	98.0	(2.0)	98.0	(2.0)	96.1	(1.7)	89.8	(1.7)
Mineral supplements	85.7	(5.0)	95.9	(2.8)	96.0	(1.7)	86.7	(1.9)
Vitamin supplements	42.9	(7.1)	49.0	(7.1)	55.9	(4.4)	43.1	(2.8)
Energy/ concentrates (e.g., grain)	38.8	(7.0)	49.0	(7.1)	46.5	(4.4)	38.6	(2.8)

3. General production practices and record keeping

Consumer demand has driven the recent growth of the commercial bison industry, as the public increasingly seeks natural products, which some view as healthy and sustainable. Producers were asked whether they used several specific production practices that appeal to some consumers and may be important for producers in terms of marketing and product labelling.

Overall, 72.5 percent of operations raised bison without using antibiotics. Approximately half of all operations (49.6 percent) raised animals without genetically modified organism (GMO) feeds. About two-fifths of operations (40.1 percent) raised bison to meet USDA's or the American Grassfed Association's grass-fed criteria. Bison were certified to USDA organic standards on 3.0 percent of operations.

A higher percentage of medium (79.6 percent) and large (80.7 percent) operations raised bison without using antibiotics than very small operations (63.9 percent). A higher percentage of medium operations (53.9 percent) than large operations (30.0 percent) raised bison to grass-fed criteria.

B.3.a. Percentage of operations by production practice, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Production practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Certified to USDA organic standards	2.6	(1.0)	3.2	(1.6)	3.7	(1.5)	2.2	(1.6)	3.0	(0.7)
Grass-fed*	35.0	(3.2)	38.8	(4.3)	53.9	(4.0)	30.0	(4.9)	40.1	(2.0)
Raised without antibiotics	63.9	(3.2)	73.8	(3.9)	79.6	(3.2)	80.7	(4.2)	72.5	(1.8)
Raised without GMO feeds	46.1	(3.3)	52.4	(4.4)	53.0	(4.0)	48.8	(5.3)	49.6	(2.0)

*Raised to meet USDA's or the American Grassfed Association's grass-fed criteria.

Some livestock producers keep records to track health and performance measures, such as animal growth rate, reproductive performance, vaccination status, and animal sales and purchases. Nearly three-fourths of bison operations (71.2 percent) maintained some handwritten or electronic records. About three-fifths of operations (60.3 percent) maintained records on purchases and sales. A little more than one-third of operations maintained records on health (37.2 percent) and breeding (34.5 percent), and about one-fourth (24.6 percent) maintained records on pasture/natural resource conditions.

A lower percentage of very small operations (52.1 percent) than operations in the other size categories maintained any electronic or handwritten records, and a lower percentage of small operations (78.0 percent) than large operations (92.1 percent) kept any records. In addition, a lower percentage of very small operations (34.9 percent) than operations in the other size categories maintained records for purchases and sales.

B.3.b. Percentage of operations by record type(s) maintained (in handwritten or electronic form), and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Record type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Purchases and sales	34.9	(3.2)	65.1	(4.2)	77.3	(3.3)	88.8	(3.4)	60.3	(2.0)
Breeding	19.2	(2.6)	48.4	(4.4)	34.4	(3.8)	53.7	(5.3)	34.5	(1.9)
Health	24.1	(2.9)	43.4	(4.4)	39.0	(3.9)	58.7	(5.2)	37.2	(2.0)
Pasture/natural resource conditions	15.0	(2.4)	27.5	(3.9)	26.1	(3.5)	42.7	(5.3)	24.6	(1.8)
Other	2.1	(0.9)	2.9	(1.5)	0.0	(—)	1.1	(1.1)	1.6	(0.5)
Any	52.1	(3.4)	78.0	(3.6)	81.6	(3.1)	92.1	(2.9)	71.2	(1.9)

A method for identifying each bison on the operation can be very important in responding to diseases, tracking exposures to other bison, and performing other practices related to health management. On 44.1 percent of operations, no bison had unique identification (ID); therefore, 55.9 percent of operations had some type of unique individual-animal ID for some bison. Overall, on about one-third of operations (33.2 percent), 81 to 100 percent of bison present on July 1, 2014, had some sort of unique individual-animal ID.

Nearly two-thirds of very small operations (65.8 percent) had no bison with unique individual-animal ID, and this percentage was higher than for operations in the other size categories. This finding might be because producers on very small operations can tell the animals apart based on physical characteristics or other attributes. A higher percentage of small (41.0 percent) and medium (32.4 percent) operations than large operations (13.7 percent) had no bison with unique individual-animal ID. In contrast, a higher percentage of large operations (59.0 percent) than operations in the other size categories had unique individual-animal ID for 81 to 100 percent of bison, and a higher percentage of medium operations (39.0 percent) than very small operations (22.1 percent) had unique individual-animal ID for at least 81 percent of bison. A higher percentage of small (19.5 percent) and large (19.3 percent) operations than very small operations (6.5 percent) had 41 to 80 percent of animals uniquely identified.

B.3.c. Percentage of operations by percentage of July 1, 2014, total bison inventory that had some type of unique individual-animal ID, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Percent inventory	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	65.8	(3.2)	41.0	(4.3)	32.4	(3.8)	13.7	(3.7)	44.1	(2.1)
1 to 40	5.7	(1.6)	11.2	(2.7)	13.3	(2.7)	8.0	(2.9)	9.2	(1.2)
41 to 80	6.5	(1.7)	19.5	(3.5)	15.3	(2.9)	19.3	(4.2)	13.5	(1.4)
81 to 100	22.1	(2.8)	28.3	(4.0)	39.0	(3.9)	59.0	(5.3)	33.2	(1.9)
Total	100.0		100.0		100.0		100.0		100.0	

There were no regional differences in the percentages of operations by the percentage of July 1, 2014, bison inventory that had some type of unique individual-animal ID.

B.3.d. Percentage of operations by percentage of July 1, 2014, total bison inventory that had some type of unique individual-animal ID, and by region:

Percent Operations

Region

	Northeast		Southeast		North Central		West	
Percent inventory	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	55.4	(6.6)	55.8	(6.9)	42.7	(4.2)	40.8	(2.6)
1 to 40	7.1	(3.4)	5.8	(3.2)	8.1	(2.3)	10.7	(1.7)
41 to 80	10.7	(4.1)	9.6	(4.1)	17.7	(3.3)	12.9	(1.8)
81 to 100	26.8	(5.9)	28.8	(6.3)	31.5	(4.0)	35.6	(2.6)
Total	100.0		100.0		100.0		100.0	

For operations that uniquely identified bison, about 55 percent of operations (54.1 percent) had any bison with official ear tags, such as tags for the national uniform ear-tagging system or tags for brucellosis vaccination (Bang's tags). More than two-thirds of operations (67.4 percent) had other metal or plastic ear tags. Almost 6 percent of operations (5.8 percent) had individual animals uniquely identified with tattoos or freeze brands, and 2.5 percent had any bison with electronic ear tags or electronic implants. Almost 14 percent of operations (13.9 percent) had bison individually identified by other means; in most cases, these were physical characteristics.

A higher percentage of large operations (84.1 percent) had bison uniquely identified with other metal ear tags or plastic tags than operations in the other size categories. Also, a higher percentage of medium operations (74.0 percent) than very small operations (46.6 percent) had any bison uniquely identified with other metal or plastic ear tags. About one-fourth of very small operations (24.1 percent) had any bison uniquely identified by "other" means; in most cases, these "other" means were based on unique physical characteristics or appearance of bison.

B.3.e. For the 55.9 percent of operations that had any bison with some type of unique individual-animal ID (table B.3.c, sum), percentage of operations that had any bison identified by the following method(s), by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Official ear tag[1]	43.3	(5.8)	53.6	(5.8)	57.6	(4.8)	60.8	(5.6)	54.1	(2.8)
Other metal ear tag or plastic ear tag	46.6	(5.8)	62.6	(5.6)	74.0	(4.2)	84.1	(4.2)	67.4	(2.6)
Electronic ear tag[2]	1.4	(1.3)	0.0	(0.0)	0.9	(0.9)	8.5	(3.1)	2.5	(0.8)
Electronic implant/ microchip	2.7	(1.9)	3.8	(2.2)	1.9	(1.4)	1.2	(1.2)	2.4	(0.8)
Tattoo/freeze brand	4.3	(2.5)	4.3	(2.4)	2.8	(1.6)	13.3	(3.9)	5.8	(1.3)
Other	24.1	(5.0)	17.4	(4.4)	9.2	(2.8)	6.5	(2.8)	13.9	(1.9)

[1]For example, brucellosis vaccination, national uniform eartagging system, etc.
[2]Radio-frequency identification (RFID).

For the 55.9 percent of operations that had any bison with unique individual-animal ID, there were few differences by region in the percentages of operations that had any bison with unique individual-animal ID. No operations in the Southeast region had any bison uniquely identified by electronic ear tag or electronic implant/microchip. No operations in the Northeast region had any animals uniquely identified by tattoo/freeze brand.

B.3.f. For the 55.9 percent of operations that had any bison with some type of unique individual-animal ID (table B.3.c, sum), percentage of operations that had any bison identified by the following method(s), by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Official ear tag[1]	40.0	(9.8)	52.2	(10.4)	42.9	(5.6)	60.4	(3.4)
Other metal ear tag or plastic ear tag	64.0	(9.6)	60.8	(10.2)	68.7	(5.3)	68.2	(3.3)
Electronic ear tag[2]	4.0	(3.9)	0.0	(—)	2.6	(1.8)	2.6	(1.1)
Electronic implant/ microchip	4.0	(3.9)	0.0	(—)	3.9	(2.2)	1.9	(1.0)
Tattoo/freeze brand	0.0	(—)	8.7	(5.9)	6.4	(2.8)	5.8	(1.6)
Other	12.0	(6.5)	13.1	(7.0)	16.7	(4.2)	13.2	(2.4)

[1]For example, brucellosis vaccination, national uniform eartagging system, etc.
[2]Radio-frequency identification (RFID).

On operations that had any bison with unique individual-animal ID, about one-third of bison (33.8 percent) were uniquely identified with official ear tags and about half (49.9. percent) were uniquely identified with other metal or plastic ear tags. Less than 3 percent of bison on these operations were identified with electronic ear tags, electronic implants/microchips, or tattoos/freeze brands, and 8.5 percent were uniquely identified via “other” methods.

Large operations had a higher percentage of bison (69.9 percent) uniquely identified with other metal or plastic tags than operations in the other size categories. A higher percentage of bison were uniquely identified with “other” methods on very small operations (16.6 percent) than on medium (4.4 percent) or large operations (2.6 percent).

B.3.g. For the 55.9 percent of operations that had any bison with some type of unique individual-animal ID (table B.3.c, sum), operation average percentage of bison identified by the following method(s), by size of operation:

Operation Average Percent Bison

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Official ear tag[1]	36.1	(5.2)	30.0	(4.3)	36.8	(4.0)	31.3	(4.0)	33.8	(2.2)
Other metal ear tag or plastic ear tag	35.7	(5.1)	41.6	(4.6)	52.1	(4.2)	69.9	(4.5)	49.9	(2.4)
Electronic ear tag[2]	1.1	(1.1)	0.0	(—)	0.4	(0.4)	7.9	(2.9)	2.1	(0.7)
Electronic implant/ microchip	2.7	(1.9)	2.6	(1.7)	1.2	(0.9)	0.2	(0.2)	1.6	(0.6)
Tattoo/freeze brand	2.8	(1.9)	2.8	(2.0)	0.1	(0.1)	5.2	(2.1)	2.5	(0.8)
Other	16.6	(4.0)	11.6	(3.3)	4.4	(1.6)	2.6	(1.5)	8.5	(1.4)

[1]For example, brucellosis vaccination, national uniform eartagging system, etc.

[2]Radio-frequency identification (RFID).

On the 55.9 percent of operations that had any bison with unique individual-animal ID, a higher percentage of bison on operations in the West region (39.0 percent) than in the North Central region (23.9 percent) had official ear tags.

B.3.h. For the 55.9 percent of operations that had any bison with some type of unique individual-animal ID (table B.3.c, sum), operation average percentage of bison identified by the following method(s), by region:

	Operation Average Percent Bison							
	Region							
	Northeast		Southeast		North Central		West	
Method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Official ear tag[1]	23.5	(7.7)	33.2	(8.0)	23.9	(4.0)	39.0	(2.8)
Other metal ear tag or plastic ear tag	45.8	(8.9)	50.0	(9.4)	52.3	(4.8)	49.5	(3.0)
Electronic ear tag[2]	2.0	(2.0)	0.0	(—)	2.3	(1.6)	2.4	(1.0)
Electronic implant/ microchip	4.0	(3.9)	0.0	(—)	2.9	(1.7)	1.1	(0.7)
Tattoo/freeze brand	0.0	(—)	8.7	(5.9)	0.9	(0.7)	2.5	(0.9)
Other	10.0	(5.7)	3.4	(1.9)	10.4	(3.2)	8.2	(1.8)

[1]For example, brucellosis vaccination, national uniform eartagging system, etc.
[2]Radio-frequency identification (RFID).

Handling systems can facilitate safe and efficient capture, sorting, loading or unloading for transportation, disease testing, and treatment of animals. The purpose of a bison operation likely influences its need for and type of equipment and facilities for handling bison. Almost 70 percent of all operations (69.5 percent) had facilities for handling/restraining bison.

The percentage of operations that had facilities for handling/restraining bison increased as operation size increased, from 48.2 percent of very small operations to 97.7 percent of large operations.

B.3.i. Percentage of operations that had facilities for handling/restraining bison, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
48.2	(3.3)	64.8	(4.2)	89.4	(2.4)	97.7	(1.6)	69.5	(1.9)

Handling facilities and equipment can be designed specifically for bison. Such systems are developed with explicit consideration for bison behavior and conformation. The goals of bison-specific systems are to maximize human and animal safety, to efficiently work the animals, and to minimize stress on the bison. Of the 69.5 percent of operations with facilities for handling/restraining bison, 75.3 percent had facilities specifically designed for bison.

In general, the percentage of operations with bison-specific facilities increased as operation size increased, ranging from 37.8 percent of very small operations to 96.4 percent of large operations.

B.3.j. For the 69.5 percent of operations with facilities for handling/restraining bison (table B.3.i), percentage of operations with facilities designed specifically for bison, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
37.8	(4.8)	77.6	(4.7)	89.7	(2.6)	96.4	(2.0)	75.3	(2.2)

Flies can be irritating to animals and can contribute to the transmission of certain diseases (e.g., pinkeye). Fly control may be needed depending on the extent of fly-related issues in the herd. A fly-control program may include one or more biological or chemical products that effectively manage the targeted fly species. Consumer demand for healthy, natural products and interest in animal-raising practices may influence the use of alternatives to conventional insecticides for fly control.

Over half of operations (54.1 percent) used some method of fly control. This percentage was consistent across all operation size categories. Topical products were used by 30.7 percent of operations, other (not including diatomaceous earth) environmental fly control by 19.3 percent, diatomaceous earth by 13.7 percent, and oral products by 13.3 percent. “Other” methods mentioned by respondents included ashes, chickens, apple cider vinegar, and dung beetles.

There were no differences by size of operation in fly-control methods used.

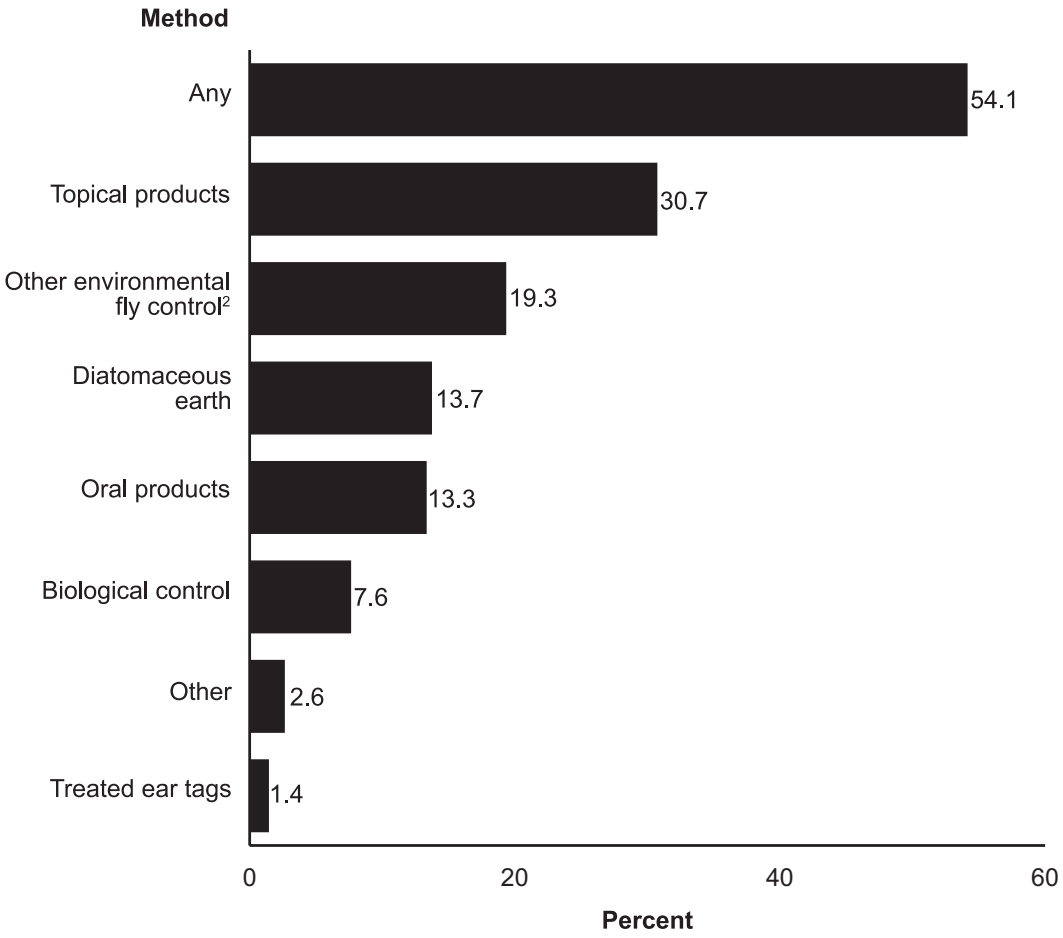
B.3.k. Percentage of operations by type of fly-control method(s) used and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Diatomaceous earth (environmentally, topically, and/or orally)	10.3	(2.0)	16.3	(3.3)	16.6	(3.0)	13.2	(3.7)	13.7	(1.4)
Other environmental fly control (e.g., sprays, foggers, strips, zappers)	20.1	(2.7)	23.2	(3.7)	16.0	(2.9)	17.5	(4.1)	19.3	(1.6)
Topical products (e.g., dust bags, dips, sprays, backrubs)	27.7	(3.0)	29.9	(4.1)	32.2	(3.8)	37.5	(5.2)	30.7	(1.9)
Oral products (e.g., feed-through larvicides)	12.0	(2.2)	20.0	(3.5)	11.3	(2.5)	9.8	(3.3)	13.3	(1.4)
Treated ear tags	0.9	(0.6)	2.5	(1.4)	0.6	(0.6)	2.3	(1.6)	1.4	(0.5)
Biological control (e.g., predator wasps)	5.3	(1.5)	10.0	(2.6)	8.6	(2.2)	7.9	(2.9)	7.6	(1.1)
Other	1.3	(0.8)	2.4	(1.4)	4.2	(1.7)	3.6	(2.0)	2.6	(0.7)
Any	51.6	(3.4)	57.8	(4.3)	54.1	(4.0)	55.3	(5.4)	54.1	(2.1)

Percentage of operations by type of fly-control method(s) used[1]



[1]Sorted high to low.
[2]For example, sprays, foggers, strips, zappers, etc. Does not include diatomaceous earth.

There were no regional differences in fly-control methods used.

B.3.I. Percentage of operations by type of fly-control method(s) used, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Diatomaceous earth (environ-mentally, topically, and/or orally)	19.6	(5.3)	13.7	(4.8)	15.2	(3.1)	12.1	(1.8)
Other environmental fly control (e.g., sprays, foggers, strips, zappers)	25.0	(5.8)	23.5	(5.9)	26.1	(3.7)	14.9	(1.9)
Topical products (e.g., dust bags, dips, sprays, backrubs)	37.5	(6.5)	41.2	(6.9)	31.1	(3.9)	27.6	(2.4)
Oral products (e.g., feed-through larvicides)	16.1	(4.9)	17.6	(5.3)	13.8	(2.9)	11.9	(1.7)
Treated ear tags	0.0	(—)	2.0	(1.9)	2.9	(1.4)	0.9	(0.5)
Biological control (e.g., predator wasps)	19.6	(5.3)	5.9	(3.3)	5.0	(1.9)	7.1	(1.4)
Other	1.8	(1.8)	5.9	(3.3)	2.2	(1.2)	2.3	(0.8)
Any	69.7	(6.1)	62.7	(6.8)	57.2	(4.2)	48.9	(2.7)

*For example, sprays, foggers, strips, zappers. Does not include diatomaceous earth.

C. Biosecurity

Note: Unless otherwise noted, tables in this section refer to the period July 1, 2013, through June 30, 2014.

Biosecurity practices are vital in protecting the health of ranched bison. Biosecurity practices include measures that reduce risks of disease introduction on an operation, such as controlling animal vectors and isolating animals when they arrive or return to the operation, as well as measures that minimize the chances for disease spread once a disease occurs on an operation.

1. Contact with other animals

Overall, three-fourths of operations (75.6 percent) had other farmed animals present on the operation. Almost half of all operations (45.6 percent) had horses, donkeys, or other equids, and about two-fifths (39.8 percent) had beef or dairy cattle. Roughly one-fourth had farmed cervids (28.6 percent) and/or poultry (24.6 percent). About one-tenth of operations had goats (12.2 percent), swine (10.5 percent), and/or sheep or lambs (9.0 percent). “Other” responses included yaks, camelids, zebras, rabbits, and Zebu cattle.

A higher percentage of very small operations (84.9 percent) than small (67.5 percent) or medium (65.5 percent) operations had any other farmed animals present. A higher percentage of very small operations (53.5 percent) than operations in the other size categories had cattle on the operation. No large operations had sheep or lambs, whereas roughly 10 percent of operations in the other size categories did. A higher percentage of very small operations (18.6 percent) than medium (8.7 percent) or large (3.7 percent) operations had goats.

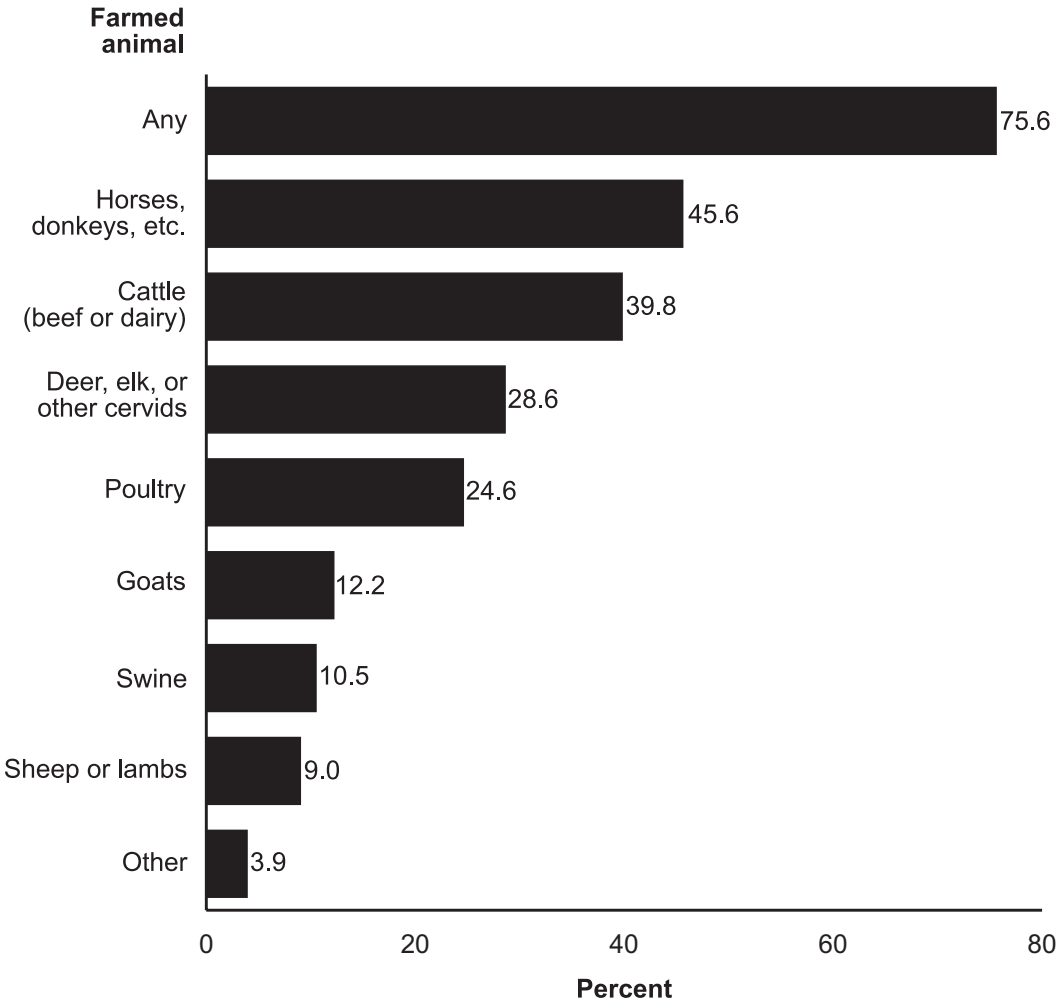
C.1.a. Percentage of operations by type(s) of farmed animal ever present on the operation from July 1, 2013, through June 30, 2014, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Farmed animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Cattle (beef or dairy)	53.5	(3.4)	37.0	(4.3)	26.5	(3.6)	31.3	(5.0)	39.8	(2.0)
Sheep or lambs	12.3	(2.2)	10.5	(2.7)	7.6	(2.1)	0.0	(—)	9.0	(1.2)
Goats	18.6	(2.6)	10.7	(2.7)	8.7	(2.3)	3.7	(2.1)	12.2	(1.4)
Horses, donkeys, etc.	50.7	(3.4)	40.3	(4.3)	37.6	(3.9)	55.2	(5.4)	45.6	(2.1)
Swine	11.5	(2.2)	10.1	(2.7)	7.9	(2.2)	13.2	(3.7)	10.5	(1.3)
Poultry	27.9	(3.0)	21.4	(3.7)	24.4	(3.5)	21.1	(4.4)	24.6	(1.8)
Deer, elk, or other cervids	30.8	(3.1)	21.6	(3.6)	29.0	(3.7)	32.6	(5.0)	28.6	(1.9)
Other	6.0	(1.6)	2.2	(1.3)	2.5	(1.3)	3.1	(1.8)	3.9	(0.8)
Any	84.9	(2.4)	67.5	(4.1)	65.5	(3.8)	81.6	(4.3)	75.6	(1.8)

Percentage of operations by type(s) of farmed animal ever present on the operation from July 1, 2013, through June 30, 2014*



*Sorted high to low.

A higher percentage of operations in the Northeast region (84.9 percent) than in the Southeast (67.5 percent) or North Central (65.5 percent) regions had any farmed animals present on the operation.

C.1.b. Percentage of operations by type(s) of farmed animal ever present on the operation from July 1, 2013, through June 30, 2014, and by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Farmed animal	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Cattle (beef or dairy)	53.5	(3.4)	37.0	(4.3)	26.5	(3.6)	31.3	(5.0)
Sheep or lambs	12.3	(2.2)	10.5	(2.7)	7.6	(2.1)	0.0	(—)
Goats	18.6	(2.6)	10.7	(2.7)	8.7	(2.3)	3.7	(2.1)
Horses, donkeys, etc.	50.7	(3.4)	40.3	(4.3)	37.6	(3.9)	55.2	(5.4)
Swine	11.5	(2.2)	10.1	(2.7)	7.9	(2.2)	13.2	(3.7)
Poultry	27.9	(3.0)	21.4	(3.7)	24.4	(3.5)	21.1	(4.4)
Deer, elk, or other cervids	30.8	(3.1)	21.6	(3.6)	29.0	(3.7)	32.6	(5.0)
Other	6.0	(1.6)	2.2	(1.3)	2.5	(1.3)	3.1	(1.8)
Any	84.9	(2.4)	67.5	(4.1)	65.5	(3.8)	81.6	(4.3)

Overall, about half of operations (48.8 percent) had “other” farmed animals with which bison could have had contact. On roughly one-fifth of operations, bison could have had contact with horses or other equids (23.7 percent); cattle (23.0 percent); or deer, elk, or other cervids (19.3 percent). On about one-tenth of operations (9.3 percent), bison could have had contact with poultry.

A higher percentage of very small operations (60.0 percent) than small (38.5 percent) or medium (40.1 percent) operations kept any farmed animals that could have had contact with the operation’s bison. Specifically, a higher percentage of very small operations (35.9 percent) than operations in the other size categories had beef or dairy cattle that could have had contact with the operation’s bison. A higher percentage of very small operations (30.7 percent) than small (16.0 percent) or medium (17.8 percent) operations had horses or other equids that could have had contact with the operation’s bison.

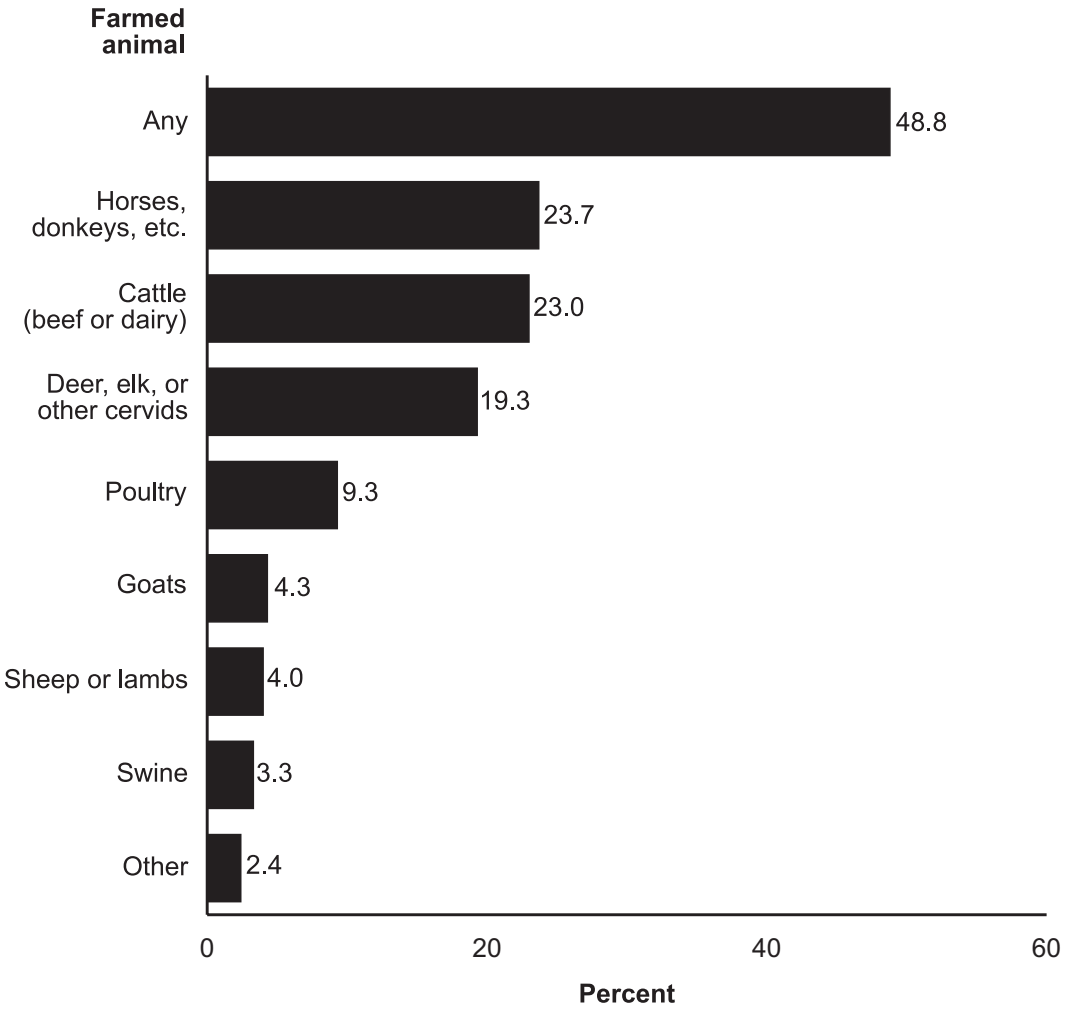
C.1.c. Percentage of operations by type(s) of farmed animal bison could have had contact with on the operation, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Farmed animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Cattle (beef or dairy)	35.9	(3.2)	15.8	(3.2)	14.5	(2.8)	14.5	(3.7)	23.0	(1.7)
Sheep or lambs	6.8	(1.7)	3.9	(1.7)	2.1	(1.2)	0.0	(0.0)	4.0	(0.8)
Goats	6.4	(1.7)	4.6	(1.9)	1.9	(1.1)	2.5	(1.8)	4.3	(0.8)
Horses, donkeys, etc.	30.7	(3.1)	16.0	(3.2)	17.8	(3.1)	27.8	(4.9)	23.7	(1.7)
Swine	4.2	(1.4)	2.4	(1.4)	0.8	(0.8)	7.1	(2.8)	3.3	(0.8)
Poultry	10.5	(2.0)	9.4	(2.6)	8.2	(2.2)	8.2	(3.0)	9.3	(1.2)
Deer, elk, or other cervids	18.0	(2.6)	14.8	(3.2)	20.9	(3.3)	27.2	(4.8)	19.3	(1.6)
Other	3.6	(1.3)	1.5	(1.0)	1.9	(1.1)	1.9	(1.3)	2.4	(0.6)
Any	60.0	(3.2)	38.5	(4.2)	40.1	(3.9)	50.5	(5.3)	48.8	(2.0)

Percentage of operations by type(s) of farmed animal bison could have had contact with on the operation*



*Sorted high to low.

Overall, just over three-fourths of operations had neighboring operations with ranched bison, cattle, sheep or lambs, and/or farmed deer or elk within 1 mile of the operation's bison. Almost three-fourths of all operations (73.3 percent) had neighboring beef or dairy cattle within 1 mile of the operation's bison. Almost 16 percent of all operations had neighboring sheep or lambs within 1 mile of the operation's bison.

By operation size, some differences existed in neighboring animals within 1 mile of the operation's bison. For both cattle and "any" type of neighboring animal, a lower percentage of very small operations than medium or large operations had neighboring animals within 1 mile of the operation's bison.

C.1.d. Percentage of operations by type(s) of neighboring animal located within 1 mile of the operation's bison, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Neighboring animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ranched bison	4.6	(1.4)	5.8	(2.1)	2.7	(1.3)	3.5	(2.0)	4.2	(0.8)
Cattle (beef or dairy)	64.4	(3.2)	72.5	(3.9)	81.7	(3.1)	83.7	(4.0)	73.3	(1.8)
Sheep or lambs	13.4	(2.3)	17.8	(3.4)	18.3	(3.1)	15.1	(3.9)	15.9	(1.5)
Farmed deer or elk	10.5	(2.1)	8.8	(2.6)	5.6	(1.9)	7.0	(2.8)	8.3	(1.2)
Any	68.1	(3.1)	75.4	(3.8)	84.4	(2.9)	86.2	(3.7)	76.5	(1.8)

About two-fifths of operations (41.5 percent) had neighboring farmed animals that could have had fence-line contact with the operation's bison. Almost two-fifths of all operations (38.0 percent) had neighboring beef or dairy cattle that could have had fence-line contact with the operation's bison.

By operation size, a few differences existed in the possibility that operation bison could have had fence-line contact with neighboring farmed animals. Bison could have had fence-line contact with neighboring cattle on a higher percentage of large operations (60.3 percent) than on very small (29.6 percent) or small (32.4 percent) operations. Bison could have had fence-line contact with "any" neighboring farmed animals on a higher percentage of large operations (62.2 percent) than on very small (33.6 percent) or small (36.5 percent) operations.

C.1.e. Percentage of operations by type(s) of neighboring animal bison could have had fence-line contact with, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Neighboring animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ranched bison	1.9	(0.9)	3.3	(1.6)	0.8	(0.8)	2.3	(1.6)	2.0	(0.6)
Cattle (beef or dairy)	29.6	(3.1)	32.4	(4.1)	43.6	(4.0)	60.3	(5.3)	38.0	(2.0)
Sheep or lambs	4.7	(1.5)	6.5	(2.2)	4.1	(1.6)	3.3	(1.9)	4.7	(0.9)
Farmed deer or elk	5.3	(1.6)	6.3	(2.2)	3.6	(1.6)	2.3	(1.6)	4.7	(0.9)
Any	33.6	(3.3)	36.5	(4.3)	45.7	(4.1)	62.2	(5.3)	41.5	(2.1)

Overall, about two-thirds of operations (67.7 percent) had ever seen any of the listed wild animals inside the operation's perimeter fence during the reference period. About three-fifths of operations (62.5 percent) had seen deer, elk, or other cervids inside the operation's perimeter fence.

By operation size, some differences existed regarding what types of wild animals were seen inside the operation's perimeter fence. For deer, elk, or other cervids, and for "any" wild animal, a higher percentage of large operations than very small or small operations had seen any wild animals inside the perimeter fence, and a higher percentage of medium operations than very small operations had seen any wild animals inside the perimeter fence. A higher percentage of large operations (30.4 percent) than operations in the other size categories had seen pronghorn inside the perimeter fence.

C.1.f. Percentage of operations by type(s) of wild animal ever seen inside the perimeter fence from July 1, 2013, through June 30, 2014, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Wild animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bison	3.4	(1.2)	2.5	(1.4)	2.6	(1.3)	2.2	(1.6)	2.8	(0.7)
Pronghorn (antelope)	2.5	(1.0)	3.8	(1.7)	8.9	(2.3)	30.4	(4.9)	8.4	(1.1)
Sheep (e.g., bighorn)	0.9	(0.6)	0.8	(0.8)	1.9	(1.1)	4.4	(2.2)	1.6	(0.5)
Deer, elk, or other cervids	48.5	(3.4)	59.7	(4.3)	75.1	(3.5)	81.2	(4.2)	62.5	(2.0)
Feral swine or wild boars	8.9	(1.9)	8.6	(2.5)	9.3	(2.4)	3.3	(1.9)	8.1	(1.1)
Other	7.0	(1.7)	6.1	(2.1)	10.3	(2.4)	8.3	(3.0)	7.8	(1.1)
Any	55.8	(3.3)	64.5	(4.2)	79.1	(3.3)	83.5	(4.0)	67.7	(1.9)

The types of wild animals seen inside operations' perimeter fences obviously depend on the distribution of the wild animals listed in the following table. Overall, there were no regional differences in the percentages of operations that saw "any" of the listed animals inside the perimeter fence (ranging from 59.6 percent of operations in the Southeast region to 72.4 percent of operations in the West region), but these values might primarily reflect the percentages for deer, elk, or other cervids, which were seen on roughly 60 percent of operations and did not vary by region. Not surprisingly, a higher percentage of operations in the West region (14.8 percent) than operations in the other three regions (all 0.0 percent) saw pronghorn inside the perimeter fence. A higher percentage of operations in the West region (12.5 percent) and Southeast region (9.6 percent) than operations in the other two regions had seen feral swine or wild boars within the operation's perimeter fence during the reference period.

C.1.g. Percentage of operations by type(s) of wild animal ever seen inside the perimeter fence from July 1, 2013, through June 30, 2014, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Wild animal	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison	0.0	(0.0)	1.9	(1.9)	1.4	(1.0)	4.0	(1.1)
Pronghorn (antelope)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	14.8	(1.9)
Sheep (e.g., bighorn)	0.0	(0.0)	0.0	(0.0)	0.7	(0.7)	2.6	(0.8)
Deer, elk, or other cervids	61.8	(6.6)	53.8	(6.9)	58.6	(4.2)	65.9	(2.5)
Feral swine or wild boars	0.0	(0.0)	9.6	(4.1)	0.0	(0.0)	12.5	(1.8)
Other	14.5	(4.8)	5.8	(3.2)	9.9	(2.5)	6.4	(1.3)
Any	63.6	(6.5)	59.6	(6.8)	61.4	(4.1)	72.4	(2.4)

About four-fifths of operations (82.8 percent) had ever seen “any” of the listed wild animals just outside the perimeter fence during the reference period. More than three-fourths of operations (78.2 percent) had seen deer, elk, or other cervids just outside the fence. About one-tenth of operations had seen pronghorn (11.5 percent), feral swine or wild boars (10.4 percent), or “other” wild animals (10.4 percent) just outside the perimeter fence.

Operations differed by size in a few aspects related to the types of wild animals seen just outside the perimeter fence. A higher percentage of large operations (97.2 percent) than operations in the other size categories had seen “any” wild animals just outside the perimeter fence. Also, a higher percentage of medium operations (86.8 percent) than very small operations (73.7 percent) had seen “any” wild animals just outside the perimeter fence. A higher percentage of large operations (38.2 percent) than operations in the other size categories had seen pronghorn just outside the fence. Higher percentages of large (92.4 percent) and medium (83.4 percent) operations than very small operations (67.7 percent) had seen deer, elk, or other cervids just outside the perimeter fence.

C.1.h. Percentage of operations by type(s) of wild animal ever seen just outside the perimeter fence from July 1, 2013, through June 30, 2014, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Wild animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bison	1.5	(0.9)	1.8	(1.3)	3.0	(1.5)	1.3	(1.3)	1.9	(0.6)
Pronghorn (antelope)	5.5	(1.6)	6.3	(2.3)	9.5	(2.4)	38.2	(5.5)	11.5	(1.4)
Sheep (e.g., bighorn)	2.0	(1.0)	0.9	(0.9)	3.4	(1.5)	9.0	(3.3)	3.2	(0.8)
Deer, elk, or other cervids	67.7	(3.3)	80.2	(3.6)	83.4	(3.0)	92.4	(3.0)	78.2	(1.8)
Feral swine or wild boars	11.7	(2.3)	12.0	(3.1)	9.9	(2.5)	5.2	(2.5)	10.4	(1.3)
Other	9.6	(2.1)	10.0	(2.9)	12.3	(2.7)	9.6	(3.5)	10.4	(1.3)
Any	73.7	(3.1)	83.8	(3.3)	86.8	(2.8)	97.2	(2.0)	82.8	(1.6)

Overall, there were no regional differences in the percentages of operations that had seen any of the listed animals just outside the perimeter fence (ranging from 76.1 percent of operations in the Southeast region to 86.6 percent of operations in the North Central region), but these values again might reflect the percentages for deer, elk, or other cervids, which were seen on roughly three-fourths of operations and did not vary by region. Not surprisingly, a higher percentage of operations in the West region (19.5 percent) than operations in the other regions had seen pronghorn just outside the perimeter fence. A higher percentage of operations in the West (15.5 percent) and Southeast regions (13.6 percent) than operations in the other regions had seen feral swine or wild boars just outside the operation's perimeter fence. A higher percentage of operations in the West region (4.8 percent) than operations in the other regions had seen wild sheep just outside the operation's perimeter fence.

C.1.i. Percentage of operations by type(s) of wild animal ever seen just outside the perimeter fence from July 1, 2013, through June 30, 2014, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Wild animal	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison	0.0	(0.0)	2.3	(2.3)	0.8	(0.8)	2.6	(0.9)
Pronghorn (antelope)	0.0	(0.0)	0.0	(0.0)	0.8	(0.8)	19.5	(2.2)
Sheep (e.g., bighorn)	0.0	(0.0)	0.0	(0.0)	1.6	(1.1)	4.8	(1.2)
Deer, elk, or other cervids	80.8	(5.5)	71.1	(6.8)	83.8	(3.2)	76.7	(2.3)
Feral swine or wild boars	0.0	(0.0)	13.6	(5.2)	0.0	(0.0)	15.5	(2.1)
Other	19.6	(5.9)	7.0	(3.9)	12.8	(3.0)	8.8	(1.6)
Any	82.7	(5.3)	76.1	(6.3)	86.6	(2.9)	82.4	(2.1)

2. Movement of bison onto and off of the operation

Overall, about one-fifth of operations (20.1 percent) had any new bison brought onto the operation (temporarily or permanently) or had any bison leave and return. A higher percentage of large operations than operations in the other size categories brought any new bison onto the operation or had any bison leave and return. A higher percentage of medium operations than very small operations had brought any new bison onto the operation or had any bison leave and return.

C.2.a. Percentage of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return,* by size of operation:

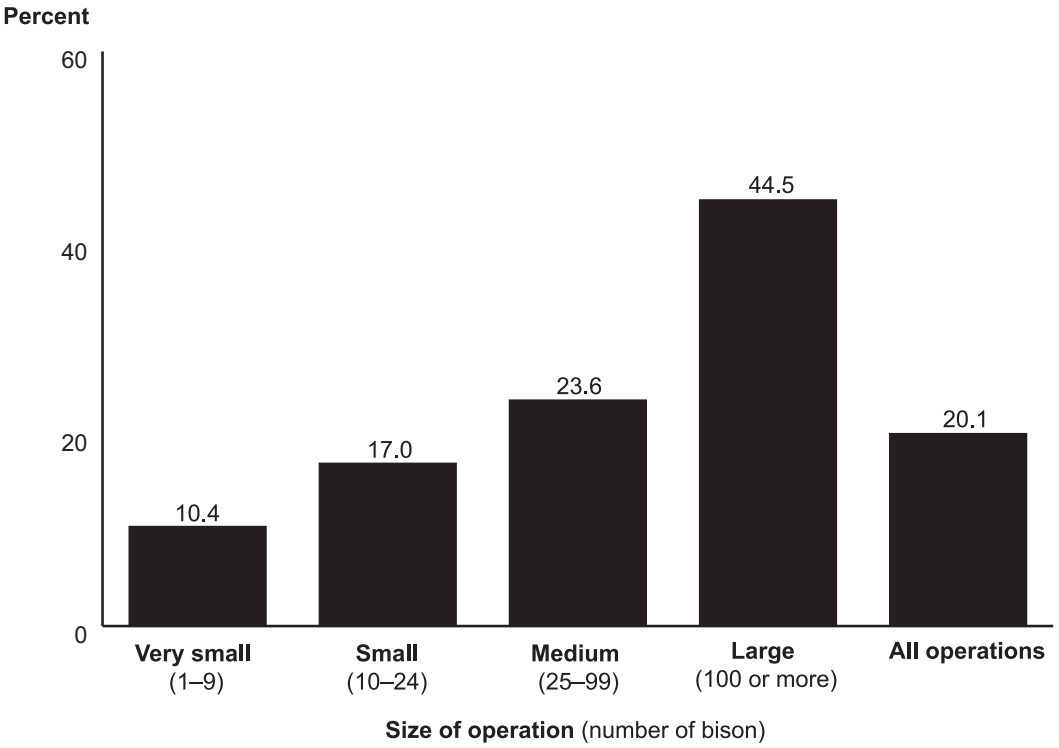
Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
10.4	(2.0)	17.0	(3.3)	23.6	(3.4)	44.5	(5.3)	20.1	(1.6)

*Such as being bred offsite, taken to a show, and returned, etc.

Percentage of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return,* by size of operation



*Such as being bred offsite, taken to a show, and returned, etc.

For operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return, about one-fifth (18.4 percent) had temporarily brought bison from other herds onto the operation for breeding purposes. Across operation sizes, there were no differences by gender of bison in the percentage of operations that temporarily brought bison onto the operation for breeding purposes.

C.2.b. For the 20.1 percent of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return* (table C.2.a), percentage of operations that temporarily brought any bison from other herds onto the operation for breeding purposes, by bison gender and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Gender	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Male	26.6	(9.5)	11.9	(7.9)	15.1	(6.2)	14.1	(5.9)	16.5	(3.6)
Female	10.2	(6.9)	6.7	(6.4)	2.6	(2.6)	8.4	(4.6)	6.6	(2.4)
Either	26.6	(9.5)	18.6	(9.6)	15.1	(6.2)	16.5	(6.2)	18.4	(3.7)

*Such as being bred offsite, taken to a show, and returned, etc.

For operations that brought on new bison (temporarily or permanently) or had any bison leave and return, 6.1 percent had bison sent to other herds for breeding purposes and returned. Medium operations did not send any bison out for breeding purposes, and very small operations did not send out any males.

C.2.c. For the 20.1 percent of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return[1] (table C.2.a), percentage of operations that sent any bison to other herds for breeding purposes and had them returned, by bison gender and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Gender	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Male[2]	0.0	(—)	12.2	(8.2)	0.0	(—)	10.8	(5.1)	5.5	(2.2)
Female[3]	4.0	(4.0)	6.5	(6.3)	0.0	(—)	5.3	(3.7)	3.5	(1.7)
Either[4]	4.0	(4.0)	11.5	(7.7)	0.0	(—)	10.8	(5.1)	6.1	(2.2)

[1]Such as being bred offsite, taken to a show, and returned, etc.
[2]For operations that had male bison onsite during the study reference period.
[3]For operations that had female bison onsite during the study reference period.
[4]For operations that had either male or female bison onsite during the study reference period.

Overall, about one-tenth of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return (9.4 percent) had any bison sent off the operation for grazing and returned. No small operations had any bison sent off for grazing.

C.2.d. For the 20.1 percent of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return* (table C.2.a), percentage of operations that had any bison sent off the operation for grazing and subsequently returned, by size of operation:

Percent Operations

Size of Operation (number of bison)

1–9		10–24		25–99		100 or more		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
4.6	(4.5)	0.0	(—)	11.8	(5.6)	14.7	(6.1)	9.4	(2.8)

*Such as being bred offsite, taken to a show, and returned, etc.

For operations that brought any new bison onto the operation or had any bison leave and return, there were no regional differences in the percentage of operations that had any bison sent off the operation for grazing and subsequently returned.

C.2.e. For the 20.1 percent of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return* (table C.2.a), percentage of operations that had any bison sent off the operation for grazing and subsequently returned, by region:

Percent Operations

Region

Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
7.7	(7.4)	9.1	(8.7)	7.0	(4.8)	11.1	(4.3)

*Such as being bred offsite, taken to a show, and returned, etc.

No operations that sent bison off the operation for grazing had their bison commingled with ranched bison from other operations at the grazing site. For more than two-fifths of operations that sent bison off for grazing, however, bison were commingled with cattle from other operations. For about one-tenth of operations that sent bison off for grazing, bison were commingled with sheep or lambs from other operations, which could create a risk for transmitting malignant catarrhal fever to bison.

C.2.f. For the 1.9 percent of all operations* that had any bison sent off the operation for grazing and subsequently returned, percentage of operations by type(s) of animal bison were commingled with:

Animal type	Percent operations	Std. error
Ranched bison from other operations	0.0	(—)
Cattle from other operations	43.1	(16.5)
Sheep or lambs from other operations	10.9	(10.3)

*Calculated by multiplying 9.4 percent (table C.2.d, operations that had any bison leave the operation for grazing and return) by 20.1 percent (table C.2.a, operations that had any new bison brought onto the operation or had any bison leave and return).

For operations that had any bison leave and return, nearly two-thirds of operations (65.6 percent) never isolated bison returning to the operation before commingling them with the rest of the operation's herd.

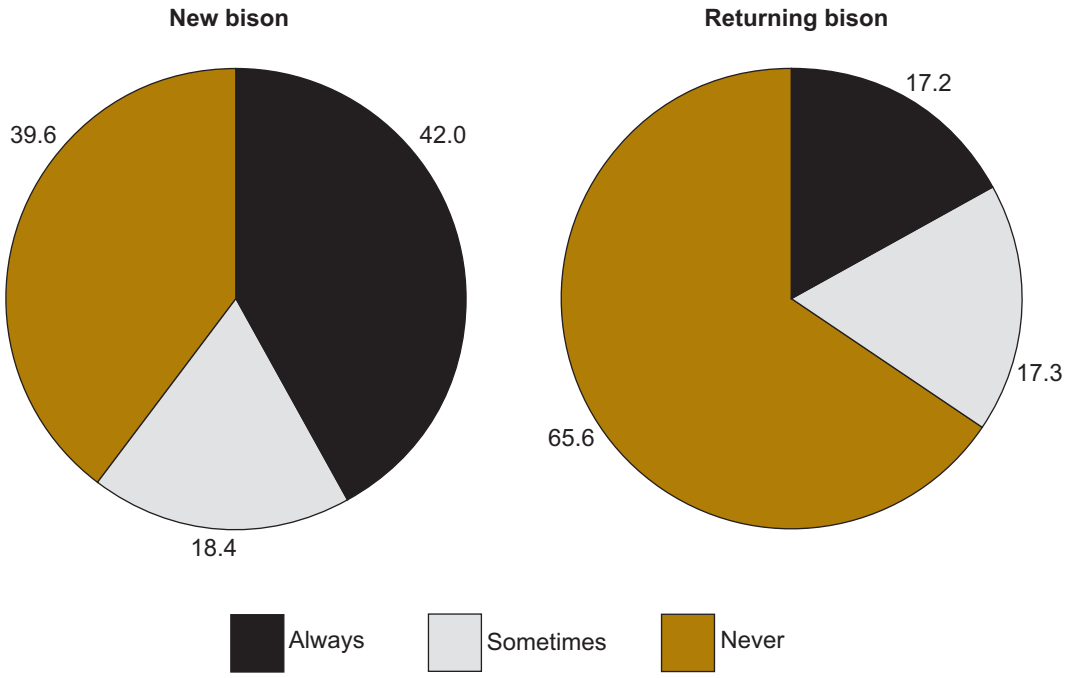
For operations that added new bison to the herd permanently or temporarily, about three-fifths of operations always (42.0 percent) or sometimes (18.4 percent) isolated bison before commingling them with the operation's herd.

C.2.g. For the 20.1 percent of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return* (table C.2.a), percentage of operations by how often these bison were isolated before being commingled with the rest of the operation's herd, and by scenario:

	Percent Operations						
	How Often Bison Were Isolated						
	Always		Sometimes		Never		
Scenario	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
New bison joining the operation permanently or temporarily	42.0	(5.2)	18.4	(4.1)	39.6	(5.1)	100.0
Bison returning to the operation	17.2	(5.9)	17.3	(5.9)	65.6	(7.5)	100.0

*Such as being bred offsite, taken to a show, and returned, etc.

For the 20.1 percent of operations that brought any new bison onto the operation (temporarily or permanently) or had any bison leave and return, percentage of operations by how often these bison were isolated before being commingled with the rest of the operation's herd



The numbers of days new or returning bison typically were isolated before being commingled with the operation's herd were similar regardless of whether bison were returning or were new to the operation (temporarily or permanently). For operations that always or sometimes isolated new or returning bison, about 30 percent isolated bison for 1 to 7 days, about one-fourth isolated bison for 8 to 14 days, and about one-third isolated bison for 15 to 30 days. About one-tenth of operations (9.2 percent) isolated returning bison and 16.9 percent of operations isolated new bison for more than 30 days, which is often recommended to minimize disease transmission.

C.2.h. For operations that always or sometimes isolated new or returning bison (table C.2.g), percentage of operations by number of days bison typically were isolated:

	Percent Operations			
	Bison returning to the operation		New bison joining the operation permanently or temporarily	
Number days	Percent	Std. error	Percent	Std. error
1 to 7	28.0	(13.6)	29.4	(6.6)
8 to 14	26.6	(13.2)	24.1	(6.3)
15 to 30	36.2	(14.5)	29.7	(6.7)
More than 30	9.2	(8.8)	16.9	(5.5)

3. Equipment use and visitors

Trucks and trailers used for transporting bison are a large expenditure and might be used only a few times a year, creating a situation in which sharing trucks might seem desirable. Equipment shared by multiple operations without proper disinfection between uses can contribute to the spread of disease among herds. Overall, 15.4 percent of operations transported bison in trucks and/or trailers shared with other livestock operations during the reference period.

A higher percentage of large operations (35.6 percent) than very small (4.6 percent) or small (13.7 percent) operations transported bison in trucks and/or trailers shared with other livestock operations. Larger operations likely have the greatest need for trucks and trailers to transport bison.

C.3.a. Percentage of operations that ever transported bison in trucks and/or trailers shared with other livestock operations from July 1, 2013, through June 30, 2014, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
4.6	(1.4)	13.7	(3.1)	21.8	(3.4)	35.6	(5.1)	15.4	(1.5)

Overall, 10.5 percent of operations shared any equipment other than trucks and trailers, such as tractors, chutes, feeding equipment, or manure spreaders, with other operations. A lower percentage of very small operations (4.1 percent) than operations in the other size categories shared any equipment other than trucks and trailers with other operations.

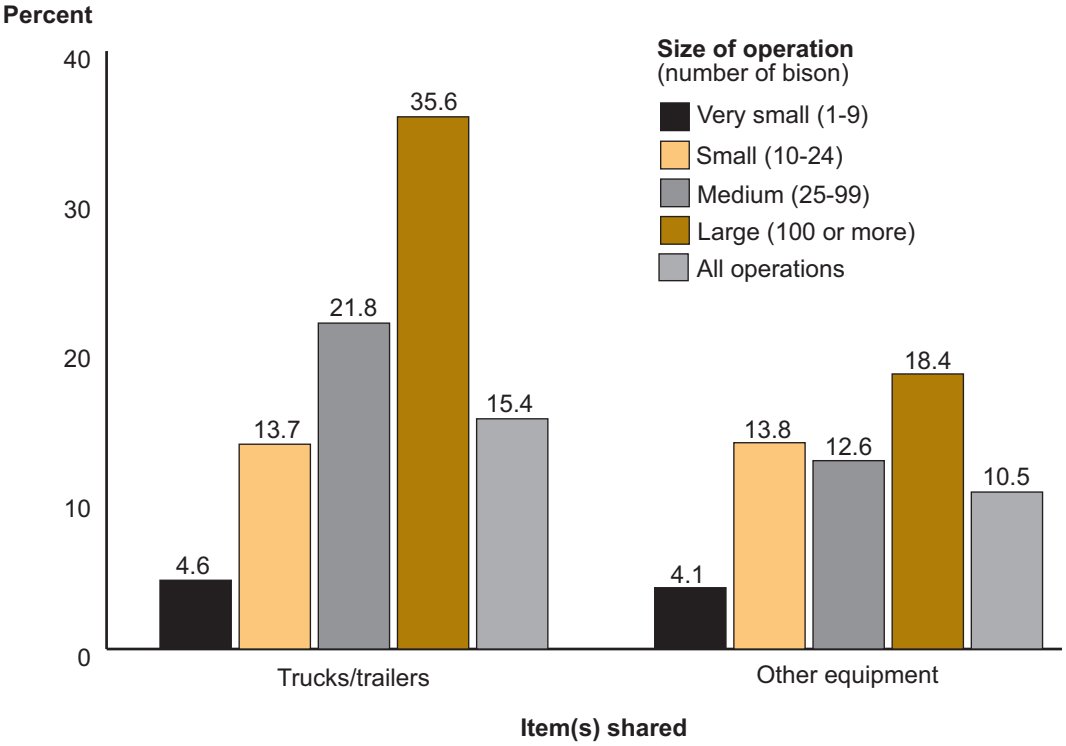
C.3.b. Percentage of operations that ever shared any equipment other than trucks or trailers (e.g., tractors, chutes, feeding equipment, manure spreaders) with other livestock operations from July 1, 2013, through June 30, 2014, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
4.1	(1.3)	13.8	(3.0)	12.6	(2.7)	18.4	(4.2)	10.5	(1.3)

Percentage of operations that ever shared trucks/trailers or other equipment with other livestock operations from July 1, 2013, through June 30, 2014, by size of operation



Visitors can also be a source of pathogens for animals, and, therefore, biosecurity protocols should address visitor access to bison. Overall, operations had about 700 visits from customers for agritourism or ecotourism experiences or hunting during the reference period. When a group of people visited at the same time it was counted as a single visit. In addition, operations had about 200 visits from nonbusiness visitors, such as other producers, neighbors, friends, school field trips, etc. Operations had an average of 12.5 visits during the reference period from customers wanting to purchase hides, skulls, meat, or other bison products.

In general, because of high standard errors, there were few differences in the operation average number of visitors by operation size. Medium operations had a higher average number of customer visits for purchasing hides, skulls, meat, or other bison products than very small or small operations. It seems that large operations had fewer visits from customers seeking agritourism experiences or nonbusiness visitors, although large standard errors for the operations with fewer than 100 bison mean these differences were not significant.

C.3.c. Operation average number of visits during the reference period, by visitor type and by size of operation:

	Operation Average Number of Visits									
	Size of Operation (number of bison)									
	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Visitor type	**No.**	**Std. error**	**No.**	**Std. error**	**No.**	**Std. error**	**No.**	**Std. error**	**No.**	**Std. error**
Private or government veterinarian or animal health worker	1.0	(0.2)	0.7	(0.1)	1.0	(0.2)	3.2	(1.3)	1.3	(0.2)
Nutritionist or feed company consultant	0.2	(0.1)	0.2	(0.1)	0.2	(0.1)	0.5	(0.1)	0.2	(0.1)
Bison trader, buyer, or dealer	0.1	(0.0)	0.5	(0.2)	0.6	(0.1)	1.0	(0.3)	0.5	(0.1)
Renderer	0.0	(0.0)	0.1	(0.0)	0.1	(0.1)	0.1	(0.1)	0.1	(0.0)
Customer (e.g., private individual purchasing hides, skulls, meat, or other bison products)	0.3	(0.1)	2.4	(0.8)	11.8	(2.9)	60.3	(31.5)	12.5	(4.8)
Other customer (e.g., agritourism or ecotourism, game ranch/ hunting)	900.1	(521.3)	991.9	(980.1)	535.5	(522.8)	24.9	(15.0)	696.5	(320.8)
Nonbusiness visitor (including other producers, neighbors, friends, school field trip visitors, etc.)	138.6	(93.7)	123.8	(82.9)	443.3	(424.5)	11.6	(1.9)	196.2	(117.6)

Overall, 70.2 percent of visits by renderers involved physical contact with bison. About two-thirds of visits by private or government veterinarians (65.6 percent) involved physical contact with bison, and about half of visits by bison traders, buyers, or dealers (50.6 percent) involved physical contact with bison. About two-fifths of visits by agritourism or ecotourism customers (41.5 percent) involved physical contact with bison.

C.3.d. Operation average percentage of visits during the reference period that involved physical contact with bison, by type of visitor:

Visitor type	Operation average percent of visits	Std. error
Private or government veterinarian or animal health worker	65.6	(3.3)
Nutritionist or feed company consultant	29.6	(8.0)
Bison trader, buyer, or dealer	50.6	(5.1)
Renderer	70.2	(10.2)
Customer (e.g., private individual purchasing hides, skulls, meat, or other bison products)	27.3	(3.7)
Other customer (e.g., agritourism or ecotourism, game ranch/hunting)	41.5	(4.3)
Nonbusiness visitor (including other producers, neighbors, friends, school field trip visitors, etc.)	25.2	(2.3)

D. Reproduction

Note: Unless otherwise noted, tables in this section refer to the period July 1, 2013, through June 30, 2014.

1. Breeding and breeding practices

Overall, 75.9 percent of operations had any bison bred while on the operation. A lower percentage of very small operations (45.3 percent) bred any bison compared with operations in the other size categories.

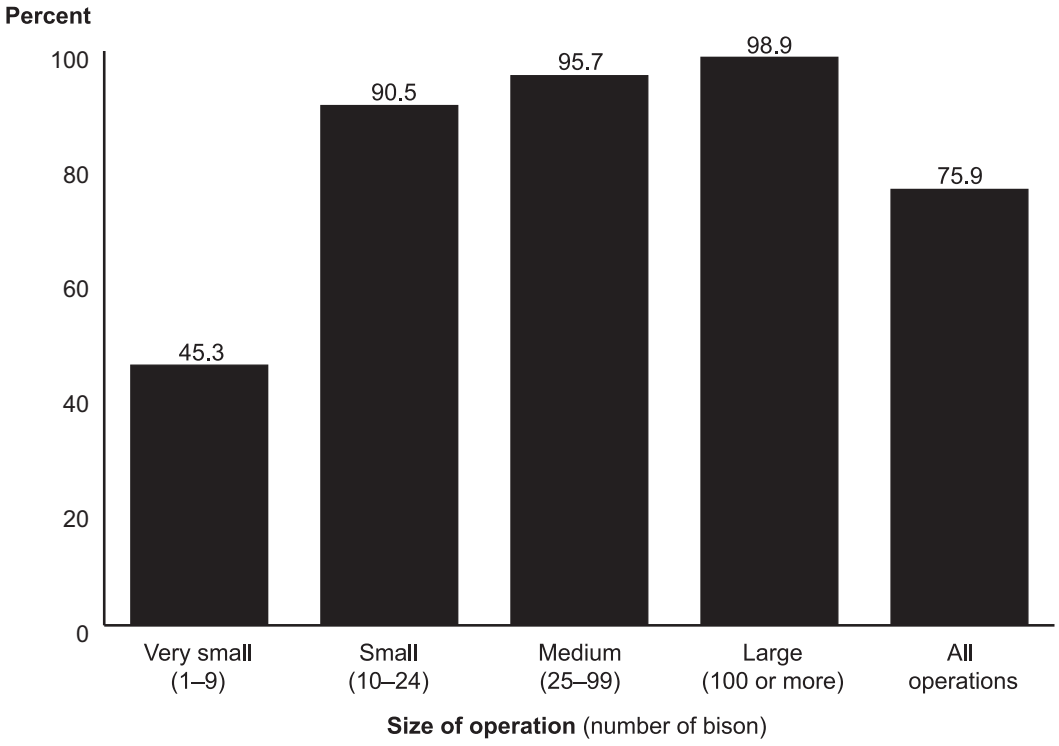
D.1.a. Percentage of operations that had any bison bred during the reference period while on the operation, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
45.3	(3.3)	90.5	(2.5)	95.7	(1.6)	98.9	(1.1)	75.9	(1.7)

Percentage of operations that had any bison bred while on the operation, by size of operation



The percentage of operations that had any bison bred while on the operation did not differ by region.

D.1.b. Percentage of operations that had any bison bred during the reference period while on the operation, by region:

Percent Operations							
Region							
Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
80.7	(5.2)	70.3	(6.2)	80.4	(3.3)	74.4	(2.3)

Photograph courtesy of Matthew S. Patyk.

Reproductive practices such as artificial insemination and embryo transfer have become commonplace for some livestock species in the United States. Of the 75.9 percent of bison operations that bred any bison, all had used only natural breeding (bulls placed with cows and heifers) during the most recent breeding season. No operations had used artificial insemination or embryo transfer during the most recent breeding season.

D.1.c. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by practice used during the most recent breeding season:

Practice	Percent operations	Std. error
Natural breeding (bulls placed with cows and heifers)	100.0	(—)
Artificial insemination	0.0	(—)
Embryo transfer	0.0	(—)

Several management practices may be used to optimize reproductive success in the herd. Body-condition scoring and breeding-soundness exams for bulls are indicators of reproductive soundness and breeding potential. Rectal palpation and ultrasound to verify pregnancy can help identify bred and open cows for purposes of herd management, sales, or removals.

For the 75.9 percent of operations that had any bison bred, 11.2 percent had used body-condition scoring during the most recent breeding season, 8.7 percent used breeding-soundness exams for bulls, 8.5 percent used palpation for pregnancy, 3.6 percent used ultrasound, and 3.4 percent used some "other" technique. A higher percentage of large operations used body-condition scoring (25.0 percent), breeding-soundness exams for bulls (30.8 percent), palpation for pregnancy (30.0 percent), and ultrasound (18.2 percent) than operations in the other size categories.

D.1.d. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by reproductive practices used for or during the most recent breeding season, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Body-condition scoring	4.9	(2.2)	8.5	(2.6)	9.7	(2.5)	25.0	(4.6)	11.2	(1.5)
Bull breeding-soundness exam (e.g., semen evaluation, scrotal exam)	3.1	(1.8)	1.9	(1.3)	5.5	(1.9)	30.8	(4.9)	8.7	(1.3)
Palpation for pregnancy	1.9	(1.3)	2.5	(1.4)	5.4	(1.9)	30.0	(4.9)	8.5	(1.3)
Ultrasound	0.0	(—)	0.9	(0.9)	0.0	(—)	18.2	(4.0)	3.6	(0.8)
Other	0.0	(—)	0.0	(—)	3.9	(1.6)	11.2	(3.5)	3.4	(0.9)

Overall, 62.6 percent of operations that bred any bison bred heifers on the operation during the most recent breeding season. A higher percentage of large operations (75.7 percent) than very small operations (50.3 percent) bred heifers.

D.1.e. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations that bred heifers on the operation during the most recent breeding season, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
50.3	(5.1)	57.7	(4.6)	67.0	(3.9)	75.7	(4.6)	62.6	(2.3)

For operations that had heifers bred during the most recent breeding season, almost two-thirds of operations (65.2 percent) bred heifers when they were 24 to 30 months old. A higher percentage of large operations (84.8 percent) than very small (51.8 percent) or small (51.6 percent) operations first bred heifers at 24 to 30 months of age.

D.1.f. For operations that bred heifers during the most recent breeding season (table D.1.e), percentage of operations by age (months) of heifers when first bred, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Age (mo)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 24	19.9	(6.3)	22.4	(5.3)	13.8	(3.7)	7.9	(3.4)	15.4	(2.3)
24 to 30	51.8	(7.8)	51.6	(6.4)	66.6	(5.0)	84.8	(4.4)	65.2	(3.0)
31 to 36	19.0	(6.1)	24.4	(5.5)	14.9	(3.7)	7.3	(3.1)	15.9	(2.3)
More than 36	9.3	(4.4)	1.6	(1.6)	4.7	(2.3)	0.0	(—)	3.5	(1.2)

Breeding animals often are specifically selected to improve or maintain qualities and characteristics desired in the herd. Of the 75.9 percent of operations that had any bison bred during the reference period, 15.0 percent used random selection as the primary basis for selecting new breeding bison, 37.3 percent used size/conformation, 14.7 percent used behavior/manageability, 8.1 percent used genetics, and 24.9 percent used an "other" basis for selecting breeding bison. In many cases, "other" was selected by producers when they could not choose among two or more of the listed options and instead listed multiple bases.

Random selection was the primary basis for selecting new bison for breeding on a higher percentage of very small (21.9 percent) and medium (18.9 percent) operations than large operations (4.0 percent). A higher percentage of large operations (65.7 percent) than operations in the other size categories used size/conformation as the primary basis for selecting new breeding bison. Behavior/manageability was the primary basis for selecting new breeding bison on a higher percentage of very small (21.1 percent) and small (20.3 percent) operations than large (5.1 percent) operations.

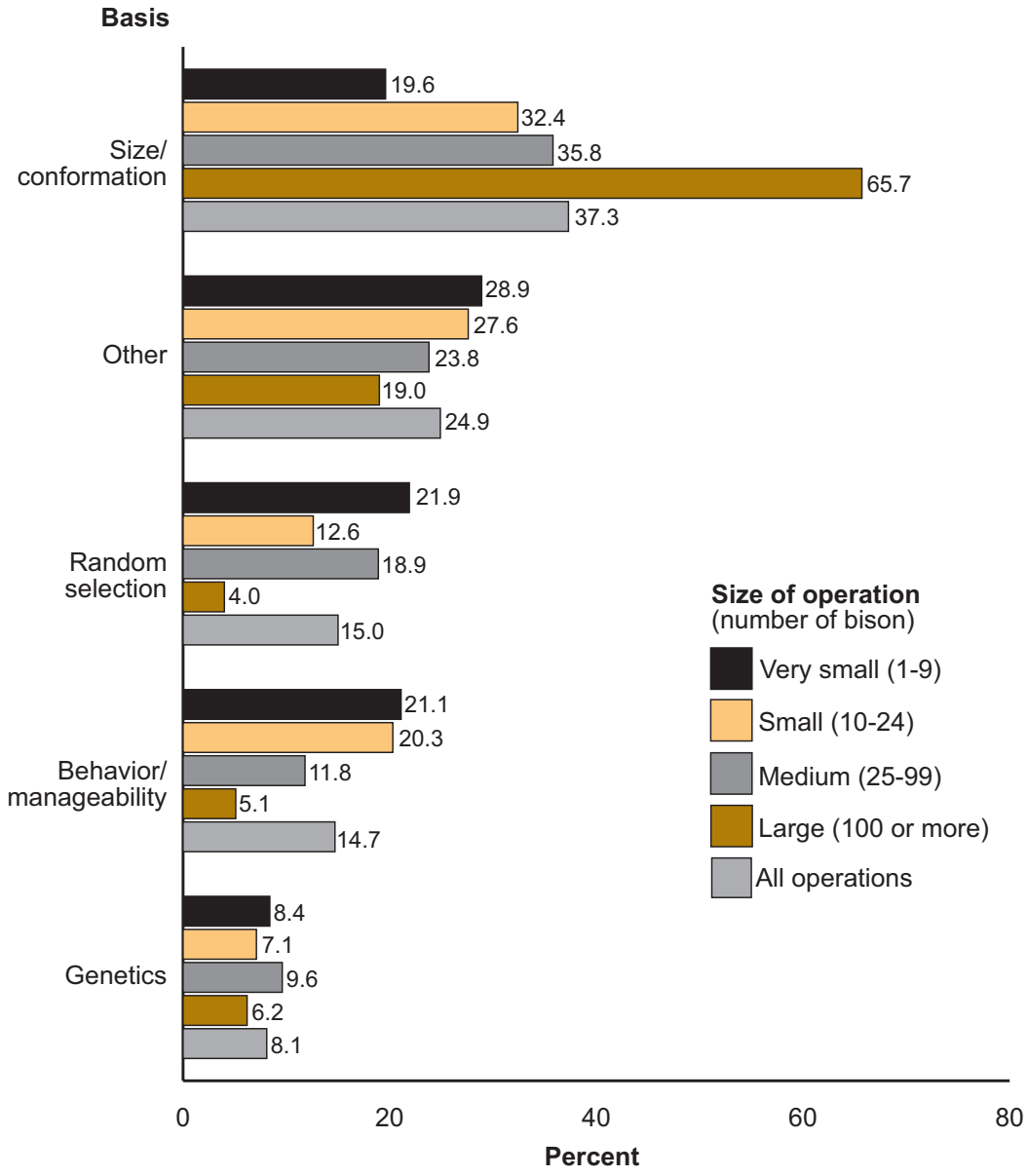
D.1.g. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by primary basis for selecting new breeding bison, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Basis	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Random selection (e.g., choosing every third group at handling time, or gate cut)	21.9	(4.6)	12.6	(3.2)	18.9	(3.4)	4.0	(2.3)	15.0	(1.8)
Size/ conformation	19.6	(4.4)	32.4	(4.5)	35.8	(4.0)	65.7	(5.3)	37.3	(2.4)
Behavior/ manageability	21.1	(4.6)	20.3	(3.9)	11.8	(2.7)	5.1	(2.5)	14.7	(1.8)
Genetics (DNA testing for parentage, ancestral line, genetic diversity, or cattle hybridization)	8.4	(3.0)	7.1	(2.4)	9.6	(2.5)	6.2	(2.7)	8.1	(1.3)
Other	28.9	(5.1)	27.6	(4.3)	23.8	(3.6)	19.0	(4.3)	24.9	(2.1)
Total	100.0		100.0		100.0		100.0		100.0	

For the 75.9 percent of operations that had any bison bred during the reference period while on the operation, percentage of operations by primary basis for selecting new breeding bison, and by size of operation*



*Sorted high to low, by all operations.

2. Calf survival and weaning

For the 75.9 percent of operations that had any bison bred during the reference period while on the operation, 75.4 percent of heifers and 78.5 percent of cows bred in 2013 had a calf born in 2014 that survived until weaning. A lower percentage of cows bred in 2013 on very small operations (68.0 percent of cows) had a calf born in 2014 that survived until weaning than on medium (81.8 percent of cows) or large (84.2 percent of cows) operations.

D.2.a. For the 75.9 percent of operations that had any bison bred while on the operation (table D.1.a), operation average percentage of heifers and cows bred in 2013 that had a calf born in 2014 that survived (or likely would survive) until weaning, by size of operation:

Operation Average Percent

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	63.2	(8.9)	70.1	(5.7)	79.5	(3.4)	80.3	(3.1)	75.4	(2.4)
Cows	68.0	(4.8)	77.2	(3.0)	81.8	(1.9)	84.2	(1.6)	78.5	(1.4)

For the 75.9 percent of operations that had any bison bred during the reference period while on the operation, the average annual percentage of bred heifers that bore a calf that survived until weaning was 75.9 percent and the average annual percentage of bred cows that bore a calf that survived until weaning was 81.4 percent. The percentages for heifers and for cows did not differ by size of operation.

D.2.b. For the 75.9 percent of operations that had any bison bred (table D.1.a), operation average annual percentage—for as long as operations had been breeding bison—of bred heifers and bred cows that bore a calf that survived until weaning, by size of operation:

Operation Average Annual Percent

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Heifers	73.0	(5.3)	70.7	(4.5)	77.4	(2.9)	81.5	(2.2)	75.9	(1.9)
Cows	75.9	(3.8)	81.2	(2.4)	81.9	(1.6)	85.7	(1.2)	81.4	(1.1)

For the 75.9 percent of operations that had any bison bred, the average annual percentage of bred heifers that bore a calf that survived until weaning was less than 50 percent for 12.4 percent of operations, 50 to 74 percent for 16.5 percent of operations, 75 to 99 percent for 53.4 percent of operations, and 100 percent for 17.7 percent of operations.

No large operations had an average annual percentage of 100.0 percent of their bred heifers bear a calf that lived until weaning. In general, the percentage of operations on which 75 to 99 percent of bred heifers bore a calf that survived until weaning increased as operation size increased; a higher percentage of large operations (77.7 percent) had 75 to 99 percent of bred heifers bear a calf that survived until weaning than very small (24.2 percent) or small (41.2 percent) operations. Generally, the percentage of operations on which 100 percent of bred heifers bore a calf that survived until weaning decreased as operation size increased.

D.2.c. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by average annual percentage of bred **heifers** that bore a calf that survived until weaning, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Average annual percent	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	10.4	(4.9)	10.0	(3.9)	4.2	(2.1)	1.8	(1.7)	6.1	(1.5)
>0 but <50	7.4	(4.1)	9.9	(3.8)	7.0	(2.8)	0.0	(0.0)	6.3	(1.6)
50–74	19.3	(6.1)	11.5	(4.1)	16.1	(3.8)	20.5	(5.5)	16.5	(2.4)
75–99	24.2	(6.7)	41.2	(6.4)	60.7	(5.1)	77.7	(5.7)	53.4	(3.2)
100	38.8	(7.6)	27.4	(5.9)	11.9	(3.4)	0.0	(0.0)	17.7	(2.5)
Total	100.0		100.0		100.0		100.0		100.0	

For the 75.9 percent of operations had any bison bred, the average annual percentage of bred cows that bore a calf that survived until weaning was less than 50 percent for 6.5 percent of operations, 50 to 74 percent for 13.9 percent of operations, 75 to 99 percent for 63.3 percent of operations, and 100 percent for 16.2 percent of operations.

The percentage of operations on which 75 to 99 percent of bred cows had calves that survived to weaning increased as operation size increased, ranging from 30.1 percent of very small operations to 89.8 percent of large operations. As might be expected, higher percentages of very small and small operations than medium or large operations had 100.0 percent of bred cows had calves that survived to weaning.

D.2.d. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by average annual percentage of bred **cows** that bore a calf that survived until weaning, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Average annual percent	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	6.4	(3.1)	0.9	(0.9)	0.0	(0.0)	0.0	(0.0)	1.4	(0.6)
>0 but <50	6.4	(3.1)	7.9	(2.7)	4.6	(1.9)	1.3	(1.3)	5.1	(1.2)
50–74	20.0	(5.0)	13.3	(3.4)	15.1	(3.1)	7.6	(3.0)	13.9	(1.8)
75–99	30.1	(5.7)	51.7	(5.0)	73.4	(3.9)	89.8	(3.4)	63.3	(2.5)
100	37.0	(6.1)	26.2	(4.4)	6.9	(2.2)	1.3	(1.3)	16.2	(1.9)

Choosing when to wean bison calves often depends on the intended purpose of the calves, feeding practices, and/or the availability of feed needed for calves to grow efficiently and for females to keep up with the nutritional demands of lactation. For the 75.9 percent of operations that had any bison bred during the reference period on the operation, the operation average age of calves at weaning was 9.0 months. The average age at weaning did not differ by operation size.

Note: A low percentage of producers wrote in expressions such as “naturally” or “mother picks weaning time” rather than giving a specific age in months at which calves were weaned. For these responses, we consulted with industry experts and literature and chose to use 9 months in the analysis as an average age for natural weaning to occur.

D.2.e. For the 75.9 percent of operations that had any bison bred (table D.1.a), operation average age (months) of calves at weaning, by size of operation:

Operation Average Age at Weaning (months)

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Mo.	**Std. error**	**Mo.**	**Std. error**	**Mo.**	**Std. error**	**Mo.**	**Std. error**	**Mo.**	**Std. error**
8.9	(0.3)	9.2	(0.3)	9.2	(0.3)	8.5	(0.3)	9.0	(0.2)

For the 75.9 percent of operations that had any bison bred, there was no difference in the average age at weaning by region.

D.2.f. For the 75.9 percent of operations that had any bison bred (table D.1.a), operation average age (months) of calves at weaning, by region:

Operation Average Age at Weaning (months)

Region

Northeast		**Southeast**		**North Central**		**West**	
Mo.	**Std. error**	**Mo.**	**Std. error**	**Mo.**	**Std. error**	**Mo.**	**Std. error**
8.8	(0.5)	8.7	(0.8)	9.2	(0.3)	9.0	(0.2)

Photograph courtesy of Dr. Chuck Fossler.

Of the 75.9 percent of operations that had any bison bred during the reference period, the majority of operations (76.8 percent) typically weaned calves when they were from 6 to 11 months of age.

A higher percentage of small operations (23.0 percent) typically weaned calves at 12 or more months of age than large operations (8.2 percent).

D.2.g. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by age (months) at which calves were typically weaned, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Age (mo)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 6	6.7	(2.9)	4.7	(2.1)	5.1	(1.9)	1.1	(1.1)	4.5	(1.0)
6 to 8	39.1	(5.6)	39.3	(4.8)	41.2	(4.2)	56.3	(5.4)	43.3	(2.5)
9 to 11	31.8	(5.4)	33.0	(4.5)	34.2	(4.0)	34.4	(5.2)	33.5	(2.3)
12 or more	22.4	(4.8)	23.0	(4.1)	19.5	(3.4)	8.2	(3.0)	18.7	(1.9)
Total	100.0		100.0		100.0		100.0		100.0	

There were no substantial differences by region in the age at which calves were typically weaned.

D.2.h. For the 75.9 percent of operations that had any bison bred (table D.1.a), percentage of operations by age (months) at which calves were typically weaned, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Age (mo)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 6	13.5	(5.6)	11.1	(6.1)	4.8	(2.1)	2.1	(0.9)
6 to 8	35.2	(7.9)	51.8	(9.6)	36.5	(4.7)	46.3	(3.2)
9 to 11	27.0	(7.3)	18.5	(7.5)	36.5	(4.7)	35.2	(3.1)
12 or more	24.3	(7.1)	18.6	(7.5)	22.1	(4.1)	16.4	(2.4)
Total	100.0		100.0		100.0		100.0	

E. Diseases, Parasites, and Health Management

Note: Unless otherwise noted, tables in this section refer to the period July 1, 2013, through June 30, 2014.

1. Producer familiarity with diseases

Familiarity with specific pathogens is important for recognizing disease conditions within a bison herd and is vital for understanding exposure risks, which can help prevent disease transmission within the herd and among the herd and other livestock and wildlife species.

For more than half of operations, respondents were not familiar with malignant catarrhal fever (MCF), clostridial diseases, or *Mycoplasma bovis*.

E.1.a. Percentage of operations by how familiar the respondent was with the following diseases in ranched bison:

	Percent Operations								
	How Familiar								
	Not		Slightly		Moderately		Very		
Disease	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Bovine tuberculosis (TB)	27.9	(1.8)	23.4	(1.7)	32.6	(1.9)	16.1	(1.5)	100.0
Brucellosis	20.4	(1.7)	22.3	(1.7)	33.8	(1.9)	23.5	(1.7)	100.0
Bovine viral diarrhea (BVD)	38.6	(2.0)	24.1	(1.8)	24.8	(1.8)	12.5	(1.4)	100.0
Malignant catarrhal fever (MCF)	50.2	(2.1)	20.2	(1.7)	17.1	(1.6)	12.5	(1.4)	100.0
Clostridial diseases	51.8	(2.1)	18.9	(1.6)	18.9	(1.6)	10.5	(1.3)	100.0
Mycoplasma bovis	55.6	(2.1)	21.3	(1.7)	14.6	(1.5)	8.5	(1.2)	100.0

More than half of operations (57.3 percent) were moderately or very familiar with brucellosis, and almost half (48.7 percent) were moderately or very familiar with bovine tuberculosis (TB).

A higher percentage of large operations were moderately or very familiar with bovine TB (61.1 percent) or brucellosis (69.9 percent) in ranched bison compared with very small operations (42.8 and 51.6 percent, respectively). A higher percentage of large operations (46.8 percent) were moderately or very familiar with MCF in ranched bison than very small (20.3 percent) or small (26.3 percent) operations, and a higher percentage of medium operations (36.5 percent) were moderately or very familiar with MCF compared with very small operations. A higher percentage of large operations were moderately or very familiar with *Mycoplasma bovis* in bison (41.6 percent) than operations in the other size categories.

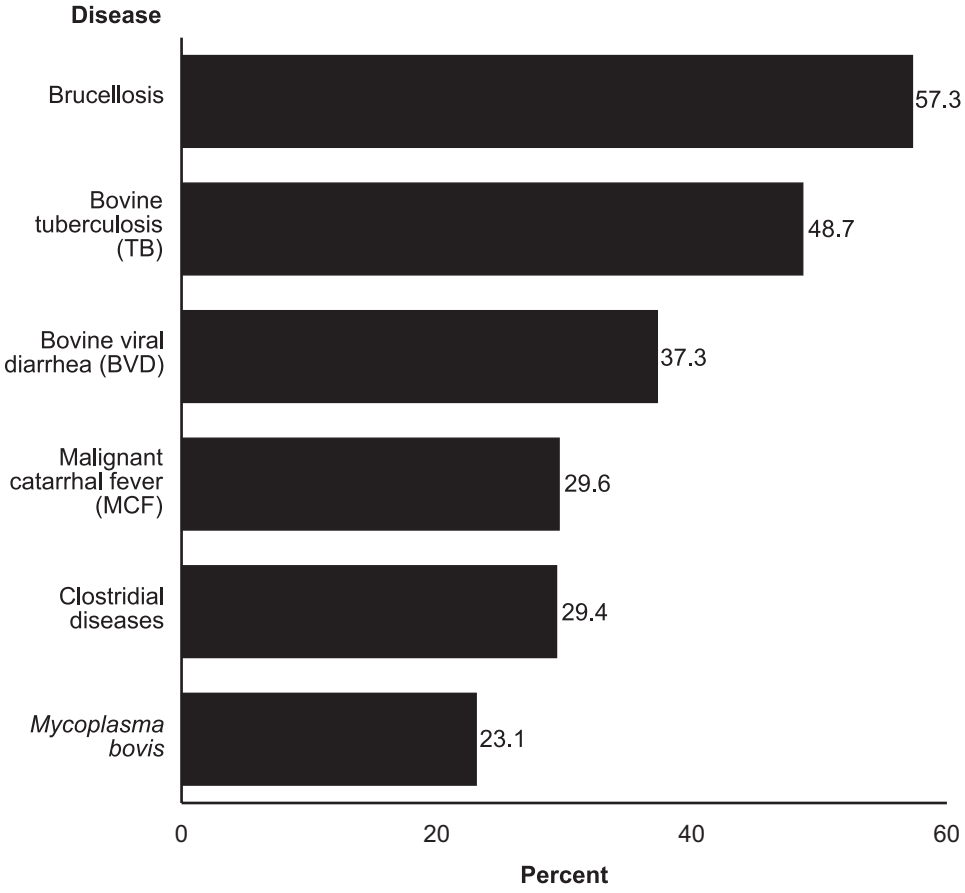
E.1.b. Percentage of operations in which the respondent was moderately or very familiar with the following diseases in ranched bison, by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine tuberculosis (TB)	42.8	(3.3)	49.1	(4.4)	50.3	(4.0)	61.1	(5.2)	48.7	(2.1)
Brucellosis	51.6	(3.4)	56.1	(4.4)	59.8	(3.9)	69.9	(5.0)	57.3	(2.0)
Bovine viral diarrhea (BVD)	32.8	(3.2)	40.2	(4.3)	36.7	(3.9)	45.5	(5.4)	37.3	(2.0)
Malignant catarrhal fever (MCF)	20.3	(2.7)	26.3	(3.9)	36.5	(3.9)	46.8	(5.4)	29.6	(1.9)
Clostridial diseases	25.6	(3.0)	26.4	(3.9)	30.4	(3.7)	42.2	(5.3)	29.4	(1.9)
Mycoplasma bovis	17.1	(2.6)	21.9	(3.7)	22.9	(3.4)	41.6	(5.3)	23.1	(1.7)

Percentage of operations that were moderately or very familiar with the following diseases in ranched bison*



*Sorted high to low.

Disease occurrence varies by region of the country, thereby influencing producer familiarity with particular pathogens. A higher percentage of operations in the West region were moderately or very familiar with brucellosis (63.5 percent) compared with operations in the Northeast (42.9 percent) and North Central (48.5 percent) regions. A higher percentage of operations in the West region were moderately or very familiar with MCF (33.6 percent) and *Mycoplasma bovis* (27.1 percent) than operations in the Northeast region (16.1 and 8.9 percent, respectively).

E.1.c. Percentage of operations that were moderately or very familiar with the following diseases in ranched bison, by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Disease	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bovine tuberculosis (TB)	35.7	(6.4)	43.1	(6.9)	46.4	(4.2)	52.7	(2.7)
Brucellosis	42.9	(6.6)	55.7	(6.9)	48.5	(4.2)	63.5	(2.6)
Bovine viral diarrhea (BVD)	25.0	(5.8)	48.0	(7.1)	35.9	(4.1)	37.6	(2.6)
Malignant catarrhal fever (MCF)	16.1	(4.9)	26.0	(6.2)	26.5	(3.7)	33.6	(2.5)
Clostridial diseases	19.6	(5.3)	30.0	(6.5)	24.2	(3.6)	32.9	(2.5)
Mycoplasma bovis	8.9	(3.8)	24.0	(6.0)	18.5	(3.3)	27.1	(2.4)

2. Deworming and parasite-control practices

Internal parasites in bison can contribute to weight loss or poor weight gain, rough hair coat, diarrhea, inappetence, and, in some cases, death. Using dewormers in bison can help offset these health problems and improve body condition, calf rate of gain and weaning weights, and feed efficiency.

Three-fourths of operations (75.7 percent) had dewormed at least some bison. A lower percentage of very small operations (65.4 percent) dewormed any bison than operations in the other size categories.

E.2.a. Percentage of operations that dewormed any bison during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
65.4	(3.2)	79.6	(3.5)	82.4	(3.0)	85.4	(3.7)	75.7	(1.7)

Parasite types and burden can vary by geographic location, and parasite-control programs should be tailored for the specific location. A lower percentage of operations in the West region (66.7 percent) dewormed any bison compared with operations in the other regions.

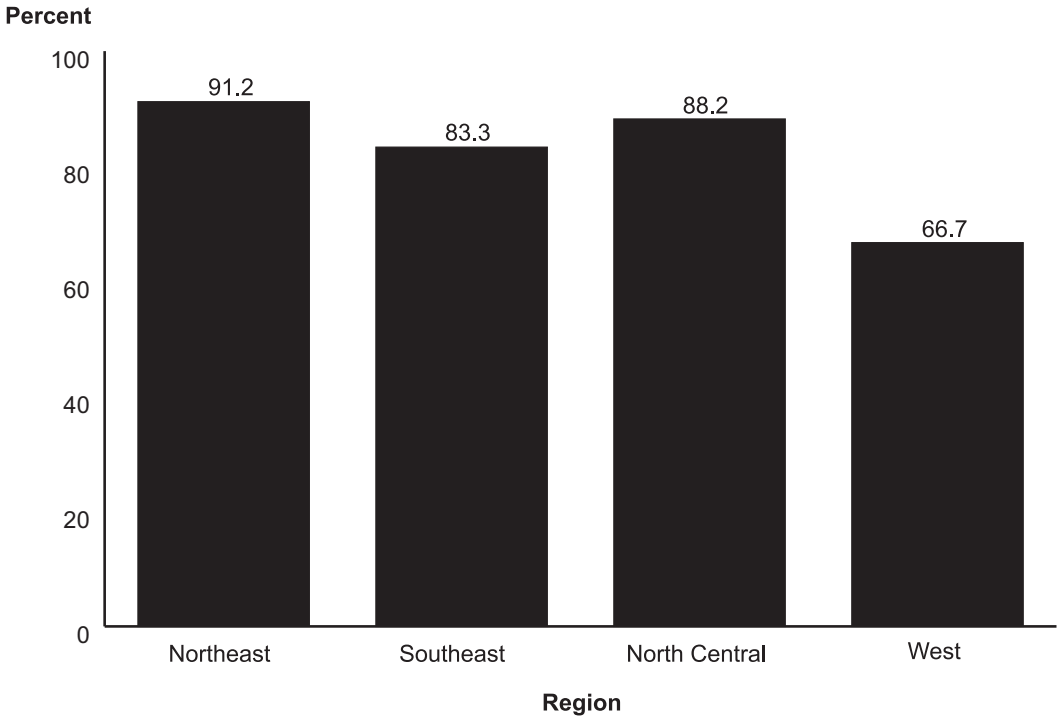
E.2.b. Percentage of operations that dewormed any bison, by region:

Percent Operations

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
91.2	(3.8)	83.3	(5.1)	88.2	(2.7)	66.7	(2.5)

Percentage of operations that dewormed any bison, by region



For the 75.7 percent of operations that dewormed any bison, 40.3 percent dewormed the majority of their bison twice and 30.6 percent dewormed the majority once during the reference period.

A lower percentage of large operations (44.5 percent) dewormed the majority of bison two or more times compared with very small (77.1 percent) or small (84.7 percent) operations. A lower percentage of medium operations (62.6 percent) than small operations (84.7 percent) dewormed bison two or more times. A higher percentage of small operations than medium or large operations dewormed bison two times. Higher percentages of very small (12.4 percent) and small (13.8 percent) operations than large operations (1.3 percent) dewormed bison four times.

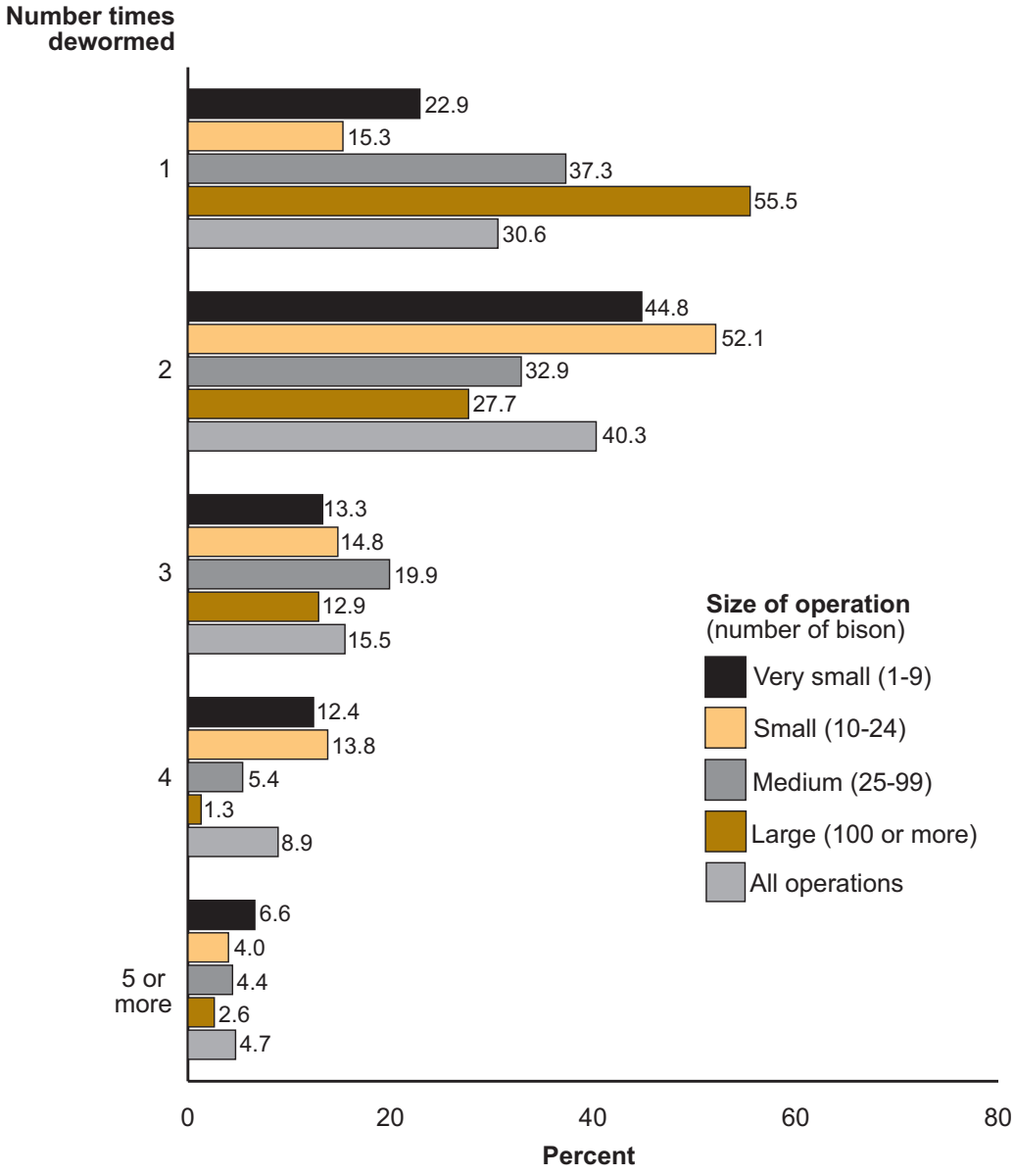
E.2.c. For the 75.7 percent of operations that dewormed any bison (table E.2.a), percentage of operations by number of times the majority of bison were dewormed during the reference period, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Number times	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1	22.9	(3.5)	15.3	(3.5)	37.3	(4.3)	55.5	(5.8)	30.6	(2.2)
2	44.8	(4.2)	52.1	(5.0)	32.9	(4.2)	27.7	(5.3)	40.3	(2.3)
3	13.3	(2.9)	14.8	(3.5)	19.9	(3.6)	12.9	(4.0)	15.5	(1.7)
4	12.4	(2.8)	13.8	(3.6)	5.4	(2.0)	1.3	(1.3)	8.9	(1.4)
5 and more	6.6	(2.2)	4.0	(2.0)	4.4	(1.8)	2.6	(1.8)	4.7	(1.0)
Total	100.0		100.0		100.0		100.0		100.0	

For the 75.7 percent of operations that dewormed any bison, percentage of operations by number of times the majority of bison were dewormed during the reference period, and by size of operation



Various natural and chemical products are available and used for deworming bison, and consumer demand for natural or organic meat products can create a need for alternatives to traditional anthelmintic drugs. Of the 75.7 percent of operations that dewormed any bison, 95.3 percent used conventional dewormers, 8.9 percent used commonly regarded natural/alternative dewormers, and 2.3 percent used “other” dewormers, which included pumpkin, apple cider vinegar, garlic, and pine needles.

The types of dewormers used did not differ by operation size, and some operations in each size category used more than one type of dewormer. It is interesting to note that no large operations used “other” dewormers.

E.2.d. For the 75.7 percent of operations that dewormed any bison (table E.2.a), percentage of operations by type(s) of dewormer used, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Dewormer	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Conventional (e.g., Ivermectin, Safeguard®, Doramectin)	95.1	(1.8)	93.3	(2.4)	96.1	(1.7)	97.3	(1.9)	95.3	(1.0)
Natural/ alternative (e.g., diatomaceous earth, botanicals, cayenne pepper)	4.9	(1.8)	10.0	(3.0)	11.3	(2.8)	11.2	(3.7)	8.9	(1.4)
Other	2.8	(1.4)	3.2	(1.8)	2.3	(1.3)	0.0	(—)	2.3	(0.7)

Of the 75.7 percent of operations that dewormed any bison, 100.0 percent from the Southeast region used conventional dewormers. Roughly one-tenth of operations in each region used natural/alternative dewormers in at least some of their bison. No operations in the Northeast region used any “other” dewormers.

E.2.e. For the 75.7 percent of operations that dewormed any bison (table E.2.a), percentage of operations by type(s) of dewormer used, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Dewormer	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Conventional (e.g., Ivermectin, Safeguard, Doramectin)	98.0	(2.0)	100.0	(—)	92.0	(2.4)	95.6	(1.4)
Natural/ alternative (e.g., diatomaceous earth, botanicals, cayenne pepper)	14.0	(4.9)	6.8	(3.8)	9.7	(2.7)	8.0	(1.8)
Other	0.0	(—)	2.3	(2.2)	4.9	(1.9)	1.3	(0.8)

On average, treating bison with a conventional dewormer cost $18.50 per animal, and each treatment using a natural/alternative dewormer cost $6.40 per animal.

Large operations might have a cost advantage because of bulk pricing; the cost per bison per treatment for conventional dewormers was lower for large operations ($4.30) than for very small ($23.70) or medium ($23.60) operations. There was no substantial cost difference by size of operation in the use of natural/alternative dewormer treatments.

E.2.f. For the 75.7 percent of operations that dewormed any bison (table E.2.a), operation average cost per bison per treatment, by type of dewormer used and by size of operation:

Operation Average Cost per Bison per Treatment ($)

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Dewormer	**Dollar**	**Std. error**	**Dollar**	**Std. error**	**Dollar**	**Std. error**	**Dollar**	**Std. error**	**Dollar**	**Std. error**
Conventional (e.g., Ivermectin, Safeguard®, Doramectin)	23.70	(4.8)	*		23.60	(8.8)	4.30	(0.4)	18.50	(3.4)
Natural/ alternative (e.g., diatomaceous earth, botanicals, cayenne pepper)	4.60	(1.0)	*		3.80	(1.5)	*		6.40	(2.1)
Other	5.30	(0.3)	*		*		*		*	

* Too few to report or none reported.

There were no regional differences in the cost per bison per treatment for conventional and natural/alternative dewormers.

E.2.g. For the 75.7 percent of operations that dewormed any bison (table E.2.a), operation average cost per bison per treatment, by type of dewormer used and by region:

Operation Average Cost per Bison per Treatment ($)

	Region							
	Northeast		Southeast		North Central		West	
Dewormer	Dollars	Std. error	Dollars	Std. error	Dollars	Std. error	Dollars	Std. error
Conventional (e.g., Ivermectin, Safeguard, Doramectin)	17.40	(4.0)	*		16.80	(6.9)	15.60	(4.8)
Natural/alternative (e.g., diatomaceous earth, botanicals, cayenne pepper)	6.20	(2.1)	*		3.80	(1.2)	7.80	(3.6)
Other	*		*		*		*	

*Too few to report or none reported.

Choice of dewormer depends on several factors, including the type of parasites targeted and the method of administration. Each method has advantages and disadvantages that must be considered. For example, dewormers that are injected allow for more accurate and certain dosing to each animal, but they require handling the bison. On the other hand, dewormers administered in mineral blocks are easy to administer and do not require handling of bison but might not be consumed by all bison in the necessary amount to achieve adequate dosing.

Of the 75.7 percent of operations that dewormed any bison, about half (50.5 percent) had administered dewormer using a feed or water additive and roughly one-third had used a pour-on dewormer (36.1 percent), injectable dewormer (34.6 percent), or mineral additive (28.3 percent). Only 9.2 percent had administered dewormer directly into the mouth.

In general, the percentage of operations using an injectable dewormer increased as operation size increased. A higher percentage of large operations (67.3 percent) than operations in the other size categories used an injectable dewormer, and a lower percentage of very small operations (11.7 percent) than operations in the other size categories used an injectable dewormer. A higher percentage of large operations (20.6 percent) than very small operations (6.1 percent) had administered dewormer directly into the mouth.

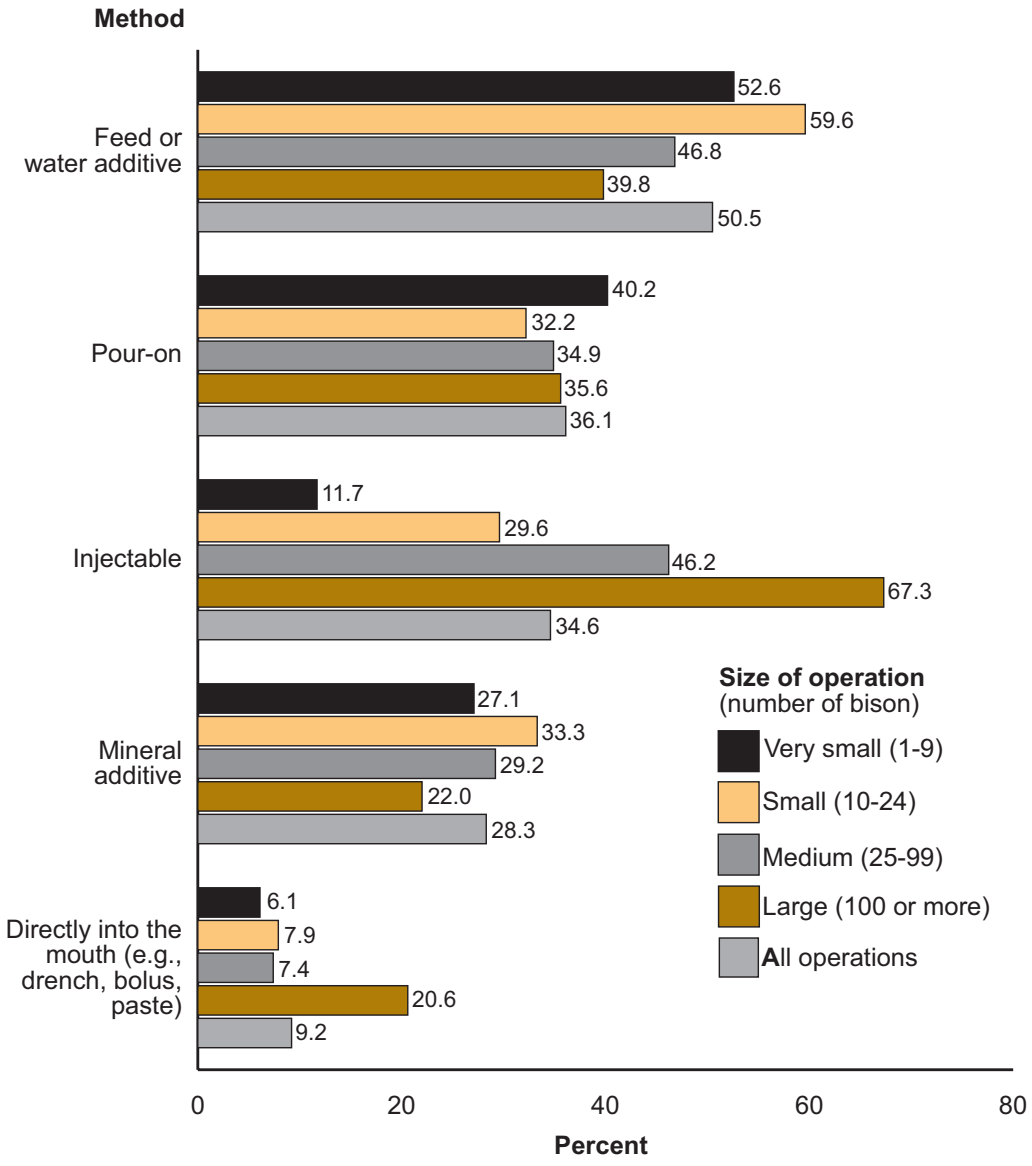
E.2.h. For the 75.7 percent of operations that dewormed any bison (table E.2.a), percentage of operations by method(s) used to administer dewormer on the operation during the reference period, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Pour-on	40.2	(4.1)	32.2	(4.6)	34.9	(4.2)	35.6	(5.5)	36.1	(2.3)
Injectable	11.7	(2.7)	29.6	(4.5)	46.2	(4.4)	67.3	(5.4)	34.6	(2.2)
Directly into the mouth (e.g., drench, bolus, paste)	6.1	(2.0)	7.9	(2.7)	7.4	(2.3)	20.6	(4.6)	9.2	(1.4)
Feed or water additive	52.6	(4.2)	59.6	(4.8)	46.8	(4.4)	39.8	(5.6)	50.5	(2.4)
Mineral additive	27.1	(3.7)	33.3	(4.6)	29.2	(4.0)	22.0	(4.9)	28.3	(2.1)

For the 75.7 percent of operations that dewormed any bison, percentage of operations by method(s) used to administer dewormer, and by size of operation*



*Sorted high to low, by all operations.

Photograph courtesy of Keith Weller, Agricultural Research Service.

Stocking density, pasture characteristics and management, climate, and nutrition can all influence parasite burden in the bison herd. A parasite-control program requires an integrated approach that considers these factors as well as the dewormer itself and its administration. Nearly half of operations (47.9 percent) rotated pastures as a method of parasite control, and almost one-third (31.6 percent) rotated dewormer type to deter parasite resistance. Roughly one-seventh of operations reduced stocking density (17.2 percent), performed laboratory (fecal) testing for intestinal parasites (15.1 percent), or used a different dose of dewormer in bison than the labeled dose recommended for cattle (11.2 percent). About 6 percent gave a combination of two or more dewormer drugs at once, and 1.0 percent used an “other” method of parasite control, which included butchering 1-year-old bison, black locust trees, fly predators, and cutting and baling pasture.

A higher percentage of large operations rotated pastures (74.2 percent) and/or performed laboratory testing for intestinal parasites (32.9 percent) than operations in the other size categories. A higher percentage of large operations rotated dewormer type to deter parasite resistance (47.3 percent) and/or reduced stocking density (25.3 percent) than very small operations (24.2 and 10.8 percent, respectively).

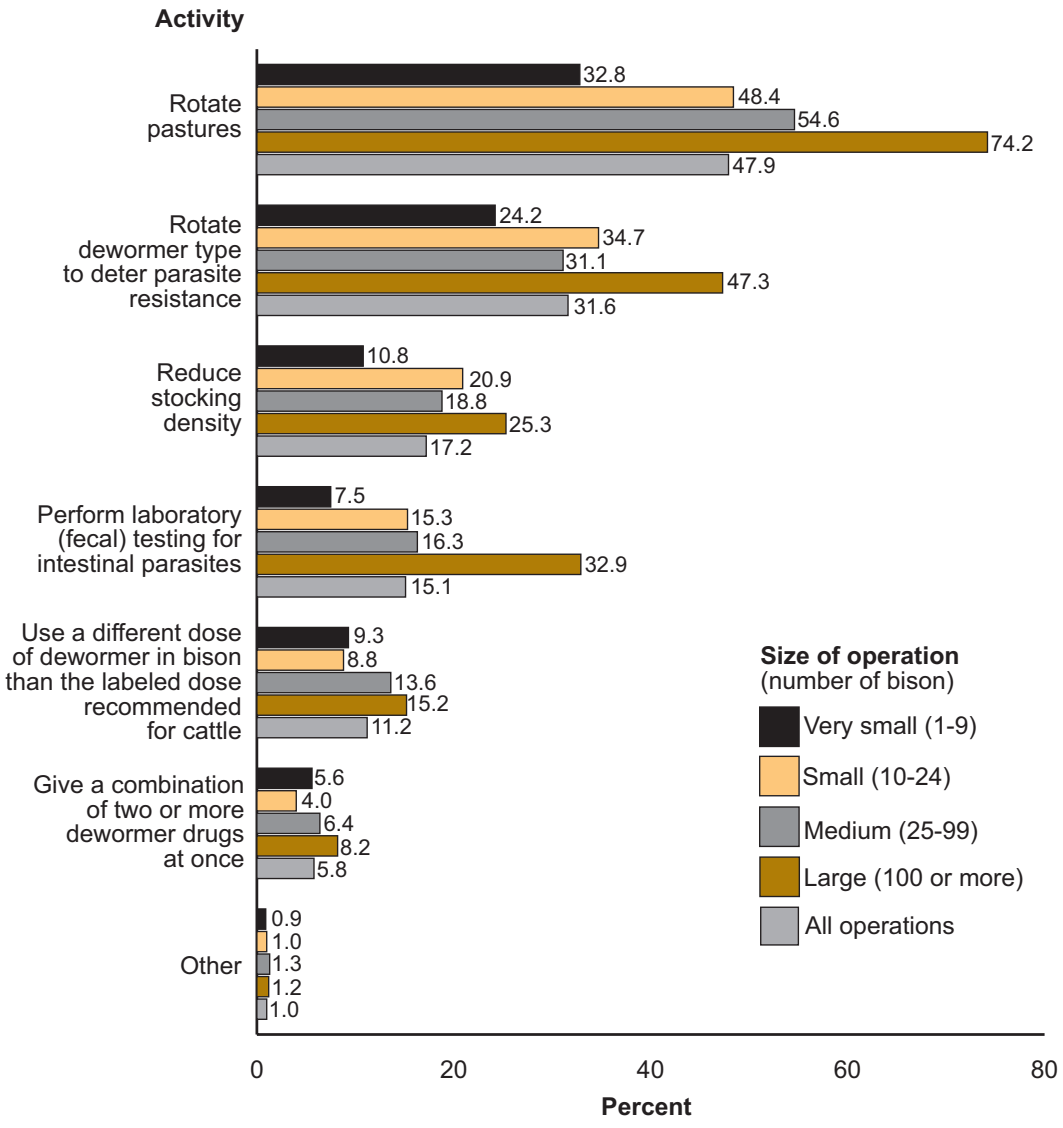
E.2.i. Percentage of operations by activity(-ies) performed as part of a parasite-control program during the reference period, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Activity	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Perform laboratory (fecal) testing for intestinal parasites	7.5	(1.8)	15.3	(3.2)	16.3	(2.9)	32.9	(5.0)	15.1	(1.5)
Rotate dewormer type to deter parasite resistance	24.2	(2.9)	34.7	(4.3)	31.1	(3.7)	47.3	(5.3)	31.6	(1.9)
Give a combination of two or more dewormer drugs at once	5.6	(1.6)	4.0	(1.8)	6.4	(2.0)	8.2	(3.0)	5.8	(1.0)
Use a different dose of dewormer in bison than the labeled dose recommended for cattle	9.3	(2.0)	8.8	(2.5)	13.6	(2.8)	15.2	(3.9)	11.2	(1.3)
Rotate pastures	32.8	(3.2)	48.4	(4.4)	54.6	(4.0)	74.2	(4.7)	47.9	(2.1)
Reduce stocking density	10.8	(2.1)	20.9	(3.7)	18.8	(3.2)	25.3	(4.7)	17.2	(1.6)
Other	0.9	(0.6)	1.0	(1.0)	1.3	(0.9)	1.2	(1.2)	1.0	(0.4)

Percentage of operations by activity(-ies) performed as part of a parasite-control program, and by size of operation*



*Sorted high to low, by all operations.

A higher percentage of operations in the Southeast region (46.1 percent) than in the West region (25.2 percent) rotated dewormer type to deter parasite resistance.

E.2.j. Percentage of operations by activity(-ies) performed as part of a parasite-control program, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Activity	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Perform laboratory (fecal) testing for intestinal parasites	23.2	(5.6)	24.5	(5.9)	14.7	(3.0)	12.3	(1.8)
Rotate dewormer type to deter parasite resistance	37.5	(6.5)	46.1	(6.9)	38.0	(4.1)	25.2	(2.3)
Give a combination of two or more dewormer drugs at once	8.9	(3.8)	9.6	(4.1)	5.6	(1.9)	4.7	(1.1)
Use a different dose of dewormer in bison than the labeled dose recommended for cattle	8.9	(3.8)	19.2	(5.5)	11.9	(2.7)	9.6	(1.6)
Rotate pastures	55.3	(6.6)	46.1	(6.9)	54.8	(4.2)	44.1	(2.7)
Reduce stocking density	14.3	(4.7)	21.1	(5.7)	22.5	(3.5)	14.6	(1.9)
Other	0.0	(—)	1.9	(1.9)	1.4	(1.0)	0.9	(0.5)

3. Vaccination practices and use of veterinarian

Vaccines are designed to prevent or minimize the impact of specific diseases. Choosing which vaccines are appropriate for a vaccination program depends on whether the bison are susceptible to the disease and the risk of developing the disease (this, for example, may depend on geographic region or management practices).

Producers were asked if they had vaccinated any bison against listed diseases or pathogens while the animals were on pasture or in a feedlot. As reported previously in table B.2.a and repeated here for ease of discussion of vaccination of bison on pasture, 87.9 percent of operations had kept any bison on range/pasture at some point during the reference period.

E.3.a. [Repeat of table B.2.a.] Percentage of operations that had any bison on range/pasture, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
78.3	(2.7)	87.4	(2.9)	95.6	(1.7)	100.0	(—)	87.9	(1.5)

Almost one-third of operations (29.1 percent) vaccinated at least some bison against a disease or pathogen while the animals were on pasture. Roughly one-fifth of operations vaccinated bison on pasture against *Clostridium* species (21.9 percent) and/or brucellosis (17.0 percent). About one-tenth vaccinated bison on pasture against bovine viral diarrhea virus (12.4 percent), bovine respiratory syncytial virus (11.1 percent), leptospirosis (10.1 percent), and/or infectious bovine rhinotracheitis (10.0 percent).

Overall, a higher percentage of large operations (61.0 percent) than operations in the other size categories gave any vaccinations to any bison on pasture. A higher percentage of small (28.7 percent) and medium (35.4 percent) operations than very small operations (10.9 percent) vaccinated any bison on pasture.

For specific diseases, in general, the percentage of operations that vaccinated bison on pasture was higher for larger operations than for smaller operations. To mention a few specific diseases, a higher percentage of large operations than operations in the other size categories vaccinated any bison against *Clostridium* species, infectious bovine rhinotracheitis, and/or *Pasteurella* species. A higher percentage of large operations than very small or small operations vaccinated any bison on pasture against bovine respiratory syncytial virus and/or *Mycoplasma bovis*.

Photograph courtesy of Matthew S. Patyk.

E.3.b. For operations with bison on pasture, percentage of operations that vaccinated any bison on pasture against the following diseases or pathogens during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Disease/ pathogen	Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Anthrax	1.2	(0.8)	5.4	(2.1)	2.8	(1.4)	6.8	(2.7)	3.4	(0.8)
Brucellosis	5.3	(1.6)	19.9	(3.7)	21.2	(3.4)	33.1	(5.1)	17.0	(1.6)
Bovine respiratory syncytial virus (BRSV)	5.0	(1.6)	12.5	(3.1)	10.1	(2.6)	25.2	(4.7)	11.1	(1.4)
Bovine viral diarrhea virus (BVDV)	4.5	(1.6)	13.6	(3.3)	13.0	(2.9)	27.9	(4.9)	12.4	(1.4)
Clostridium species (tetanus, blackleg; e.g., 7-way)	8.4	(2.1)	20.5	(3.8)	27.0	(3.8)	46.7	(5.4)	21.9	(1.8)
Infectious bovine rhinotracheitis (IBR)	5.5	(1.7)	9.5	(2.7)	7.0	(2.1)	26.4	(4.8)	10.0	(1.3)
Leptospirosis	5.0	(1.6)	12.0	(3.0)	9.2	(2.4)	20.9	(4.4)	10.1	(1.3)
Mycoplasma bovis	2.7	(1.2)	5.2	(2.1)	3.0	(1.5)	15.5	(3.9)	5.3	(1.0)
Parainfluenza 3 virus (PI3)	4.5	(1.6)	9.0	(2.7)	3.5	(1.6)	15.0	(3.8)	6.9	(1.1)
Pasteurella species	3.5	(1.4)	4.4	(1.9)	3.0	(1.5)	20.0	(4.4)	6.1	(1.1)
Rotavirus/ coronavirus	2.9	(1.3)	6.1	(2.2)	1.4	(1.0)	5.7	(2.5)	3.6	(0.8)
Other	1.2	(0.8)	3.3	(1.6)	1.4	(1.0)	0.0	(—)	1.5	(0.5)
Any	10.9	(2.3)	28.7	(4.2)	35.4	(4.0)	61.0	(5.3)	29.1	(2.0)

As reported in table B.1.a and repeated here for ease of discussion, 15.8 percent of operations kept bison, at least in part, in feedlot during the reference period.

E.3.c. [Excerpted from table B.1.a.] Percentage of operations that kept any bison in feedlot, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
4.2	(1.3)	12.6	(2.9)	18.3	(3.0)	47.1	(5.3)	15.8	(1.5)

Overall, 38.3 percent of operations that had any bison in feedlot vaccinated any bison during the reference period. About one-third of operations (33.8 percent) vaccinated bison against *Clostridium* species (e.g., tetanus, blackleg). About one-fifth vaccinated feedlot bison against bovine respiratory syncytial virus (19.1 percent) and/or bovine viral diarrhea virus (17.7 percent). Roughly one-seventh of operations vaccinated feedlot bison against infectious bovine rhinotracheitis (15.4 percent), *Pasteurella* species (13.9 percent), and/or brucellosis (13.6 percent). About one-tenth of operations vaccinated feedlot bison against *Mycoplasma bovis* (11.6 percent) and/or parainfluenza 3 virus (10.1 percent).

A higher percentage of large operations vaccinated any feedlot bison (73.7 percent) compared with very small (5.8 percent) and small (19.8 percent) operations. Also, a higher percentage of medium operations (42.1 percent) vaccinated any feedlot bison compared with very small and small operations.

E.3.d. For the 15.8 percent of operations that kept any bison in feedlot (table E.3.c), percentage of operations that vaccinated any bison in feedlot against the following diseases or pathogens during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Disease/ pathogen	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Anthrax	0.0	(—)	0.0	(—)	3.3	(3.2)	4.8	(3.3)	2.3	(1.3)
Brucellosis	0.0	(—)	11.7	(6.4)	22.4	(7.5)	19.2	(6.1)	13.6	(3.0)
Bovine respiratory syncytial virus (BRSV)	2.8	(2.7)	7.8	(5.3)	22.5	(7.5)	37.1	(7.4)	19.1	(3.4)
Bovine viral diarrhea virus (BVDV)	2.8	(2.7)	7.8	(5.3)	19.5	(7.2)	34.7	(7.3)	17.7	(3.3)
Clostridium species (tetanus, blackleg; e.g., 7-way)	5.8	(4.0)	11.7	(6.4)	35.5	(8.7)	69.0	(7.2)	33.8	(4.1)
Infectious bovine rhinotracheitis (IBR)	2.8	(2.7)	7.8	(5.3)	12.9	(6.1)	32.3	(7.2)	15.4	(3.1)
Leptospirosis	2.8	(2.7)	0.0	(—)	6.2	(4.3)	18.6	(6.0)	8.0	(2.3)
Mycoplasma bovis	2.8	(2.7)	0.0	(—)	6.6	(4.5)	29.7	(7.0)	11.6	(2.7)
Parainfluenza 3 virus (PI3)	2.8	(2.7)	0.0	(—)	6.2	(4.3)	25.2	(6.6)	10.1	(2.6)
Pasteurella species	0.0	(—)	0.0	(—)	12.9	(6.1)	34.5	(7.3)	13.9	(3.0)
Rotavirus/ coronavirus	0.0	(—)	0.0	(—)	6.2	(4.3)	9.3	(4.4)	4.4	(1.7)
Other	2.8	(2.7)	0.0	(—)	0.0	(—)	2.4	(2.4)	1.5	(1.0)
Any	5.8	(4.0)	19.8	(8.0)	42.1	(9.0)	73.7	(6.8)	38.3	(4.3)

Veterinarians can assist with many aspects of herd health, such as disease prevention, reproduction, diagnosis of disease, and postmortem examinations. Almost one-third of operations (30.6 percent) had a veterinarian visit the operation concerning its bison.

A higher percentage of large operations (68.3 percent) than operations in the other size categories had a veterinarian visit the operation concerning its bison.

E.3.e. Percentage of operations that had a veterinarian visit the operation for reasons concerning its bison during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
13.0	(2.3)	25.2	(3.8)	40.4	(3.9)	68.3	(5.0)	30.6	(1.9)

Of the 30.6 percent of operations that had a veterinarian visit the operation concerning its bison, 50.1 percent had the veterinarian visit for vaccination, 39.0 percent for health certificate issuance, and 35.3 percent for medical treatment of bison for illness or injury. About one-fourth of operations had a veterinarian visit for a reproductive procedure (26.9 percent) or disease testing/sample collection (23.1 percent).

A higher percentage of small operations (55.9 percent) than large operations (25.8 percent) had a veterinarian visit the operation for medical treatment of bison. A higher percentage of large operations (56.4 percent) than operations in the other size categories had a veterinarian visit to perform a reproductive procedure on bison.

E.3.f. For the 30.6 percent of operations that had a veterinarian visit the operation concerning its bison (table E.3.e), percentage of operations by reason(s) for visit and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Medical treatment of bison, for illness or injury	28.8	(8.7)	55.9	(8.7)	36.1	(6.0)	25.8	(5.6)	35.3	(3.5)
Consultation, such as nutrition or reproduction advice	41.8	(9.6)	19.2	(7.1)	10.5	(3.8)	19.6	(5.1)	19.8	(3.0)
Vaccination	44.7	(9.6)	51.0	(8.7)	52.3	(6.2)	49.8	(6.4)	50.1	(3.7)
Health certificate issuance	18.7	(7.6)	27.5	(7.8)	39.6	(6.1)	55.1	(6.4)	39.0	(3.6)
Reproductive procedure (e.g., pregnancy check)	7.0	(4.8)	11.9	(5.6)	16.6	(4.6)	56.4	(6.4)	26.9	(3.2)
Disease testing/sample collection	7.0	(4.8)	38.0	(8.6)	18.4	(4.8)	27.5	(5.7)	23.1	(3.1)
Tranquilization/ handling	7.1	(4.9)	16.0	(6.6)	1.6	(1.5)	6.4	(3.1)	6.6	(1.9)
Euthanasia	0.0	(—)	2.7	(2.6)	3.1	(2.1)	1.7	(1.6)	2.1	(1.0)
Postmortem exam/necropsy	10.1	(5.6)	17.7	(6.6)	15.3	(4.5)	27.2	(5.7)	18.7	(2.8)
Other	9.9	(5.5)	5.8	(4.0)	8.0	(3.5)	1.6	(1.6)	5.9	(1.7)

4. Health problems present in bison on the operation

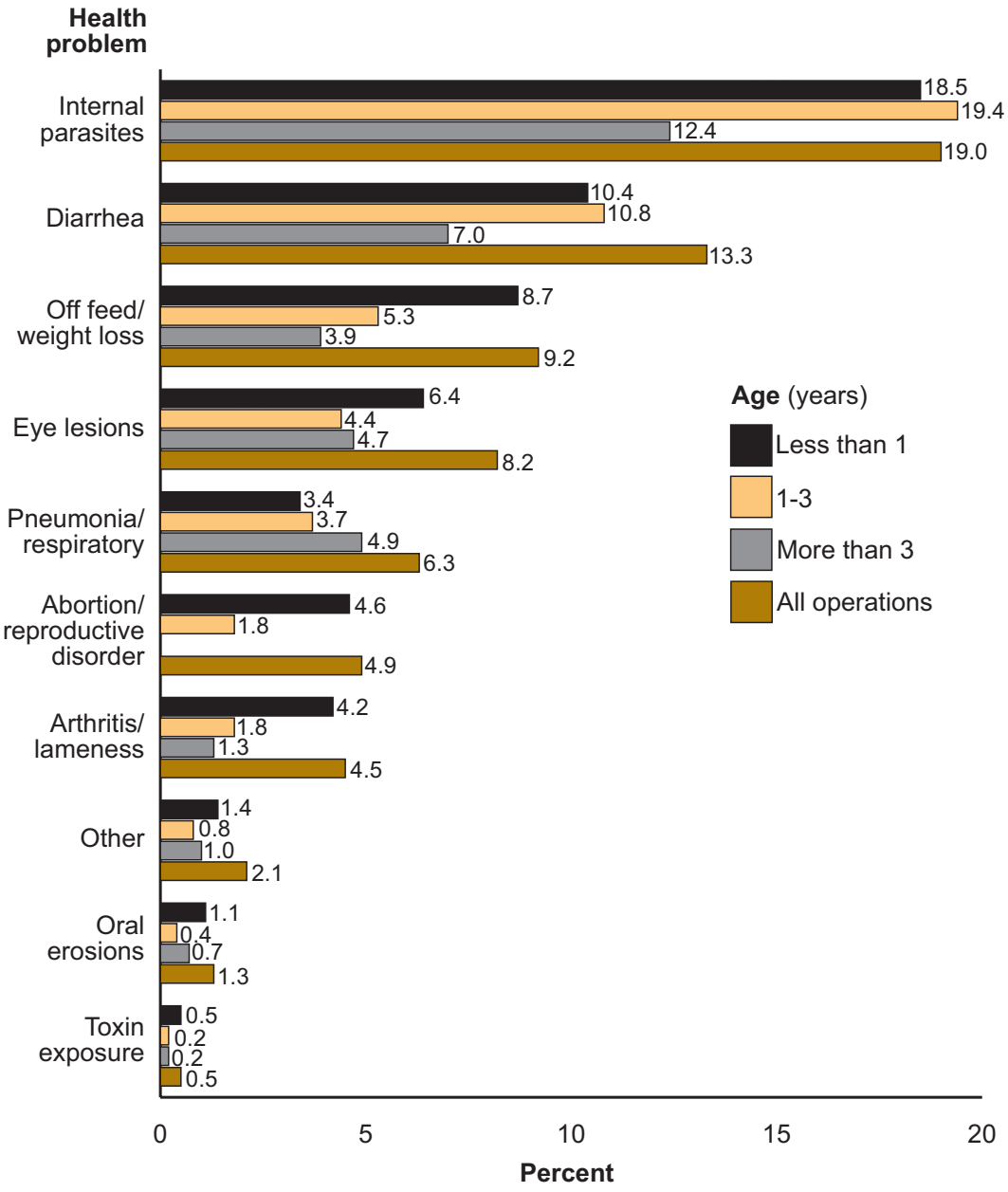
Internal parasites were present in at least some bison on 19.0 percent of operations, and diarrhea was present in some bison on 13.3 percent of operations. Problems with being off feed/weight loss were present in bison on 9.2 percent of operations, and eye lesions occurred in some bison on 8.2 percent of operations. Pneumonia/respiratory problems were present in at least some bison on 6.3 percent of operations. Each of the other listed health problems was present in bison on less than 5.0 percent of operations. “Other” health problems included injury, abscess, and bad weather.

Higher percentages of operations reported problems of arthritis/lameness or being off feed/weight loss in bison more than 3 years old (4.2 percent and 8.7 percent, respectively) than in bison less than 1 year old (1.3 percent and 3.9 percent, respectively).

E.4.a. Percentage of operations by health problem(s) present (suspected or confirmed) in any bison during the reference period, and by age of bison:

	Percent Operations							
	Age (years)							
	More than 3		**1–3**		**Less than 1**		**All operations**	
Health problem	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Pneumonia/ respiratory	3.4	(0.8)	3.7	(0.9)	4.9	(1.1)	6.3	(1.0)
Abortion/ reproductive disorder	4.6	(0.9)	1.8	(0.6)	NA	NA	4.9	(0.9)
Arthritis/lameness	4.2	(0.9)	1.8	(0.6)	1.3	(0.5)	4.5	(0.8)
Internal parasites	18.5	(1.7)	19.4	(1.9)	12.4	(1.7)	19.0	(1.7)
Off feed/ weight loss	8.7	(1.2)	5.3	(1.1)	3.9	(1.0)	9.2	(1.2)
Diarrhea	10.4	(1.4)	10.8	(1.5)	7.0	(1.3)	13.3	(1.4)
Oral erosions	1.1	(0.5)	0.4	(0.3)	0.7	(0.4)	1.3	(0.5)
Eye lesions	6.4	(1.1)	4.4	(1.0)	4.7	(1.1)	8.2	(1.2)
Toxin exposure	0.5	(0.3)	0.2	(0.2)	0.2	(0.2)	0.5	(0.3)
Other	1.4	(0.5)	0.8	(0.4)	1.0	(0.5)	2.1	(0.6)

Percentage of operations by health problem(s) present (suspected or confirmed) in any bison during the reference period, and by age of bison*



*Sorted high to low, by all operations.

In general, higher percentages of larger operations than smaller operations had health problems present in any bison. Specifically, problems with internal parasites, off feed/ weight loss, and diarrhea were present in bison on a lower percentage of very small operations than operations in the other size categories. A lower percentage of very small and small operations than large operations had any bison with pneumonia/respiratory problems. A lower percentage of very small operations than medium or large operations had any bison with eye lesions or reproductive disorders.

E.4.b. Percentage of operations by health problem(s) present in any bison during the reference period, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)	
Health problem	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Pneumonia/ respiratory	2.2	(1.0)	4.7	(1.9)	7.3	(2.1)	18.6	(4.4)
Abortion/ reproductive disorder	0.9	(0.6)	5.6	(2.0)	7.2	(2.1)	10.8	(3.4)
Arthritis/ lameness	1.3	(0.8)	0.7	(0.7)	10.0	(2.4)	9.0	(3.1)
Internal parasites	4.0	(1.4)	23.3	(3.9)	27.3	(3.7)	38.8	(5.4)
Off feed/weight loss	3.0	(1.2)	12.2	(3.0)	10.6	(2.5)	19.6	(4.4)
Diarrhea	4.8	(1.5)	16.6	(3.4)	21.0	(3.4)	17.4	(4.2)
Oral erosions	0.4	(0.4)	2.3	(1.3)	1.4	(0.9)	2.4	(1.7)
Eye lesions	2.2	(1.0)	5.7	(2.1)	11.5	(2.6)	22.9	(4.7)
Toxin exposure	0.0	(0.0)	0.8	(0.8)	0.0	(0.0)	2.3	(1.6)
Other	1.0	(0.7)	2.5	(1.4)	1.9	(1.1)	4.6	(2.3)

A higher percentage of operations in the North Central region than in the West region had any bison with internal parasites or diarrhea.

E.4.c. Percentage of operations by health problem(s) present (suspected or confirmed) in any bison during the reference period, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Health problem	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Pneumonia/ respiratory	7.8	(3.8)	5.9	(3.3)	5.3	(1.9)	6.6	(1.3)
Abortion/ reproductive disorder	3.9	(2.7)	0.0	(0.0)	6.1	(2.1)	5.5	(1.2)
Arthritis/ lameness	2.0	(1.9)	0.0	(0.0)	3.0	(1.5)	6.3	(1.3)
Internal parasites	19.6	(5.6)	29.9	(6.5)	27.2	(3.9)	13.5	(1.9)
Off feed/weight loss	15.7	(5.1)	12.0	(4.6)	11.4	(2.8)	7.0	(1.4)
Diarrhea	17.6	(5.3)	20.0	(5.7)	21.9	(3.6)	7.9	(1.5)
Oral erosions	2.0	(1.9)	0.0	(0.0)	0.8	(0.8)	1.8	(0.7)
Eye lesions	9.8	(4.2)	7.9	(3.8)	10.5	(2.7)	7.1	(1.4)
Toxin exposure	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.8	(0.5)
Other	9.8	(4.2)	4.0	(2.8)	0.8	(0.8)	1.1	(0.6)

5. Death loss from disease and carcass disposal

Overall, 15.0 percent of operations had bison die from unknown health problems, and 8.4 percent had bison die from "other disease." Parasitism was a primary cause of bison deaths on 5.3 percent of operations, and other respiratory illness/pneumonia caused deaths on 4.3 percent of operations. Digestive illness caused bison deaths on 2.0 percent of operations, MCF on 0.9 percent of operations, and *Mycoplasma bovis* on 0.7 percent of operations. It is important to note that although a cause of death might have occurred on a low percentage of operations, it could have affected a high percentage of the bison on those operations.

The percentage of operations that had any bison die because of the listed diseases, disorders, or health problems differed little by age of bison affected. Higher percentages of operations reported deaths because of "other disease" in bison more than 3 years old (4.6 percent) and less than 1 year old (5.3 percent) than in bison 1 to 3 years old (1.5 percent). "Other disease" causes of death included low selenium, copper deficiency, and epizootic hemorrhagic disease/bluetongue.

E.5.a. Percentage of operations that had any bison die because of the listed diseases, disorders, or health problems during the reference period, by age of bison:

	Percent Operations							
	Age (years)							
	More than 3		**1 to 3**		**Less than 1**		**All operations**	
Cause of death	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Mycoplasma bovis (confirmed by vet or lab)	0.5	(0.3)	0.8	(0.4)	0.5	(0.3)	0.7	(0.3)
Malignant catarrhal fever (MCF)	0.4	(0.2)	0.7	(0.4)	0.4	(0.3)	0.9	(0.4)
Parasitism as primary cause of death	2.9	(0.7)	3.0	(0.8)	2.0	(0.7)	5.3	(0.9)
Other respiratory illness/pneumonia	1.9	(0.6)	2.8	(0.7)	3.1	(0.8)	4.3	(0.8)
Digestive illness	1.4	(0.5)	1.1	(0.4)	0.2	(0.2)	2.0	(0.6)
Neurologic disorder	0.2	(0.2)	0.4	(0.3)	0.0	(—)	0.5	(0.3)
Other disease	4.6	(0.9)	1.5	(0.5)	5.3	(1.0)	8.4	(1.1)
Unknown health problem	9.8	(1.2)	5.7	(1.0)	7.1	(1.2)	15.0	(1.4)

In general, the percentage of operations that had any bison die because of any of the listed diseases, disorders, or health problems increased as operation size increased.

Only large operations reported any bison lost to *Mycoplasma bovis*. It is possible, however, that some bison whose deaths were attributed to unknown health problems actually died because of a *Mycoplasma bovis* infection not confirmed by a veterinarian or laboratory. In general, a higher percentage of larger operations than smaller operations had bison die because of primary parasitism, other respiratory illness/pneumonia, or unknown causes.

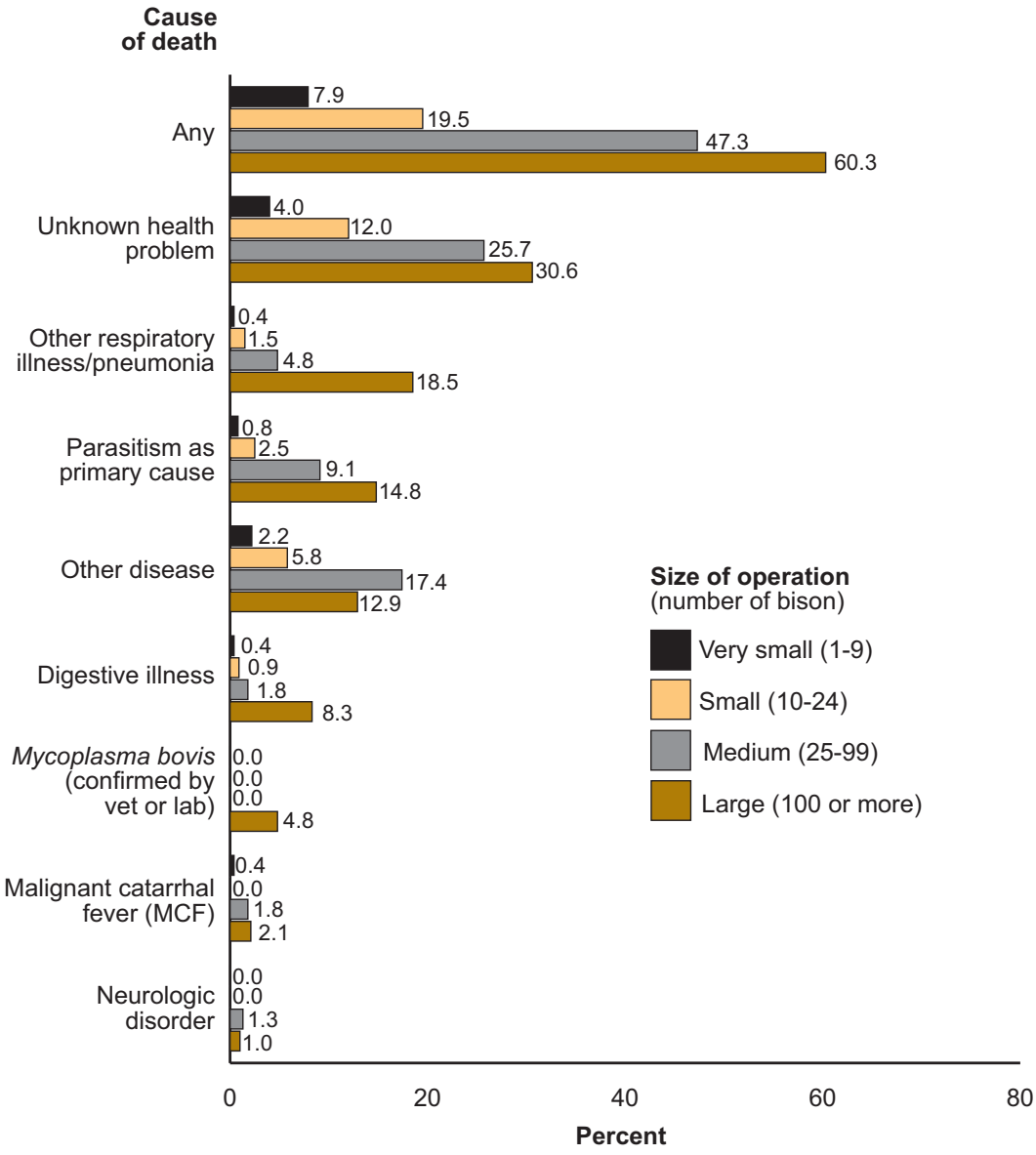
E.5.b. Percentage of operations that had any bison die because of the listed diseases, disorders, or health problems during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)	
Cause of death	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Mycoplasma bovis (confirmed by vet or lab)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	4.8	(2.1)
Malignant catarrhal fever (MCF)	0.4	(0.4)	0.0	(0.0)	1.8	(1.0)	2.1	(1.5)
Parasitism as primary cause of death	0.8	(0.6)	2.5	(1.4)	9.1	(2.3)	14.8	(3.8)
Other respiratory illness/ pneumonia	0.4	(0.4)	1.5	(1.0)	4.8	(1.7)	18.5	(4.1)
Digestive illness	0.4	(0.4)	0.9	(0.9)	1.8	(1.0)	8.3	(2.8)
Neurologic disorder	0.0	(0.0)	0.0	(0.0)	1.3	(0.9)	1.0	(1.0)
Other disease	2.2	(1.0)	5.8	(2.0)	17.4	(3.0)	12.9	(3.5)
Unknown health problem	4.0	(1.3)	12.0	(2.8)	25.7	(3.5)	30.6	(4.9)
Any	7.9	(1.8)	19.5	(3.4)	47.3	(4.0)	60.3	(5.2)

Percentage of operations that had any bison die because of the listed diseases, disorders, or health problems, by size of operation*



*Sorted high to low, by large operations.

The percentages of operations that had any bison die because of the listed diseases, disorders, or health problems did not differ much by region. A higher percentage of operations in the North Central region (10.3 percent) than in the West region (2.5 percent) had bison die because of parasitism as primary cause of death. A higher percentage of operations in the North Central region (11.0 percent) than in the Southeast region (1.9 percent) had bison die because of "other disease."

E.5.c. Percentage of operations that had any bison die because of the listed diseases, disorders, or health problems during the reference period, by region:

Percent Operations

	Region							
	Northeast		**Southeast**		**North Central**		**West**	
Cause of death	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Mycoplasma bovis (confirmed by vet or lab)	1.7	(1.7)	0.0	(0.0)	0.0	(0.0)	0.9	(0.5)
Malignant catarrhal fever (MCF)	1.7	(1.7)	0.0	(0.0)	0.7	(0.7)	1.1	(0.5)
Parasitism as primary cause of death	6.9	(3.3)	7.4	(3.6)	10.3	(2.5)	2.5	(0.8)
Other respiratory illness/ pneumonia	5.2	(2.9)	1.8	(1.8)	2.7	(1.4)	5.3	(1.2)
Digestive illness	1.7	(1.7)	1.9	(1.8)	2.1	(1.2)	2.0	(0.7)
Neurologic disorder	1.7	(1.7)	0.0	(0.0)	0.7	(0.7)	0.3	(0.3)
Other disease	12.0	(4.3)	1.9	(1.8)	11.0	(2.6)	8.0	(1.4)
Unknown health problem	17.2	(5.0)	14.7	(4.8)	13.1	(2.8)	15.6	(1.9)

Overall, 24.2 percent of operations with any bison deaths had a necropsy performed on one or more of the operation's bison. The percentage of operations that performed necropsies did not differ by size of operation.

E.5.d. For operations with any bison deaths, percentage of operations that had necropsies performed on any of the operation's dead bison during the reference period, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
21.0	(8.4)	16.1	(5.6)	19.6	(4.3)	35.8	(5.7)	24.2	(2.9)

Of operations that had necropsies performed on any bison, 59.7 percent of operations had the majority of necropsies performed by a private veterinarian.

E.5.e. For operations that had necropsies performed on any dead bison during the reference period, percentage of operations by person who performed the majority of necropsies:

Person	**Percent operations**	**Std. error**
Owner/manager/staff	19.2	(5.3)
Private veterinarian	59.7	(6.7)
Federal or State veterinarian	10.0	(4.2)
Other	11.1	(4.3)
Total	100.0	

Of operations that had any bison die, about one-third used onsite burial (35.6 percent) or no disposal method (33.0 percent)—that is, leaving the carcass to nature/scavengers—as the primary method for disposing of dead bison. There were no substantial differences by operation size in the primary method of disposing of dead bison.

E.5.f. For operations that had any bison deaths, percentage of operations by primary method of disposing of dead bison during the reference period, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Primary disposal method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Composted	8.2	(5.5)	12.9	(4.9)	10.0	(3.2)	15.4	(4.3)	12.0	(2.1)
Onsite burial	30.0	(9.5)	49.0	(7.6)	38.0	(5.1)	26.1	(5.2)	35.6	(3.2)
Sent to landfill	11.9	(6.5)	0.0	(—)	1.1	(1.1)	2.8	(1.9)	2.6	(1.0)
Rendered	4.0	(3.9)	6.6	(3.7)	7.6	(2.8)	7.1	(3.1)	6.9	(1.7)
Incinerated	9.0	(6.1)	4.5	(3.1)	5.5	(2.4)	4.2	(2.4)	5.3	(1.5)
No disposal method (left to nature/ scavengers)	28.7	(9.3)	24.8	(6.5)	33.5	(5.0)	38.9	(5.8)	33.0	(3.1)
Other	8.2	(5.6)	2.2	(2.2)	4.2	(2.1)	5.5	(2.7)	4.7	(1.4)
Total	100.0		100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region (45.0 percent) than in the North Central (17.8 percent) or Northeast (5.3 percent) regions used no disposal method for dead bison, leaving them to nature/scavengers.

E.5.g. For operations that had any bison deaths, percentage of operations by primary method of disposing of dead bison during the reference period, and by region:

Percent Operations

Region

	Northeast		Southeast		North Central		West	
Primary disposal method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Composted	36.8	(11.1)	15.3	(10.0)	16.1	(4.7)	6.4	(2.1)
Onsite burial	31.6	(10.7)	54.0	(13.8)	46.8	(6.3)	28.5	(3.9)
Sent to landfill	0.0	(—)	0.0	(—)	0.0	(—)	4.5	(1.8)
Rendered	10.6	(7.1)	0.0	(—)	11.3	(4.0)	5.1	(1.9)
Incinerated	0.0	(—)	7.7	(7.4)	1.6	(1.6)	7.4	(2.3)
No disposal method	5.3	(5.1)	23.1	(11.7)	17.8	(4.9)	45.0	(4.3)
Other	15.8	(8.4)	0.0	(—)	6.4	(3.1)	3.0	(1.5)
Total	100.0		100.0		100.0		100.0	

6. Abnormally high death loss within the past 5 years

Producers were asked whether the operation had experienced 1 or more months of abnormally high death loss in the bison herd within the past 5 years. Abnormally high death loss was defined as a level of death loss more than twice what the producer would normally expect.

Overall, 13.2 percent of operations experienced 1 or more months of abnormally high death loss in the bison herd within the past 5 years. A higher percentage of large (29.8 percent) or medium (16.2 percent) operations than very small operations (6.0 percent) had experienced 1 or more months of abnormally high death loss. Also, a higher percentage of large operations than small operations (10.9 percent) had experienced 1 or more months of abnormally high death loss.

E.6.a. Percentage of operations that had 1 or more months of abnormally high death loss in the bison herd within the past 5 years, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
6.0	(1.6)	10.9	(2.8)	16.2	(3.0)	29.8	(4.8)	13.2	(1.4)

There were no substantial differences by region in the percentages of operations that had experienced 1 or more months of abnormally high death loss in the bison herd within the past 5 years.

E.6.b. Percentage of operations that had 1 or more months of abnormally high death loss in the bison herd within the past 5 years, by region:

Percent Operations

Region

Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
20.0	(5.4)	19.2	(5.5)	14.9	(3.0)	10.3	(1.6)

During the most recent period of abnormally high death loss, about half of operations experienced abnormally high death loss in bison less than 1 year old, 1 to 3 years old, or more than 3 years old. About one-tenth of operations (9.0 percent) experienced abnormally high death loss of fetuses.

E.6.c. For the 13.2 percent of operations that experienced 1 or more months of abnormally high death loss within the past 5 years (table E.6.a), percentage of operations by age of bison affected during the most recent period of abnormally high death loss:

Age (yr)	**Percent operations***	**Std. error**
More than 3	49.2	(5.9)
1 to 3	52.8	(5.9)
Less than 1	50.9	(6.1)
Bison fetuses (spontaneous abortions)	9.0	(3.5)

*For operations that had the age group.

During the most recent period of abnormally high death loss, more than three-fifths of operations (62.3 percent) observed severe weight loss in bison before they died. About one-half of operations (51.4 percent) observed that moribund bison became isolated from the herd, and about two-fifths observed reluctance to move (42.5 percent) and/or diarrhea/scours (42.7 percent) in bison before they died. About one-fourth (25.5 percent) observed coughing or breathing difficulty in bison before they died.

E.6.d. For the 13.2 percent of operations that experienced 1 or more months of abnormally high death loss within the past 5 years (table E.6.a), percentage of operations by sign(s) observed in bison before they died during the most recent period of abnormally high death loss:

Sign observed	**Percent operations**	**Std. error**
Reluctance to move	42.5	(5.6)
Coughing or breathing difficulty	25.5	(4.9)
Severe weight loss	62.3	(5.5)
Diarrhea/scours	42.7	(5.7)
Isolation from the herd	51.4	(5.7)

During the most recent period of abnormally high death loss, almost one-fourth of operations (23.0 percent) received a confirmed diagnosis of parasitism from a veterinarian or diagnostic laboratory. About one-fifth (20.5 percent) received diagnoses of “other” causes. Six percent of operations that had experienced 1 or more months of abnormally high death loss received a diagnosis of *Mycoplasma bovis* for the most recent period, and 2.6 percent had confirmed MCF.

E.6.e. For the 13.2 percent of operations that experienced 1 or more months of abnormally high death loss within the past 5 years (table E.6.a), percentage of operations that received a confirmed diagnosis for the listed causes of death from a veterinarian or diagnostic laboratory during the most recent period of abnormally high death loss:

Cause	Percent operations	Std. error
Mycoplasma bovis	6.0	(2.6)
Malignant catarrhal fever (MCF)	2.6	(1.8)
Parasitism (internal and/or external)	23.0	(4.9)
Other	20.5	(4.6)

F. Disease Testing Practices

1. Testing for bovine tuberculosis (TB)

Overall, 4.6 percent of operations had an Accredited Herd for Tuberculosis designation or were in the process of becoming an Accredited Herd. There were no differences by operation size in the percentages of operations with or in the process of obtaining accreditation.

F.1.a. Percentage of operations that had an Accredited Herd for Tuberculosis designation or were in the process of becoming an Accredited Herd, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		Small (10–24)		Medium (25–99)		Large (100 or more)		All operations	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
1.8	(0.9)	7.5	(2.3)	6.1	(2.0)	4.5	(2.2)	4.6	(0.9)

No operations in the Southeast region had an Accredited Herd for Tuberculosis designation or were in the process of becoming an Accredited Herd.

F.1.b. Percentage of operations that had an Accredited Herd for Tuberculosis designation or were in the process of becoming an Accredited Herd, by region:

Percent Operations

Region

Northeast		Southeast		North Central		West	
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
3.7	(2.6)	0.0	(—)	6.7	(2.1)	4.8	(1.2)

About one-third of operations (36.2 percent) had ever had any bison tested for TB. A higher percentage of large operations (61.9 percent) had ever tested any bison for TB than operations in the other size categories.

F.1.c. Percentage of operations that ever had any bison tested for TB, by size of operation:

Percent Operations									
Size of Operation (number of bison)									
Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
21.9	(2.9)	37.2	(4.3)	41.0	(4.0)	61.9	(5.2)	36.2	(2.0)

There were no differences by region in the percentage of operations that had ever had any bison tested for TB.

F.1.d. Percentage of operations that ever had any bison tested for TB, by region:

Percent Operations							
Region							
Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
23.6	(5.7)	26.5	(6.3)	41.7	(4.3)	37.7	(2.6)

For 41.8 percent of operations that had ever had any bison tested for TB, more than 5 years had passed since the last TB test. For 21.2 percent of operations, less than a year had passed since the most recent test. For more than two-thirds of very small operations (68.2 percent), more than 5 years had passed since the last TB test.

F.1.e. For the 36.2 percent of operations that had ever had any bison tested for TB (table F.1.c), percentage of operations by years since most recent TB test for any of the operation's bison, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Years since TB test	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 1	11.4	(4.8)	27.5	(6.5)	14.2	(4.4)	32.0	(6.4)	21.2	(2.8)
1 to 2	4.5	(3.1)	12.7	(4.9)	21.1	(5.2)	10.8	(4.2)	13.0	(2.3)
2 to 3	2.3	(2.2)	12.7	(4.9)	13.4	(4.4)	9.5	(4.1)	9.9	(2.1)
3 to 5	13.6	(5.2)	10.1	(4.3)	18.2	(5.0)	13.4	(4.8)	14.1	(2.4)
More than 5	68.2	(7.1)	37.0	(7.0)	33.2	(6.0)	34.3	(6.5)	41.8	(3.4)
Total	100.0		100.0		100.0		100.0		100.0	

There were no substantial differences by region in the number of years since the most recent TB test.

F.1.f. For the 36.2 percent of operations that had ever had any bison tested for TB (table F.1.c), percentage of operations by years since most recent TB test for any of the operation's bison, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Years since TB test	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Less than 1	15.4	(10.0)	15.4	(10.0)	21.8	(5.6)	22.2	(3.7)
1 to 2	15.4	(10.0)	15.4	(10.0)	9.1	(3.9)	14.3	(3.1)
2 to 3	7.7	(7.4)	15.4	(10.0)	12.7	(4.5)	8.0	(2.4)
3 to 5	7.7	(7.4)	15.3	(10.0)	16.3	(5.0)	13.6	(3.1)
More than 5	53.9	(13.8)	38.5	(13.5)	40.0	(6.6)	41.9	(4.4)
Total	100.0		100.0		100.0		100.0	

About two-fifths of operations that had ever had any bison tested for TB had only specific bison tested during the most recent test (42.6 percent). About one-fourth (24.6 percent) had the entire herd tested, and about one-fifth (20.2 percent) had only bison less than 1 year old tested.

As might be expected, a higher percentage of very small operations (43.9 percent) than medium (12.1 percent) or large (13.8 percent) operations had the entire herd tested during the most recent test. Also, a higher percentage of small operations (36.8 percent) than medium operations had the entire herd tested during the most recent test.

F.1.g. For the 36.2 percent of operations that had ever had any bison tested for TB (table F.1.c), percentage of operations by bison tested for TB during the operation's most recent test, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Bison tested	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Entire herd	43.9	(8.2)	36.8	(7.3)	12.1	(4.3)	13.8	(4.8)	24.6	(3.2)
Less than 1 year only	13.3	(5.5)	15.6	(5.4)	27.4	(5.8)	21.2	(5.7)	20.2	(2.9)
Bison 1 year and older only	11.3	(5.3)	4.5	(3.1)	17.1	(5.0)	15.5	(5.1)	12.6	(2.4)
Specific bison only	31.5	(7.6)	43.1	(7.5)	43.4	(6.5)	49.5	(7.0)	42.6	(3.6)
Total	100.0		100.0		100.0		100.0		100.0	

For operations that had ever had bison tested for TB, the only differences in the bison tested by region were for bison less than 1 year old. No operations in the Northeast or Southeast regions tested only animals less than 1 year old, whereas 18.4 percent of operations in the North Central region and 25.5 percent of operations in the West region did so.

F.1.h. For the 36.2 percent of operations that had ever had any bison tested for TB (table F.1.c), percentage of operations by bison tested for TB during the operation's most recent test, and by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Bison tested	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Entire herd	16.7	(10.8)	41.7	(14.2)	26.6	(6.3)	22.3	(3.8)
Bison less than 1 year only	0.0	(—)	0.0	(—)	18.4	(5.5)	25.5	(4.0)
Bison 1 year and older only	25.0	(12.5)	16.7	(10.8)	8.1	(3.9)	12.8	(3.1)
Specific bison only	58.4	(14.2)	41.6	(14.2)	46.9	(7.1)	39.4	(4.5)
Total	100.0		100.0		100.0		100.0	

Operators that had ever had any bison tested for TB were asked why the bison were tested during the most recent test; respondents could provide more than one purpose for testing. For operations that had ever had any bison tested for TB, three-fifths (60.9 percent) had bison tested because of a sale requirement and about half (48.2 percent) had bison tested because of a movement requirement. About one-fourth (27.7 percent) had bison tested because of a State requirement.

A higher percentage of large operations (57.1 percent) than very small operations (27.0 percent) had bison tested most recently because of a movement requirement. A higher percentage of large operations (42.8 percent) than operations in the other size categories had bison tested most recently for a show or exhibition requirement.

F.1.i. For the 36.2 percent of operations that had ever had any bison tested for TB (table F.1.c), percentage of operations by reason(s) for most recent test for TB, and by size of operation:

Percent Operations

Size of Operation (number of bison)

Reason	**Very small** (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Herd accreditation for TB-free status	15.0	(5.6)	10.9	(4.6)	8.3	(3.6)	6.0	(3.4)	9.7	(2.1)
Movement requirement	27.0	(7.0)	50.1	(7.6)	53.9	(6.5)	57.1	(6.9)	48.2	(3.6)
Show or exhibition requirement	2.4	(2.4)	11.2	(4.7)	15.0	(4.6)	42.8	(6.9)	18.6	(2.8)
State requirement	24.7	(6.8)	29.7	(6.9)	28.8	(5.9)	27.1	(6.2)	27.7	(3.2)
Veterinarian (nonregulatory, private practitioner) recommendation	19.9	(6.3)	21.4	(6.3)	11.4	(4.1)	4.0	(2.8)	13.6	(2.5)
Sale requirement	46.6	(7.9)	68.5	(7.0)	60.3	(6.4)	66.5	(6.6)	60.9	(3.5)
Other	7.4	(4.1)	2.2	(2.2)	5.1	(2.9)	1.6	(1.6)	4.0	(1.4)

During the most recent test for TB, about one-tenth of operations in the North Central (9.8 percent) and West (11.7 percent) regions had bison tested for herd accreditation for TB-free status. Bison were tested most recently for show or exhibition requirements on a higher percentage of operations in the North Central (23.4 percent) and West (19.7 percent) regions than in the Southeast region (0.0 percent). A higher percentage of operations in the North Central region (68.6 percent) than in the Southeast region (27.3 percent) had bison tested most recently for a sale requirement.

F.1.j. For the 36.2 percent of operations that had ever had any bison tested for TB (table F.1.c), percentage of operations by reason(s) for most recent test for TB, and by region:

Percent Operations

	Region							
	Northeast		Southeast		North Central		West	
Reason	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Herd accreditation for TB-free status	0.0	(—)	0.0	(—)	9.8	(4.2)	11.7	(2.9)
Movement requirement	66.6	(13.6)	45.4	(15.0)	50.9	(7.0)	45.7	(4.6)
Show or exhibition requirement	8.3	(8.0)	0.0	(—)	23.4	(5.9)	19.7	(3.6)
State requirement	25.0	(12.5)	18.2	(11.6)	41.2	(6.9)	23.2	(3.8)
Veterinarian (nonregulatory, private practitioner) recommendation	25.0	(12.5)	27.3	(13.4)	5.9	(3.3)	14.3	(3.2)
Sale requirement	50.0	(14.4)	27.3	(13.4)	68.6	(6.5)	62.6	(4.4)
Other	0.0	(—)	0.0	(—)	2.0	(2.0)	5.8	(2.1)

2. Testing for brucellosis

About one-third of all operations (33.1 percent) had ever had any bison tested for brucellosis. The percentage of operations that had tested bison for brucellosis at some point increased, in general, as operation size increased; a higher percentage of large operations (60.2 percent) had ever tested bison for brucellosis than medium (40.4 percent) or small (35.4 percent) operations, and these percentages were higher than that for very small operations (15.8 percent).

F.2.a. Percentage of operations that had ever had any bison tested for brucellosis, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
15.8	(2.5)	35.4	(4.2)	40.4	(3.9)	60.2	(5.2)	33.1	(1.9)

A higher percentage of operations in the North Central (36.9 percent) and West (35.3 percent) regions than in the Northeast region (14.5 percent) had ever had any bison tested for brucellosis.

F.2.b. Percentage of operations that had ever had any bison tested for brucellosis, by region:

Percent Operations

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
14.5	(4.8)	27.4	(6.2)	36.9	(4.1)	35.3	(2.6)

Operators that had ever had any bison tested for brucellosis were asked why the bison were tested during the most recent test; respondents could provide more than one purpose for testing. Almost two-thirds of operations (63.1 percent) had most recently tested bison for brucellosis because of a sale requirement, and about half (53.6 percent) had tested for a movement requirement. Almost 30 percent (29.7 percent) had tested most recently for a State requirement.

There were few differences by operation size in the reasons given for the most recent brucellosis testing. A higher percentage of large operations (41.2 percent) than operations in the other size categories had tested bison most recently for a show or exhibition requirement.

F.2.c. For the 33.1 percent of operations that had ever had any bison tested for brucellosis (table F.2.a), percentage of operations by reason(s) for most recent test for brucellosis, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Reason	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Herd accreditation for brucellosis-free herd status	24.8	(7.6)	6.9	(3.9)	12.8	(4.2)	10.9	(4.2)	13.0	(2.4)
Movement requirement	43.3	(8.5)	61.0	(7.2)	51.0	(6.3)	57.1	(6.8)	53.6	(3.6)
Show or exhibition requirement	2.8	(2.8)	8.6	(4.1)	16.9	(4.7)	41.2	(6.8)	18.8	(2.8)
State requirement	29.1	(7.8)	30.4	(6.8)	29.9	(5.8)	29.2	(6.2)	29.7	(3.3)
Veterinarian (nonregulatory, private practitioner) recommendation	20.1	(6.8)	19.8	(5.9)	9.8	(3.8)	3.8	(2.7)	12.5	(2.4)
Sale requirement	49.5	(8.6)	62.5	(7.2)	68.8	(5.9)	65.8	(6.6)	63.1	(3.5)
Other	2.9	(2.8)	9.0	(4.3)	6.7	(3.2)	3.7	(2.6)	5.8	(1.7)

A higher percentage of operations in the North Central (68.6 percent) and West (66.9 percent) regions than operations in the Southeast region (21.5 percent) had tested bison for brucellosis most recently because of a sale requirement. Similarly, a higher percentage of operations in the North Central (23.4 percent) and West (20.0 percent) regions than operations in the Southeast region (0.0 percent) had tested bison for brucellosis most recently because of a show or exhibition requirement. No operations in the Northeast region had tested for brucellosis most recently for herd accreditation, likely because States in the Northeast are considered free of brucellosis.

F.2.d. For the 33.1 percent of operations that had ever had any bison tested for brucellosis (table F.2.a), percentage of operations by reason(s) for most recent test for brucellosis, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Reason	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Herd accreditation for brucellosis-free herd status	0.0	(—)	28.7	(12.1)	13.8	(4.8)	11.2	(2.8)
Movement requirement	62.4	(17.1)	35.6	(12.8)	56.9	(6.9)	54.4	(4.5)
Show or exhibition requirement	12.5	(11.7)	0.0	(—)	23.4	(5.9)	20.0	(3.6)
State requirement	12.5	(11.7)	14.3	(9.4)	39.3	(6.8)	28.8	(4.1)
Veterinarian (nonregulatory, private practitioner) recommendation	25.0	(15.3)	21.4	(11.0)	7.9	(3.8)	12.4	(3.0)
Sale requirement	62.5	(17.1)	21.5	(11.0)	68.6	(6.5)	66.9	(4.2)
Other	0.0	(—)	14.3	(9.4)	2.0	(2.0)	6.5	(2.2)

Overall, 14.1 percent of operations that had ever had any bison tested for brucellosis had a Certified Brucellosis-Free Herd designation or were in the process of acquiring that designation. There were no differences in this percentage by size of operation.

F.2.e. For the 33.1 percent of operations that had ever had any bison tested for brucellosis (table F.2.a), percentage of operations that had a Certified Brucellosis-Free Herd designation or were in the process of becoming a Certified Brucellosis-Free Herd, by size of operation:

Percent Operations

Size of Operation (number of bison)

Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
19.2	(7.0)	11.9	(5.0)	10.2	(4.0)	17.5	(5.3)	14.1	(2.6)

No operations in the Northeast region had ever had bison tested as part of the process for acquiring a Certified Brucellosis-Free Herd designation.

F.2.f. For the 33.1 percent of operations that had ever had any bison tested for brucellosis (table F.2.a), percentage of operations that had a Certified Brucellosis-Free Herd designation or were in the process of becoming a Certified Brucellosis-Free Herd, by region:

Percent Operations

Region

Northeast		**Southeast**		**North Central**		**West**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	7.7	(7.4)	13.3	(5.1)	16.3	(3.4)

3. Producer concern about disease testing

Handling bison for any reason, including disease testing, is accompanied by issues and challenges. In general, producers were more concerned about stress on the bison from testing and bison injuries or deaths from handling than about the other four issues (expense of testing, reliability of tests, amount of time required for testing, and lack of facilities to restrain bison for testing). The percentages of operations on which the respondent was very concerned about stress on bison from testing or bison injuries or deaths from handling were higher than the percentages of operations on which the respondent had a lower level of concern for those issues/challenges.

F.3.a. Percentage of operations by how concerned respondent was about the following issues and challenges related to testing bison for diseases, such as TB:

	Percent Operations								
	How Concerned								
	Not		Slightly		Moderately		Very		
Issue/challenge	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Expense of testing	36.7	(2.0)	21.2	(1.7)	24.6	(1.8)	17.5	(1.6)	100.0
Stress on bison from testing	22.6	(1.7)	11.5	(1.3)	24.9	(1.8)	40.9	(2.0)	100.0
Bison injuries or deaths from handling	23.8	(1.8)	14.6	(1.5)	23.4	(1.8)	38.2	(2.0)	100.0
Reliability of tests (e.g., false-positive results)	42.5	(2.1)	23.8	(1.8)	19.5	(1.6)	14.2	(1.5)	100.0
Amount of time required for testing	36.7	(2.0)	19.6	(1.7)	24.5	(1.8)	19.2	(1.6)	100.0
Lack of facilities to restrain bison for testing	46.3	(2.1)	13.4	(1.4)	14.8	(1.5)	25.5	(1.8)	100.0

To evaluate responses about disease testing by operation size, responses of "moderately" and "very" concerned were combined. Overall, more than three-fifths of respondents were moderately or very concerned about stress on bison from testing (65.8 percent) and bison injuries or deaths from handling (61.6 percent).

A lower percentage of very small operations than operations in the other size categories were moderately or very concerned about stress on bison from testing or about bison injuries or deaths from handling. A higher percentage of very small (53.4 percent) or small (48.5 percent) operations than medium (28.9 percent) or large (15.6 percent) operations were moderately or very concerned about the lack of facilities to restrain bison for testing.

F.3.b. Percentage of operations in which respondent was moderately or very concerned about the following issues and challenges related to testing bison for diseases such as TB, by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Issue/challenge	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Expense of testing	34.3	(3.3)	47.6	(4.4)	46.9	(4.0)	44.3	(5.3)	42.1	(2.1)
Stress on bison from testing	52.8	(3.5)	72.7	(4.0)	70.6	(3.7)	79.1	(4.4)	65.8	(2.0)
Bison injuries or deaths from handling	50.0	(3.5)	71.4	(4.0)	66.6	(3.8)	67.0	(5.0)	61.6	(2.0)
Reliability of tests (e.g., false-positive results)	25.7	(3.1)	36.5	(4.3)	36.7	(3.9)	43.9	(5.3)	33.7	(2.0)
Amount of time required for testing	34.0	(3.3)	42.6	(4.4)	48.2	(4.0)	61.8	(5.2)	43.7	(2.1)
Lack of facilities to restrain bison for testing	53.4	(3.5)	48.5	(4.4)	28.9	(3.6)	15.6	(3.9)	40.3	(2.0)

G. Organization Membership and Bison Health Information Sources

Industry associations can provide a wealth of resources to members and help address industry concerns. Overall, about half of producers (49.4 percent) were in one or more bison or cattle associations. About one-third were in regional, State, and/or local bison associations (33.3 percent) and/or the National Bison Association (31.9 percent).

The percentage of operations belonging to the National Bison Association generally increased with increasing operation size, from 5.7 percent of very small operations to 78.0 percent of large operations, although the percentages of small (30.6 percent) or medium (45.4 percent) operations did not differ from each other. The percentage of operations belonging to regional, State, and/or local bison associations increased with increasing operation size, from 6.4 percent of very small operations to 78.0 percent of large operations. The percentage of operations belonging to "any" of the listed associations increased with increasing operation size, from 20.0 percent of very small operations to 91.1 percent of large operations.

G.1. Percentage of operations by membership in the following bison or cattle associations, and by size of operation:

Percent Operations

Size of Operation (number of bison)

	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Association	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
National Bison Association	5.7	(1.6)	30.6	(4.1)	45.4	(3.9)	78.0	(4.4)	31.9	(1.9)
Regional, State, and/ or local bison associations	6.4	(1.6)	30.1	(4.0)	50.4	(4.0)	78.0	(4.4)	33.3	(1.9)
InterTribal Buffalo Council	0.4	(0.4)	1.5	(1.1)	1.2	(0.9)	4.5	(2.2)	1.5	(0.5)
Canadian Bison Association	0.8	(0.6)	0.7	(0.7)	3.0	(1.3)	8.1	(2.8)	2.4	(0.6)
National Cattlemen's Beef Association	4.0	(1.3)	6.6	(2.3)	4.4	(1.6)	11.1	(3.3)	5.7	(1.0)
Regional, State, and/ or local cattle associations	7.7	(1.8)	8.9	(2.6)	9.2	(2.3)	14.8	(3.8)	9.4	(1.2)
Other	2.8	(1.1)	0.8	(0.8)	5.5	(1.8)	2.6	(1.8)	3.0	(0.7)
Any	20.0	(2.7)	50.1	(4.4)	68.3	(3.7)	91.1	(3.0)	49.4	(2.0)

A lower percentage of operations in the Southeast region (9.4 percent) than in the North Central (42.0 percent) or West (35.0 percent) regions belonged to regional, State, and/or local bison associations.

G.2. Percentage of operations by membership in the following bison or cattle associations, and by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Association	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
National Bison Association	34.4	(6.2)	22.6	(5.7)	37.3	(4.0)	30.9	(2.5)
Regional, State, and/or local bison associations	27.5	(5.9)	9.4	(4.0)	42.0	(4.1)	35.0	(2.5)
InterTribal Buffalo Council	0.0	(—)	0.0	(—)	1.4	(1.0)	2.0	(0.7)
Canadian Bison Association	1.7	(1.7)	0.0	(—)	2.0	(1.1)	3.2	(0.9)
National Cattlemen’s Beef Association	1.7	(1.7)	9.4	(4.0)	4.8	(1.8)	6.0	(1.3)
Regional, State, and/or local cattle associations	3.4	(2.4)	15.1	(4.9)	9.5	(2.4)	9.1	(1.5)
Other	3.5	(2.4)	5.6	(3.2)	1.4	(1.0)	3.2	(0.9)
Any	43.0	(6.5)	43.3	(6.8)	55.7	(4.1)	48.8	(2.7)

Photograph courtesy of Matthew S. Patyk.

A higher percentage of operations (35.9 percent) rated veterinarians as very important sources of bison health information compared with the other levels of importance. The percentage of operations that rated feed and drug salespeople as sources of bison health information decreased from 54.4 percent for not important to 6.6 percent for very important.

G.3. Percentage of operations by level of importance of bison health information sources:

	Percent Operations								
	Level of Importance								
	Not		Slightly		Moderately		Very		
Health information source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Total**
Bison association resources/ meetings	32.7	(1.9)	17.8	(1.6)	24.9	(1.8)	24 .6	(1.8)	100.0
Producer gatherings (informal)	39.3	(2.0)	19.5	(1.6)	24.3	(1.7)	16.9	(1.5)	100.0
Other producers—individually	30.1	(1.9)	16.4	(1.5)	30.3	(1.9)	23.3	(1.7)	100.0
Internet	28.8	(1.9)	16.9	(1.5)	30.9	(1.9)	23.4	(1.7)	100.0
Magazines/ newsletters	27.4	(1.8)	20.2	(1.6)	35.5	(2.0)	16.9	(1.5)	100.0
University/ extension	36.4	(2.0)	20.0	(1.6)	28.0	(1.8)	15.6	(1.5)	100.0
Veterinarians	20.8	(1.7)	16.5	(1.5)	26.7	(1.8)	35.9	(2.0)	100.0
Feed and drug salespeople	54.4	(2.0)	26.1	(1.8)	12.9	(1.4)	6.6	(1.0)	100.0
Other	91.3	(1.2)	3.5	(0.8)	3.2	(0.7)	2.1	(0.6)	100.0

To evaluate the importance of various bison health information sources by operation size, the values for moderately and very important categories were combined. Overall, about half of operations rated the following sources of bison health information as moderately or very important: bison association resources/meetings (49.5 percent), other producers—individually (53.6 percent), Internet (54.3 percent), magazines/newsletters (52.4 percent), and veterinarians (62.6 percent).

A higher percentage of large operations (83.6 percent) than operations in the other size categories considered bison association resources/meetings to be moderately or very important sources of bison health information. Also, a higher percentage of medium (66.1 percent) and small (52.6 percent) operations considered bison association resources/meetings to be moderately or very important than did very small operations (23.6 percent). A lower percentage of very small operations than operations in the other size categories considered informal producer gatherings, other producers—individually, the Internet, and veterinarians to be moderately or very important.

G.4. Percentage of operations in which respondent considered various bison health information sources to be moderately or very important, by size of operation:

	Percent Operations									
	Size of Operation (number of bison)									
	Very small (1–9)		**Small** (10–24)		**Medium** (25–99)		**Large** (100 or more)		**All operations**	
Health information source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bison association resources/ meetings	23.6	(2.8)	52.6	(4.4)	66.1	(3.8)	83.6	(3.9)	49.5	(2.0)
Producer gatherings (informal)	17.6	(2.5)	45.0	(4.4)	57.3	(4.0)	68.9	(4.9)	41.2	(2.0)
Other producers—individually	30.0	(3.1)	57.3	(4.3)	71.5	(3.6)	77.8	(4.4)	53.6	(2.0)
Internet	42.5	(3.3)	59.7	(4.3)	60.0	(3.9)	66.7	(5.0)	54.3	(2.0)
Magazines/ newsletters	37.7	(3.3)	50.4	(4.4)	63.5	(3.9)	74.3	(4.6)	52.4	(2.0)
University/ extension	32.9	(3.2)	47.3	(4.4)	49.6	(4.0)	55.6	(5.3)	43.6	(2.0)
Veterinarians	48.6	(3.4)	67.3	(4.1)	72.2	(3.6)	75.4	(4.6)	62.6	(2.0)
Feed and drug salespeople	14.0	(2.3)	18.6	(3.4)	23.4	(3.4)	28.4	(4.8)	19.5	(1.6)
Other	6.0	(1.6)	6.0	(2.1)	3.2	(1.4)	5.9	(2.6)	5.3	(0.9)

A higher percentage of operations in the North Central region than operations in the Southeast region considered bison association resources/meetings, informal producer gatherings, or other producers—individually to be moderately or very important sources of bison health information. Also, a higher percentage of operations in the North Central region (53.8 percent) than in the Northeast region (32.7 percent) considered informal producer gatherings to be moderately or very important sources of bison health information. A higher percentage of operations in the North Central region than in the West region considered magazines/newsletters or university/extension to be moderately or very important sources of bison health information.

G.5. Percentage of operations in which respondent considered various bison health information sources to be moderately or very important, by region:

	Percent Operations							
	Region							
	Northeast		Southeast		North Central		West	
Health information source	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Bison association resources/ meetings	43.1	(6.5)	33.3	(6.6)	60.7	(4.1)	48.8	(2.7)
Producer gatherings (informal)	32.7	(6.2)	23.5	(5.9)	53.8	(4.2)	40.5	(2.6)
Other producers—individually	50.0	(6.6)	39.2	(6.8)	64.3	(4.0)	52.3	(2.7)
Internet	53.4	(6.6)	54.8	(7.0)	60.8	(4.1)	51.5	(2.7)
Magazines/ newsletters	46.5	(6.6)	43.1	(6.9)	64.3	(4.0)	50.0	(2.7)
University/ extension	37.9	(6.4)	39.2	(6.8)	55.9	(4.2)	40.1	(2.6)
Veterinarians	60.4	(6.4)	60.8	(6.8)	67.1	(3.9)	61.4	(2.6)
Feed and drug salespeople	20.7	(5.3)	13.7	(4.8)	23.8	(3.6)	18.6	(2.1)
Other	7.0	(3.4)	2.1	(2.1)	4.9	(1.8)	5.7	(1.3)

Photograph courtesy of Dr. Kelly Patyk.

Section II: Methodology

A. Study Purpose and Needs Assessment

This report presents results from the Bison 2014 study conducted by the National Animal Health Monitoring System (NAHMS). The primary goals of the Bison 2014 study were to provide statistically valid national estimates of the health management and production practices of the Nation's bison industry and to improve understanding of bison health-related issues faced by bison producers.

NAHMS develops study objectives by following changes in the industry and by contacting industry members and other stakeholders about their informational needs and priorities during a needs-assessment phase. The needs-assessment survey targeted producers, veterinarians, extension personnel, university researchers, State and Federal animal health officials, and allied industry groups, and was designed to ascertain the top management and health issues facing the bison industry. The needs-assessment survey was administered online through SurveyMonkey from June 20, 2013, through July 15, 2013. It was promoted via industry-related electronic newsletters, magazines, and Web sites.

Respondents to the needs assessment represented the following affiliations:

- Bison producers/operators, 59 percent;
- Federal or State government personnel, 25 percent;
- Allied industry personnel (processors, marketers), 5 percent;
- Veterinary practitioners, 3 percent;
- University/extension personnel, 2 percent; and
- Other, 6 percent.

B. State and Sample Selection

NASS' list frame was used to identify bison operations in the United States. The potential respondent population of the Bison 2014 study was all operations with bison in the United States on the NASS list frame except some types of operations, such as prisons or research farms, that were excluded from the study. A total of 2,837 operations received a questionnaire by mail. Forty-nine bison producers that were eligible did not receive the questionnaire because they had requested that NASS not contact them for voluntary surveys.

C. Data Collection

The questionnaires and instructions were mailed by NASS to participants in early September 2014. Respondents mailed completed questionnaires directly back to NAHMS in postage-prepaid envelopes. NASS mailed a second set of study materials to producers who had not yet responded about 3 weeks after the first mailing. NAHMS staff entered the data into a SAS dataset and performed relational checks and validation checks to identify improperly entered data.

D. Estimation

Because this survey was a census, every participant had a selection weight of 1. The selection weight was adjusted for nonresponse so that weights from nonrespondents were given to responding operations that were similar in terms of location (State) and inventory. Weighted estimates of percentages and averages were generated using SUDAAN® software.

Response category	Number of operations	Percent of operations
Returned, complete	632	21.9
Returned, no bison	222	7.7
Refusal*	1983	68.7
Office hold (NASS elected not to contact)	49	1.7
Total	2,886	100.0

*Refusals likely included some operations that had no bison.

Overall response rate: (632 plus 222)/2,886 = 29.6%

E. Sample Evaluation

Response category	Number of operations	Percent of operations
Returned, complete	632	21.9
Returned, no bison	222	7.7
Refusal*	1983	68.7
Office hold (NASS elected not to contact)	49	1.7
Total	2,886	100.0

*Refusals likely included some operations that had no bison.

Appendix I: Sample Profile

A. Responding Sites

1. Size of operation

Size of operation (number of bison on July 1, 2014)	**Number of responding operations**
1 to 9	241
10 to 24	136
25 to 99	163
100 or more	92
Total	632

2. Region

Region	**Number of responding operations**
Northeast	62
Southeast	54
North Central	150
West	366
Total	632

Appendix II: 2012 Census of Agriculture Data

State	Bison	
	Farms	Number
Alabama	32	252
Alaska	15	1,597
Arizona	10	74
Arkansas	34	333
California	87	1,465
Colorado	126	10,731
Connecticut	8	122
Delaware	4	94
Florida	24	385
Georgia	33	278
Hawaii	2	(D)
Idaho	45	3,553
Illinois	32	688
Indiana	58	1,319
Iowa	65	1,838
Kansas	133	6,638
Kentucky	41	1,411
Louisiana	12	83
Maine	20	267
Maryland	8	441
Massachusetts	3	(D)
Michigan	89	1,901
Minnesota	97	3,096
Mississippi	7	49
Missouri	88	2,044
Montana	80	14,671
Nebraska	88	23,152
Nevada	11	80
New Hampshire	12	301
New Jersey	7	199
New Mexico	43	5,156
New York	32	997
North Carolina	25	312
North Dakota	89	9,560
Ohio	46	849
Oklahoma	121	9,685
Oregon	41	1,398
Pennsylvania	81	1,308
South Carolina	16	131
South Dakota	104	33,637
Tennessee	39	346
Texas	370	4,378
Utah	36	1,132
Vermont	4	108
Virginia	19	1,037
Washington	52	961
West Virginia	7	45
Wisconsin	102	4,246
Wyoming	66	9,569
U.S.	2,564	162,110

Source: National Agricultural Statistics Service.

(D) = Withheld to avoid disclosing data for individual farms.

Appendix III: Study Objectives and Related Outputs

- Provide a baseline description of the U.S. bison industry, including basic characteristics of operations, such as inventory, size, and type.
  - ""Health and management practices on U.S. ranched-bison operations, 2014," descriptive report
  - Demographics and characteristics of U.S. ranched-bison operations, information sheet
- Describe current U.S. bison industry production practices and challenges, including identification, confinement and handling, animal care, and disease testing.
  - "Health and management practices on U.S. ranched-bison operations, 2014," descriptive report
  - Management and production practices on U.S. ranched-bison operations, information sheet
- Describe health management and biosecurity practices important for the productivity and health of ranched bison.
  - "Health and management practices on U.S. ranched-bison operations, 2014," descriptive report
  - Biosecurity practices on U.S. ranched-bison operations, information sheet
  - Health and management practices on U.S. ranched-bison operations, information sheet
- Describe producer-reported occurrence of select health problems and evaluate potentially associated risk factors.
  - "Health and management practices on U.S. ranched-bison operations, 2014," descriptive report
  - Producer-reported occurrence of health problems on U.S. ranched-bison operations, information sheet
  - Producer familiarity with select health problems on U.S. ranched-bison operations and preferred sources for health information, information sheet

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