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Feedback

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Foreword

I am privileged to present the 2008 United States Animal Health Report. This is the fifth annual report produced by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) on the Nation's animal health status.

This publication highlights APHIS Veterinary Services' (VS) programs, events, and initiatives aimed at maintaining healthy livestock, poultry, and aquaculture populations. In addition, the report reviews key epidemiological developments of 2008 and provides an overview of our animal health surveillance activities, as well as our emergency planning, preparedness, and monitoring efforts. We also include an informative summary of the U.S. livestock, poultry, and aquaculture industries.

As we review the events of the past year, it is essential that we also look ahead. The national animal health landscape continues to change, and so the mission and role of VS—and the entire veterinary health community—must evolve to continue to meet its role of protecting U.S. animal agriculture. In 2008, we began to outline our vision to project a broad view of the organization we anticipate becoming by 2015. In the next few years, we will fine-tune this vision. Some of the key forces affecting U.S. animal health and APHIS are:

- *Evolving needs of the animal agriculture industry.* With effective control or eradication of many diseases, the scope and type of government services needed by the animal agriculture industry must evolve to meet the new challenges. In addition, changes in industry structure—characterized by the increase in the number of large-scale, production-intensive farm operations—will also alter the type of government services that will be needed. Meanwhile, we will consider the impact that programs may have on small and non-traditional producers.
- *Advances in technology.* New diagnostics, vaccines, and novel treatment technologies are changing veterinary medicine and management of animal disease events. These new disease detection, prevention, or treatment possibilities might provide alternatives to traditional eradication programs, which historically have relied on expensive, large-scale depopulation activities.
- *The animal and human health interface.* Public awareness of diseases like highly pathogenic avian influenza, bovine spongiform encephalopathy, West Nile virus, and others has escalated consumer/public demand for leadership at the intersection of animal and public health concerns.
- *Increasing demand.* Developing countries will especially increase the demand for animals and animal products. With an increasing world population, demand for agricultural and other resources will only continue to rise. This trend will increase pressure to more efficiently provide necessary products and also increase the movement of animals and products around the globe.
- *Tightening Federal budgets.* For the foreseeable future, Federal budgets will be under intense pressure. This is prompting increased emphasis on utilizing available resources wisely.

Our expertise and core capabilities will position APHIS to meet these animal health challenges. We intend to continue our strong partnerships with State animal health officials, agricultural producers, and veterinary organizations. We will also continue to strengthen relationships with the emergency management community at State, national, and international levels. Additionally, we will strive to enhance our collaboration with public health and wildlife agencies and their respective organizations.

As always, I invite and welcome your comments and ideas. Information on how to provide feedback and contact details are on the inside front cover.

—John Clifford
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CHAPTER 1

CHAPTER 1

Significant Animal Health Events in 2008

The Veterinary Services (VS) branch of the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) protects and improves the health, quality, and marketability of the Nation's animals, animal products, and veterinary biologics. As part of its role in preventing, controlling, and eliminating animal diseases, VS practices veterinary medicine and epidemiology on a broad scale. The VS mission also involves detecting, monitoring, and responding to animal health events of statewide, regional, national, and international significance.

This chapter documents several important animal health events that occurred in the United States in 2008. These events include outbreaks or detections of bovine tuberculosis, malignant catarrhal fever, cattle fever tick, equine piroplasmosis, equine herpesvirus myeloencephalopathy, contagious equine metritis, bluetongue viruses, epizootic hemorrhagic disease viruses, and methicillin-resistant *Staphylococcus aureus* in swine and swine workers.

Bovine Tuberculosis

In January 2008, animal health officials from USDA and the California Department of Food and Agriculture (CDFA) expanded the epidemiological investigation of a large central California dairy herd that was infected with bovine tuberculosis (TB). The disease confirmation was made in December 2007 following whole-herd tuberculin skin testing. The herd, composed of 5,016 dairy cattle, was depopulated.

The ensuing investigation of this index herd resulted in the identification of 3,209 potentially exposed cattle that had moved to 143 other premises or to slaughter before officials knew that the herd was infected. Additional investigations to determine the origin of this herd's infection identified 110 cattle from 56 premises as potential sources for the disease.

Epidemiological investigations conducted on the index herd during 2008 identified two other large dairy herds in California as TB-infected. One of these herds, which contained 1,014 dairy cattle, was depopulated. The other herd, composed of more than 12,000 cattle, is undergoing a test-and-removal program to rid the herd of TB. The resulting investigations of these 2 herds identified at least 14,410 potentially exposed cattle that, between 2003 and 2008, had moved to 354 other premises or to slaughter (whereupon they were subject to inspection by USDA's Food Safety and Inspection Service to ensure food safety). These movements required investigatory activities in 16 U.S. States and Canada.

During calendar year (CY) 2008, USDA and CDFA officials conducted 271 herd tests for TB involving more than 377,000 cattle in California alone in response to this outbreak. Nearly $20 million in Federal funds was used to purchase known exposed cattle, depopulate infected herds, and cover expenses for personnel assigned to conduct herd testing, epidemiological investigations, and identification.

Epidemiological investigations and further herd test activities continue in 2009.

Malignant Catarrhal Fever

Malignant catarrhal fever (MCF) is a clinical disease of cattle and bison caused by a herpesvirus. The MCF virus occurs in two forms, which are named after the associated reservoir host: sheep-associated MCF virus, and wildebeest-associated MCF virus. In affected cattle or bison, MCF can cause high fever, enlarged lymph nodes, profuse nasal and ocular

discharge, sloughing of mucosal surfaces, corneal opacity, and death. Cattle and bison are dead-end hosts for MCF and do not transmit the virus to other livestock. MCF poses no threat to human health. The United States experiences sporadic outbreaks of sheep-associated MCF in cattle or bison; however, wildebeest-associated MCF in cattle is considered a foreign animal disease (FAD).

In April 2008, a cow in Georgia presented at the University of Georgia College of Veterinary Medicine with clinical signs of MCF, a diagnosis later confirmed by laboratory testing as wildebeest-associated MCF. At around the same time, two other cows—one in Alabama and one in Louisiana—also presented with clinical signs; laboratory testing subsequently confirmed wildebeest-associated MCF in the two cows. All three MCF-positive cows had been purchased in March 2008 from a purebred beef cattle ranch in Texas through a private sale. The source ranch in Texas was placed under quarantine on April 16.

An epidemiological investigation revealed that within the approximately 11,000-acre cattle ranch, several species of exotic hoofstock, including 23 adult wildebeest, were contained in a 1,000-acre, high-fenced pasture. The wildebeest, which had been calving from November through December 2007, were in fenceline contact with cattle in four adjacent pastures during that time. Wildebeest-associated MCF virus can be transmitted to cattle via direct contact with infected wildebeest placentas, amniotic fluid, or young wildebeest calves during birth or shortly thereafter.

A total of 589 cattle—including the 3 cows that had already been identified as MCF-positive in Georgia, Alabama, and Louisiana—were determined to have been exposed to MCF virus on the index premises during the wildebeest calving period. There were 459 exposed cattle still located on the index premises in Texas, while 130 exposed cattle had moved to other premises in Texas and 6 additional U.S. States. All exposed cattle were located and quarantined. While under quarantine, one exposed bull and two exposed heifers on the index premises in Texas presented with clinical signs of MCF died and were subsequently confirmed by laboratory testing as positive for wildebeest-associated MCF virus.

Clinical signs of wildebeest-associated MCF usually appear within 30 days of exposure, but incubation periods of up to 7 months have been described in cattle. Additionally, currently available diagnostic tests are not reliable indicators of infection in animals that are not showing clinical signs. It was therefore determined that exposed cattle could be euthanized, slaughtered, or undergo a minimum quarantine period of 7 months from the last date of exposure. This time period was possible to calculate for each animal because the index ranch's management staff kept extensive records of individual animal movement into and out of specific pastures. All quarantined exposed cattle were also required to test negative for MCF just prior to quarantine release.

During the incident, 11 cattle died (6 of laboratory-confirmed MCF, 5 of other or unknown causes), 24 cattle were euthanized, 155 were slaughtered, and 399 underwent the minimum 7-month quarantine. No additional cattle presented with clinical signs of MCF during the quarantine period, and all remaining animals tested negative prior to quarantine release. Exposed cattle on the index farm in Texas were released from quarantine on October 29. (The last possible exposure date for the animals on the infected premises was February; consequently, the release from quarantine on October 29 met the 7-month minimum requirement.) All MCF-exposed cattle associated with this incident were released from quarantine by December 2.

Cattle Fever Tick

The Cattle Fever Tick Eradication Program (CFTEP) was created in 1906 to eliminate bovine babesiosis—a severe and often fatal cattle disease—from the U.S. cattle population. The cattle tick (*Boophilus annulatus*) and the tropical cattle tick (*B. microplus*) are carriers of protozoan parasites (*Babesia bigemina and B. bovis*) that cause babesiosis. These ticks are well established in Mexico, and a permanent, 500-mile quarantine zone along the Texas–Mexico border was created in 1938 to maintain the Nation's status as free from babesiosis

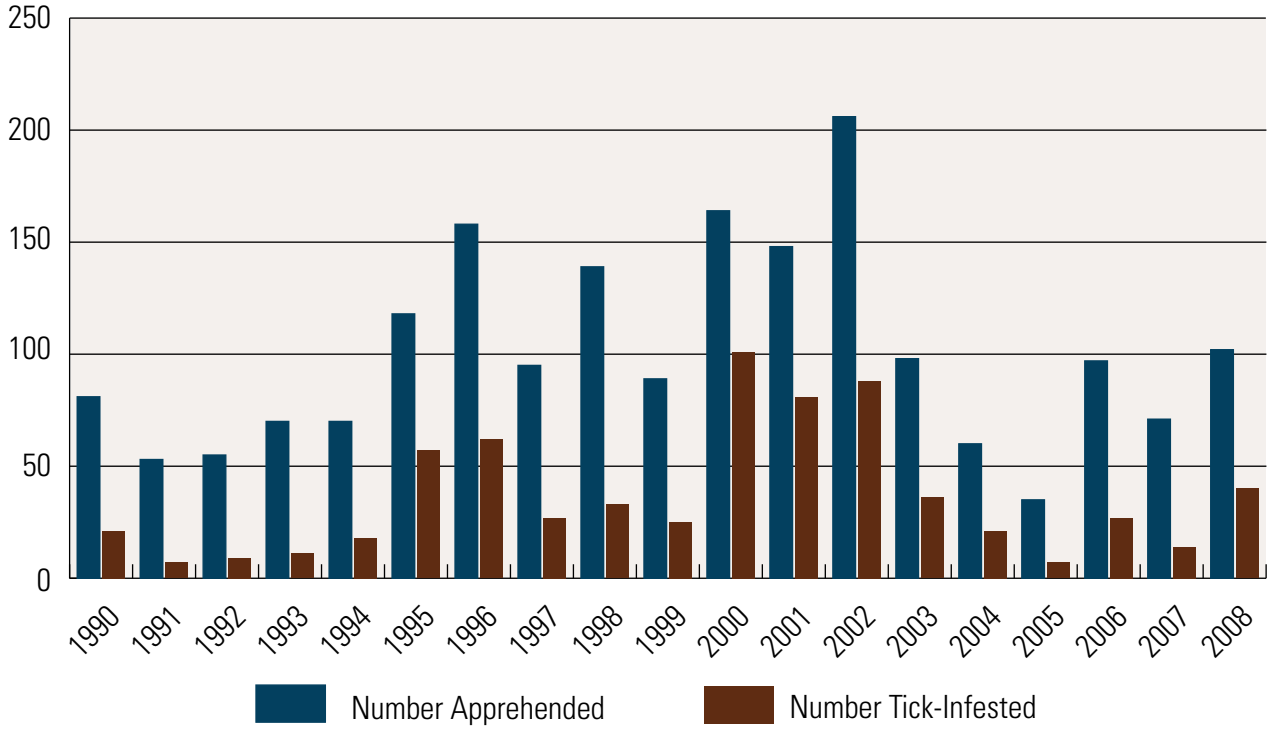
and cattle fever ticks. The disease and the ticks were officially eradicated from the continental United States in 1943, with the exception of a narrow permanent quarantine "buffer" zone (also known as the systematic quarantine zone) that follows the Rio Grande in south Texas. This zone is also known as the systematic quarantine zone because cattle with ticks must be systematically treated every 7 to 14 days for 6 to 9 months.

The CFTEP is a cooperative program between APHIS and the Texas Animal Health Commission (TAHC). The TAHC supports the CFTEP by providing personnel, purchasing acaricides, and conducting surveillance in free areas of Texas. APHIS leads the program and maintains the permanent quarantine zone through surveillance and tick control activities. USDA's mounted patrol inspectors, known as "tick riders," patrol designated sections along the Rio Grande River for interdiction of tick-carrying wildlife and stray and smuggled Mexican-origin livestock. Intercepted animals must be quarantined, inspected, and treated. From 1990 to 2008, approximately 581 out of 1,092 (53 percent) intercepted cattle have been tick-infested (fig. 1.1). During fiscal year (FY) 2008 (October 1 through September 30), APHIS horseback river patrols along the U.S.–Mexico border apprehended a total of 102 Mexican livestock animals (51 cattle and 51 equids). This compares to 71 animals in FY 2007, a 44-percent increase. Of the 51 cattle apprehended, 30 were infested with fever ticks. Ten of the 51 equids apprehended were infested with fever ticks. Apprehended stray animals are captured, inspected ("scratched"), treated if fever ticks are found, and transported to a local quarantine facility where they are cared for until claimed by the rightful owner, who will then be responsible for paying the boarding fees.

Since FY 2004, the number of tick infestations outside the existing permanent quarantine zone has increased substantially. Factors causing the increase in tick outbreaks include:

- Greater abundance of white-tailed deer and other wildlife along the border;
- Increased commingling of livestock with tick-bearing wildlife;
- Unrestrained movement of white-tailed deer and exotic wildlife;

Figure 1.1: Annual number of apprehended stray and smuggled livestock, including tick-infested animals, 1990–2008.



- A decrease in CFTEP personnel since the early 1980s, which has reduced river surveillance; and
- Increased rainfall and mild winters in recent years, which provide ideal habitat conditions for tick populations.

The high number of outbreaks has precipitated the addition of two temporary quarantine areas totaling approximately 1 million acres outside the permanent quarantine zone in the Texas counties of Starr, Maverick, Dimmit, Webb, and Zapata. Premises and livestock (including deer populations) within these temporarily quarantined areas must be systematically inspected and treated, and the movement of all livestock must be controlled.

APHIS received emergency funding during FY 2008 to hire 14 new temporary tick riders and purchase additional pesticides for treating both cattle and deer on quarantined and adjacent premises.

Equine Piroplasmosis

Equine piroplasmosis (EP) is a disease of equids caused by infection with the blood-borne parasites *Babesia caballi* and/or *Theileria equi* (also referred to as *Babesia equi*, or *B. equi*). The World Organization for Animal Health (OIE) recognizes Australia, Canada, England, Ireland, Japan, and the United States as nonendemic for EP. (Although the United States is considered nonendemic for EP, Puerto Rico and the U.S. Virgin Islands are affected.) The disease agent is commonly transmitted through tick vectors; however, transfer of whole blood or blood products from infected equids to susceptible equids for treatment purposes may transmit the disease agent, as may the reuse of needles on multiple animals.

The Florida State Veterinarian's office provided details on an EP outbreak in the United States during 2008. On August 11, a horse with clinical signs was hospitalized in Ocala, Florida. The attending veterinarian detected suspect hemoprotozoan parasites on a blood smear and sent the blood to the University of Florida for examination on August 12. The laboratory personnel tentatively diagnosed EP after consulting with the attending veterinarian on August 13; the attending veterinarian reported the suspect case to the State Veterinarian's office, which immediately quarantined the index premises (the premises where the horse resided prior to hospitalization). Between August 13 and December 31, the State Veterinarian's office conducted trace-in and trace-out of equids on the index premises, testing of potentially exposed equids, tick surveillance, and an epidemiological investigation to determine the likely route of introduction and spread of the disease agent.

Investigations identified horses that had potentially been exposed; these horses were tested as part of the initial investigation and then were retested 60 days after the potential exposure. A total of 210 horses were tested, and 20 had positive test results for *B. equi* infection. (Premises with tested horses were located in nine different counties; seven of these premises had one or more infected equids. The number of test-positive horses on premises ranged from one to six.) Twenty-five equine premises in Florida were quarantined in 2008. By December 31, 2008, only two premises remained under quarantine, and no infected horses remained in Florida. The test-positive horses have either been euthanized or shipped to a U.S. research facility. As of February 12, 2009, the last premises had been released from quarantine, and the mainland United States was again considered free of EP.

Tick surveillance included examination of horses on initial quarantine, weekly tick drags to collect ticks on quarantined premises and adjacent premises, carbon dioxide tick traps on quarantined premises, and examination of other domestic and trapped wild animals on quarantined and adjacent premises for the presence of ticks. In the U.S. outbreak, ticks evidently were not important in transmission, as *Dermacentor variabilis* ticks recovered through the surveillance program were tested for *B. equi* by polymerase chain reaction (PCR) and all were found to be negative.

Serosurvey to Determine Prevalence

An APHIS project to determine the prevalence of equids that are seropositive for antibodies to *B. caballi* and/or *B. equi* in the United States was implemented in FY 2008. The project was based on a resolution from the United States Animal Health Association's (USAHA) Infectious Diseases of Horses Committee. Periodically, horses that reside in the United States are seropositive but do not show any clinical signs

(the disease is usually detected when they are tested for export purposes). VS selected a systematic random sample of 15,000 equine serum samples that were previously tested for equine infectious anemia. (The samples were selected from all sera made available by National Animal Health Laboratory Network laboratories in 35 States from October 1, 2007, through June 30, 2008.) As of the end of December 2008, partial testing of samples was completed. Results will be reported when all testing is completed, weighted national seroprevalence estimates have been generated, and the results of the serosurvey have been interpreted.

Equine Herpesvirus Myeloencephalopathy

In August 2007, the steering committee of VS' National Animal Health Reporting System (NAHRS) approved the addition of reporting capabilities for neurological equine herpesvirus myeloencephalopathy (EHM). The USAHA/American Association of Veterinary Laboratory Diagnosticians Committee on Animal Health Information Systems approved the proposal in October 2007 and the additional reporting was implemented in January 2008. Prior to that, States participating in NAHRS had two categories, "yes" or "no," for reporting equine herpesvirus-1 (EHV-1) or EHV-4, with no further differentiation.

A case of EHM is defined as a horse exhibiting signs of central nervous system dysfunction. Additionally, the horse tests positive for EHV-1 by virus isolation and/or PCR assay on nasal swab or blood.

In 2008, eight States reported at least one EHM case into the NAHRS. A total of 11 monthly reports of EHM were submitted to NAHRS by these 8 States; thus, some States reported positives in more than 1 month during 2008. In some months, more than one State reported EHM. EHM cases were reported in January (two State reports), February (two State reports), March (one State report), April (two State reports), November (two State reports), and December (two State reports). Forty-eight States reported data into NAHRS in calendar year 2008.

A July 2008 report from VS' Centers for Epidemiology and Animal Health (CEAH), entitled "Equine Herpesvirus Myeloencephalopathy: Mitigation Experiences, Lessons Learned, and Future Needs," provides information on prevention and mitigation of EHM outbreaks. In addition, the report highlights some of the research needed to provide scientific evidence on designating best management practices for EHV-1 and specifically EHM. This 74-page report can be viewed online at *www.aphis.usda.gov/vs/nahss/equine/ehv/equine_herpesvirus_nahms_2008report.pdf*.

Contagious Equine Metritis

Contagious equine metritis (CEM) is an FAD in the United States. The CEM organism is transmitted by either carrier stallions or mares during breeding. Clinical signs in mares may include vaginal discharge and temporary infertility. Stallions typically show no clinical signs. Stallions and mares can become chronic carriers of CEM and be sources of infection for future outbreaks. The transmission rate is high; the organism can be spread directly by mating, and also indirectly by contaminated instruments and equipment and semen collected for artificial insemination.

On December 15, 2008, the State of Kentucky confirmed that a quarter horse stallion on a central Kentucky premises was positive for *Taylorella equigenitalis* (*T. equigenitalis*), the bacterium that causes CEM. By December 31, testing confirmed three Indiana stallions as positive for *T. equigenitalis*. The stallions were tested as a result of exposure to a positive stallion while they were kept at a breeding facility in Kentucky.

As of early April 2009, the National Veterinary Services Laboratories (NVSL) had confirmed 17 stallions and 5 mares positive for *T. equigenitalis*. The positive stallions were located in six States: one in Georgia, three in Illinois, three in Indiana, four in Kentucky, one in Texas, and five in Wisconsin. The positive mares were located in three States: two in California, two in Illinois, and one in Wisconsin. One of the positive mares was inseminated by natural breeding; the other four positive mares were

bred by artificial insemination. All of the positive horses are epidemiologically linked cases. None of the positives has been identified as the source of the outbreak.

By early April, locations had been confirmed for an additional 733 horses exposed to *T. equigenitalis*. The 22 positive and 733 exposed horses were located in 47 States. There were 125 exposed or positive stallions in 19 States and 630 exposed or positive mares in 45 States. All positive horses and all exposed horses were placed under quarantine or hold order, and testing and treatment protocols were implemented.

Epidemiological investigations are continuing in 2009.

Bluetongue and Epizootic Hemorrhagic Disease

Bluetongue (BT) is a noncontagious viral disease of domestic and wild ruminants and is caused by the bluetongue virus (BTV), which is transmitted by biting *Culicoides* spp. midges. Epizootic hemorrhagic disease (EHD) is an acute, infectious, often fatal viral disease of some wild ruminants. Like BT, this disease is spread by biting midges.

In most years, few BT and EHD outbreaks are reported in the United States. In 2007, however, significant outbreaks of both BT and EHD occurred. BTV serotype 17 (BTV-17) was identified as the agent that caused disease in sheep, deer, pronghorn, and elk in Montana and Wyoming. In 2008, no large BT outbreaks were reported, but BTV-17 was isolated at NVSL in three samples from Texas. In recent years, EHD virus (EHDV) has been responsible for significant epizootics in deer in the northern United States and southern Canada.

Notable changes in the epizootiology of BTV are occurring, both domestically and abroad. Worldwide, there are 24 serotypes of BT, of which 5 (serotypes 2, 10, 11, 13, and 17) are considered endemic in the United States. The range of serotypes—10, 11, 13, and 17—is associated with *Culicoides sonorensis* distribution and encompasses most of the lower 48 States with the exception of the northeastern United States. BTV serotype 2 is associated with *Culicoides insignis* (*C. insignis*) and is limited to the southeast, primarily Florida. To date, BT has not been identified in Alaska or Hawaii.

Since 1998, for the first time multiple novel incursions of BTV have been reported in countries surrounding the Mediterranean Basin. In Northern Europe, starting in 2006, unprecedented outbreaks of BTV-1, -6, and -8 have caused high levels of disease in both cattle and sheep in countries previously considered BT-free. BTV-8 in particular has been isolated from cattle with more lesions than historically have been associated with BTV.

In the United States, nonendemic types of BTV have been identified in a collection of historical isolates obtained from animals of U.S. origin. Between 1999 and 2007, BT serotypes 1, 3, 5, 6, 14, 19, 22, and 24 were identified. In 2008, isolates of BTV serotypes 9 and 12 were added to this list of serotypes. The majority of nonendemic isolates were obtained from animals in Florida, with a few originating from animals in Louisiana, Mississippi, Texas, Oklahoma, and Arkansas. Some of the serotypes, such as BTV-3, have been isolated in more than one year, and from more than one location.

In 2008, at the University of Georgia, College of Veterinary Medicine's Southeastern Cooperative Wildlife Diseases Study (SCWDS) laboratory in Georgia, BTV and EHDV isolations included BTV-3 in Arkansas; EHDV-2 in Indiana; EHDV-6 in Kansas; and EHDV-1, -2, -6, and BTV-12 and -17 in Texas. In the past, BTV-3, BTV-12, and EHDV-6 have been considered "exotic" viruses. BTV-3 was first isolated in Mississippi in 2006 and was subsequently detected by APHIS in Florida; the 2008 isolation is the second report of BTV-3 by SCWDS. The 2008 isolation in Texas is the first report of BTV-12 in the United States. This is the third consecutive year in which EHDV-6 has been isolated. Indiana, Illinois, Missouri, Kansas, and Texas are now considered positive for EHDV-6.

The significance of finding "exotic" BT serotypes in the United States is unclear, and the potential impact on U.S. agriculture is largely unknown. Although some of the nonendemic isolates were obtained from ill animals, others were encountered during screening of healthy animals intended for export. No large disease outbreaks due to

nonendemic strains of BTV have occurred in the United States to date.

NVSL, as an OIE reference laboratory for BT, is committed to accurate identification of BT isolates obtained from U.S. animals. NVSL regularly collaborates with veterinary diagnostic laboratories throughout the country, the SCWDS laboratory in Georgia, and the Institute for Animal Health in the United Kingdom.

Methicillin-Resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of *staphylococcus* that is resistant to certain antibiotics. These antibiotics include methicillin, oxacillin, penicillin, amoxicillin, and often other non-penicillin antibiotics.

According to the Centers for Disease Control and Prevention, most life-threatening infections caused by *Staphylococcus aureus*, including MRSA, occur among persons who have weakened immune systems and are receiving, or have recently received, care in healthcare facilities, such as hospitals, nursing homes, or outpatient facilities in which surgery, chemotherapy, or hemodialysis services are provided. MRSA infections that are acquired by persons without recent (within the past year) healthcare contact are known as community-associated MRSA infections. *Staphylococcus* or MRSA infections in the community usually appear as skin infections.

Throughout the past decade, a growing number of studies have investigated MRSA in companion and food animals and in their human associates, including pet owners, farmers, and veterinary personnel. MRSA in animals was first detected in milk from cows with mastitis and has since been found in dogs, cats, horses, pigs, sheep, rabbits, chickens, and several exotic species.

In a 2008 pilot study, the University of Iowa took nasal swabs from swine and swine workers from two commercial swine production systems in the Midwestern United States to investigate the presence of MRSA. MRSA was not detected in one of the production systems. In the other production system, MRSA strain sequence type 398 was detected in swine and swine workers. For the overall study, 299 swine and 20 workers from the two production systems were sampled. Of those sampled, MRSA was cultured from 147 swine and 9 of the swine workers—all from the one affected production system. Samples from pigs less than 15 weeks of age were more likely to be positive than samples from adult pigs. None of the pigs or humans in the study was reported to have clinical illness related to MRSA colonization.

An information sheet on MRSA issued by the APHIS Centers for Epidemiology and Animal Health's Center for Emerging Issues is available online at *www.aphis.usda.gov/vs/ceah/cei/taf/emergingdiseasenotice_files/mrsa_122007.pdf*.

CHAPTER 2

CHAPTER 2

Prevention and Preparedness

APHIS-VS is focused on protecting the Nation's animal health and facilitating safe agricultural trade. This chapter highlights VS programs and activities aimed at disease prevention and preparedness. These include efforts to ensure safe imports and exports, provide accredited veterinarians to conduct regulatory functions, and plan and prepare for emergencies. In addition, the chapter provides updates on the National Veterinary Stockpile (NVS) and VS information technology and data systems.

Trade Imports and Exports

The APHIS animal health mission includes ensuring the safe import of animals, animal products, and biologics, as well as certifying animals, animal products, and veterinary biologics for export. In fiscal year (FY) 2008, the value of U.S. imports of live animals and animal products remained steady at $10.4 billion, while the value of U.S. exports of live animals and animal products increased by almost 50 percent to $16.6 billion, due to a weakened U.S. dollar value.

Imports

APHIS conducts regulatory oversight for the importation of millions of head of livestock including cattle, swine, horses, live poultry, hatching eggs, and commercial birds. Millions of koi and goldfish were also successfully imported. APHIS also conducts regulatory oversight for germplasm imports.

In FY 2008, APHIS processed a total of 9,011 import permit applications for animal products, organisms and vectors, and select agents, resulting in 8,869 permits issued. More than three-fourths, or 77 percent, of the permits issued were for animal products and 19 percent were for organisms and vectors.

APHIS recognizes that animal health risks associated with the importation of animals and animal products may be tied to climatic, geographical, and biological factors that are not always defined by national political boundaries. This approach is consistent with U.S. obligations under international trade agreements. To help ensure that U.S. standards for regulating imports and assessing the disease risk within defined regions are transparent and applied on a consistent and scientific basis, APHIS conducts import risk analyses that evaluate the animal health status of countries and/or regions requesting approval to import animals and/or animal products into the United States. During FY 2008, APHIS' animal health status evaluations of imports to the United States included the diseases and countries or regions listed in table 2.1.

TABLE 2.1: Animal health status evaluations on imports in FY 2008

Disease	Country/region
Bovine tuberculosis (TB)	Canada, Mexico
Brucellosis	Canada–elk and bison
Classical swine fever (CSF)	European Union–swine semen; Estonia; Slovenia
Foot-and-mouth disease (FMD)	Argentina; Brazil; Slovakia; Slovenia; South Africa; United Kingdom; Uruguay–sheep meat
Highly pathogenic avian influenza (HPAI), subtype H5N1	Denmark, France
Screwworm	Panama
Swine vesicular disease (SVD)	Estonia, Slovakia, Slovenia

As an example, the APHIS analyses of the status of highly pathogenic avian influenza H5N1 (HPAI H5N1) in Denmark and France relied on several sources of information including the Danish Veterinary and Food Administration, the Ministere de L'Agriculture et de La Peche, Direction Generale de L'Alimentation, the European Commission, and reports to the World Organization for Animal Health (OIE). APHIS analyses list the following critical factors in evaluating import risk:

- Freedom from HPAI H5N1 for at least 3 months as the result of effective control measures undertaken within a competent veterinary infrastructure;
- Status of HPAI H5N1 as a notifiable disease;
- Ongoing disease awareness programs;
- Investigation of all notified or suspect occurrences; existence of effective surveillance programs for HPAI H5N1 supporting detection and investigation of outbreaks;
- Adequate and effective diagnostic and laboratory capabilities;
- Appropriate eradication and control measures and movement restrictions preventing further spread of disease; and
- Procedures used for repopulation of affected premises, which include monitoring to demonstrate that HPAI H5N1 was eradicated.

The analyses pointed out that APHIS considered the presence of HPAI H5N1 in wild birds to present the highest risk for the reintroduction of HPAI H5N1 into either country, but that extensive surveillance in wild birds and domestic poultry in the countries since eradication indicated that it has not been reintroduced.

APHIS concluded as a result of these evaluations that Denmark and France were able to effectively control and eradicate HPAI H5N1 from their domestic poultry population and the authorities had adequate control measures in place to rapidly identify, control, and eradicate the disease if it were reintroduced in either wild birds or domestic poultry. Based on the results of the assessments, APHIS did not identify any additional risk factors that would indicate that domestic poultry in Denmark or France would continue to be affected with HPAI H5N1. As a result, the analyses determined that the likelihood of introducing HPAI H5N1 into the United States through the import of live birds or poultry products from either Denmark or France was low.

Exports

Similarly, during 2008, APHIS issued point-of-origin certificates for the export of millions of head of live animals including cattle, goats, sheep, swine, live poultry, fish (mollusks, and crustaceans), and zoo animals, as well as germplasm. Approximately 111,448 animal product health certificates were issued for U.S. exports in FY 2008.

APHIS developed extensive information packages and/or responded to questionnaires from various countries in an effort to maintain or reopen export markets or expand market access for U.S. goods. The issues and countries included appear in table 2.2.

APHIS also successfully addressed market barriers to U.S. exports in 19 countries in FY 2008 based on domestic regionalization activities. These activities included providing detailed technical information and data that enabled many of our trading partners to accept the animal health status of the United States and lift restrictions imposed because of specific animal diseases. Of the 19 countries provided with information on domestic regionalization, 18 involved questions about U.S. exports of poultry and poultry products, and 1 country involved questions about the U.S. beef market.

In the January 2008 domestic regionalization report describing the eradication of H5N2 subtype low pathogenicity avian influenza (LPAI) from live bird markets (LBMs) in four counties in New York, information provided to U.S. trading partners was similar to that considered in the import analyses described above. The report describes veterinary infrastructure, disease status, disease control programs, movement controls, poultry demographics, and surveillance for the four counties involved. Detailed information on the U.S. live bird marketing system, laboratory diagnosis of avian influenza (AI) in the United States, and the U.S. animal health emergency response system is also included.

TABLE 2.2: Animal health status evaluations on exports in FY 2008

Disease/issue	Country/region
Avian influenza (AI)	Albania, Argentina, Bolivia, Brazil, Chile, China, Cuba, Ecuador, European Union, Guatemala, Hong Kong, Indonesia, Japan, Libya, Mexico, Peru, Philippines, Singapore, Sri Lanka, Taiwan
Bovine and swine embryos and semen collection centers	Chile, European Union
Bovine spongiform encephalopathy (BSE)	Brazil, Ukraine, Pakistan
Cattle identification and tracking system	Macao, Ukraine
Contagious equine metritis (CEM)	Brazil
Equine piroplasmosis	Canada
Malignant catarrhal fever (MCF)-wildebeest	Chile, Hong Kong
Poultry health, inspection, and certification system	Argentina, Chile
Pseudorabies	Chile, Mexico
Rabies	Taiwan
Scrapie	Jamaica
Veterinary infrastructure	Ukraine
West Nile virus	Dominican Republic, Korea

The report concluded that all related incidents in LBMs were eradicated in accordance with the LPAI prevention and control program standards. The affected LBMs were closed, all birds were depopulated, and all premises were cleaned and disinfected. All subsequent environmental testing revealed negative AI results. The testing also noted that birds sold at the LBMs are consumed by the local population and do not enter the commercial poultry marketing channels that supply U.S. exports. Provision of this information addresses Japanese concerns about U.S. poultry and poultry product exports.

Finally, APHIS further contributed to enhancing U.S. trade by successfully negotiating 136 new or revised sanitary regulation protocols in FY 2008 for the export of live animals, embryos, and semen. These protocols specify the health requirements that U.S. exports must meet in order to enter foreign markets.

National Veterinary Accreditation Program

Although many countries allow only government-employed veterinarians to conduct regulatory functions, the United States uses a network that includes private practitioners to carry out these tasks. The National Veterinary Accreditation Program (NVAP) authorizes veterinarians to perform regulatory functions on behalf of APHIS in a manner consistent with international trade and animal health safeguarding requirements. Approximately 80 percent of veterinarians in the United States are accredited through this voluntary program.

Accredited veterinarians identify and inspect animals, collect specimens, vaccinate livestock, and prepare point-of-origin health certificates for interstate movement and export. APHIS grants national accreditation to private veterinary practitioners only after they have met specific eligibility and training requirements.

Accredited veterinarians provide the first line of surveillance for reportable domestic and foreign animal diseases. When large-scale animal disease or other emergency events occur, accredited veterinarians are often enlisted to help APHIS and State veterinary regulators in containment and eradication efforts.

While NVAP staff at APHIS headquarters direct policy issues at the national level, the 41 VS area offices throughout the Nation oversee veterinarians' authorized activities and process most NVAP documentation. To become accredited, a veterinarian must be licensed or otherwise legally able to practice (via reciprocity or other agreement with State

licensing officials) in the State in which they wish to perform regulatory activities. When an accredited veterinarian wants to perform regulatory activities in additional States, authorization to do so must be acquired through that State's VS area office.

2008 National Veterinary Accreditation Program Highlights

NVAP is awaiting publication of a final rule that will:

- Establish two accreditation categories in place of the current single category (Category 1 includes companion animals such as cats and dogs while Category 2 is all animals);
- Add requirements for supplemental training and accreditation renewal; and,
- Offer "program certifications," which will enable accredited veterinarians to administer additional regulatory duties requiring specific knowledge, such as aquaculture medicine or Johne's disease.

The changes are intended to support APHIS' animal health safeguarding initiatives, involve accredited veterinarians in integrated surveillance activities, and make NVAP provisions more uniform and consistent. The changes will increase the level of training and skill of accredited veterinarians in the areas of disease prevention and preparedness for animal health emergencies in the United States. A plan to enact the amended regulation has been developed; implementation will depend on information technology (IT) capabilities and funding levels. VS and Iowa State University are developing several Web-based educational modules to satisfy the educational requirements for accreditation renewal, as well as modules that will serve as initial accreditation training, a formal prerequisite to apply for accreditation.

Emergency Planning and Preparedness

Animal health emergencies (AHEs) have a major impact on the Nation's agricultural infrastructure, animal and public health, food safety, economy, and export markets. AHEs can include foreign animal disease (FAD) incursions, natural disasters, emerging disease incidents, and agroterrorism. APHIS is the lead Federal agency for preventing or mitigating AHEs in the United States.

VS' National Center for Animal Health Emergency Management (NCAHEM) leads the effort in preparing for and responding effectively to animal disease-related national emergencies. NCAHEM develops strategies and policies for effective incident management and coordination of incident responses. During an emergency, NCAHEM is responsible for deploying critical veterinary supplies and personal protective equipment from the National Veterinary Stockpile (NVS) to responders within 24 hours.

NCAHEM creates and facilitates partnerships among Federal, State, tribal, local, and international entities to continually improve the approach to emergency management. NCAHEM's strategic approach aligns tactics with the four pillars: preparedness and communication, surveillance and detection, response and containment, and recovery and continuity of business for animal agriculture operations.

2008 National Center for Animal Health Emergency Management Highlights

NCAHEM and VS' Centers for Epidemiology and Animal Health worked with egg industry representatives, university officials, and State animal health officials to develop a continuity-of-business preparedness and response planning initiative for egg industry facilities in a control zone (quarantine zone). The plan addresses factors such as biosecurity, epidemiology, and surveillance that would have to be considered during an HPAI incident or outbreak. In the outbreak, Federal and State officials would use information—provided voluntarily by producers and held in a database at Iowa State University—to quickly determine if shell eggs and liquid egg products may be allowed to resume movement into market channels without compromising the safety of animal or human health. The protocols developed with the egg industry will serve as a model for similar biosecurity plans for other commodities.

Response Planning Update

In 2008, NCAHEM revised national response plans and objectives for HPAI and foot-and-mouth disease (FMD). The revised plan, called the Foreign Animal Disease Preparedness and Response Plan, is more specific and comprehensive than previous plans and clearly outlines the responsibilities and actions for officials responding to an FAD. In addition, the plans incorporate the principles and applied systems of the National Response Framework, the National Incident Management System, and the National Animal Health Emergency Management System.

While the United States has been free of FMD since 1929, the disease is still found in about two-thirds of the world. An FMD outbreak in the United States would have serious economic consequences, including lost trade and costs directly associated with the eradication effort (depopulation, indemnity, carcass disposal, and cleaning/disinfection). There would also be direct and indirect costs related to lost production, unemployment, and losses in related businesses.

Eight specific FMD outbreak simulation exercises have been performed since 1998. In 2008, APHIS met with the Texas Animal Health Commission to review progress made on issues identified in the 2007 Palo Duro FMD exercise held in Texas. A New England FMD exercise was held in November 2008. The States of Maine, New Hampshire, and Vermont participated in this regional exercise.

Simulation models are useful for analyzing effects of mitigation strategies (vaccination, movement controls, etc.), planning for resource needs (stockpiling), and developing response exercises. The Joint Modeling Operations Center (JMOC) is an ongoing collaboration between APHIS and the Department of Homeland Security to enhance interagency analysis of foreign animal disease scenarios, including the use of simulations and animal disease spread models to explore response strategies and countermeasure requirements.

National Veterinary Stockpile

The NVS was established as part of Homeland Security Presidential Directive–9 (HSPD–9), which was issued in February 2004. HSPD–9 reflects concerns that terrorists could release catastrophic animal disease agents in multiple locations. The NVS mission is to deliver critical veterinary supplies nationwide within 24 hours.

2008 National Veterinary Stockpile Highlights

In 2008, NVS:

- Hired a full-time liaison to help States, tribes, and territories plan, train, and conduct health-related test exercises;
- Acquired carbon dioxide carts and foaming equipment for depopulating poultry;
- Refined the deployment of its all-hazards commercial response contractors to help States that lack personnel with depopulating, disposing, and decontaminating efforts;
- Established distribution facilities on each coast to minimize deployment time; and
- Developed plans for rapidly transporting vaccine antigen concentrate from the North American FMD Vaccine Bank to overseas processors, and for the return of vaccine to domestic vaccination teams.

National Response Preparedness Exercises

NCAHEM tests national response preparedness by coordinating and participating in stakeholder exercises for FMD, HPAI, and radiologic leaks. Throughout FY 2008, VS participated in 133 animal health-related test exercises with stakeholders in various States (table 2.3).

TABLE 2.3: Animal health-related test exercises with stakeholders

Highly pathogenic avian influenza (HPAI)	87
Foot-and-mouth disease (FMD)	16
Natural or manmade/chemical, biological, radiological/nuclear, and explosive	29
Glanders	1
Total	**133**

Deployment drills were held with Louisiana, California, and South Carolina. During the drills, participants learned about the NVS program, its capabilities, deployment of supplies, and recovery processes and procedures. Attendees also initiated a request for NVS assistance, which resulted in an NVS deployment and allowed State participants to prepare to receive and store NVS assets, and exercise each State's Incident Command System.

Surge Capacity During an Animal Health Emergency

In 2000, APHIS created the National Animal Health Emergency Response Corps (NAHERC) to provide a volunteer reserve of veterinary professionals to assist Federal or State responders during an AHE. During 2008, NAHERC staff attended veterinary and animal health conferences, seminars, and professional training sessions to publicize the program and recruit veterinary medical officers (VMOs) and animal health technicians (AHTs) to the NAHERC. As of December 2008, NAHERC had received 1,054 applications through the USAJOBS Web site. Since 2000, a total of 671 applicants—285 VMOs and 386 AHTs—have qualified for the program. The Iowa State University Center for Food Security and Public Health recently developed Internet training modules for the program. Also, a standard operating procedure manual was written to guide NAHERC finance, administration, operation, and planning functions during an emergency.

Depopulation, Disposal, and Decontamination Collaboration

In 2008, NCAHEM participated in a number of work groups, especially those involving depopulation, disposal, and decontamination (3D) planning and discussion.

International Working Group—As chair of the Destruction, Disposal, and Decontamination Technical Working Group for Australia, Canada, New Zealand, and the United States, APHIS is developing information on recent, ongoing, and planned 3D research in each country. This will help identify research gaps that member countries can then prioritize and address collaboratively.

National Security Working Group—Representatives from APHIS and the Environmental Protection Agency co-chair the Foreign Animal Disease Threats Subcommittee Decontamination and Disposal Working Group. In its role, APHIS identifies, prioritizes, and coordinates implementation of research related to animal disease decontamination and disposal in collaboration with other Federal agencies.

Online Emergency Management Tools—With input from members of the APHIS Carcass Disposal Working Group, APHIS has developed an Emergency Management Tools Web site, including a carcass disposal decision tree, which assists disposal officers in determining the most appropriate disposal methods. Other tools include several online training modules detailing methods for composting, onsite burial and treatment, secure transport, offsite burial and treatment, and cleaning and disinfection.

Interagency Depopulation Working Group—APHIS is assembling an interagency/stakeholder working group to develop mass depopulation guidelines to minimize animal stress while controlling disease. Stakeholders include veterinary and animal health organizations; industry; academia; animal health emergency responders; Federal, State, and local governments; and subject matter experts on animal welfare and mass depopulation.

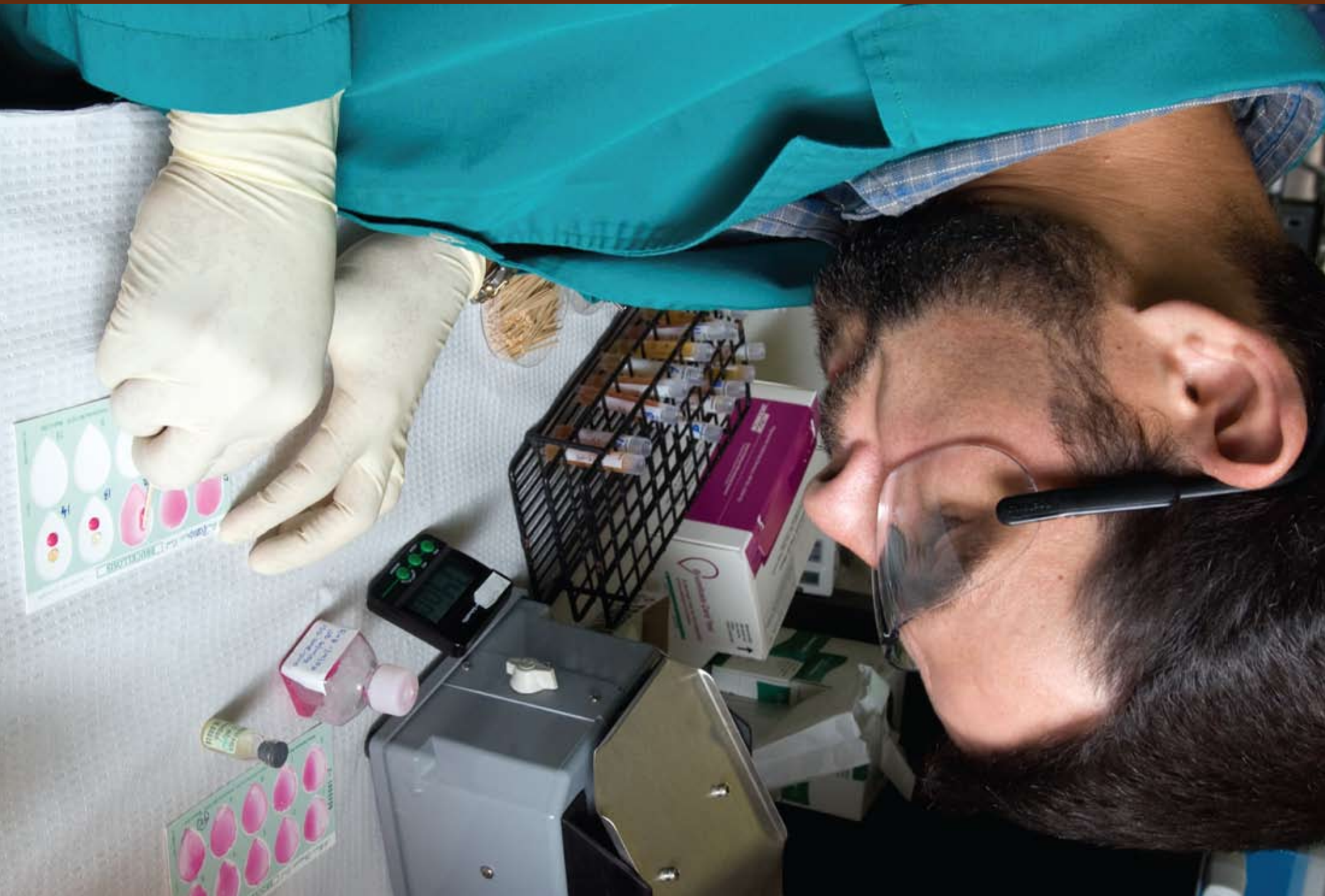
Information Technology Roadmap

In 2009, the Office of the VS Chief Information Officer will begin implementation of a 3-year IT Roadmap. The IT Roadmap identifies five priority initiatives: governance; security; data acquisition and exchange; software and services delivery; and modernization of legacy systems. Objectives within each initiative have been identified and scoped with task and resource requirements. VS will begin building the IT tools and data repositories that are needed to acquire, aggregate, and share data using standardized terminology and messaging.

In 2009, VS will initiate a discovery and analysis project to guide the decision of whether to buy a commercial "off-the-shelf" software product or

build an in-house software application to modernize the legacy systems. A discovery and analysis project will also be used to identify an enterprise reporting system. VS will begin the process of moving national databases from agency-owned and -managed servers to USDA enterprise data centers. Finally, VS will continue to use and enforce state-of-the-art security models to assure that access to data is authorized and that data are secure and confidential.

CHAPTER 3



CHAPTER 3

Detection and Early Response

Monitoring and surveillance for foreign and emerging animal diseases are critical components of VS' mission. VS programs and activities are aimed at ensuring rapid detection of, and early response to, animal disease threats, as well as development and application of new technologies for early and rapid disease detection. This chapter includes updates on the National Animal Health Surveillance System (NAHSS), the National Animal Health Laboratory Network (NAHLN), and the National Animal Health Reporting System (NAHRS). In addition, the chapter describes the plans for a new animal disease biocontainment facility to house the National Animal Disease Center (NADC) now located on Plum Island, New York.

The National Animal Health Surveillance System

The NAHSS is an APHIS initiative to integrate existing animal health monitoring programs and surveillance activities into a national, comprehensive, and coordinated system. The NAHSS is an interdisciplinary network of Federal, State, and industry partners working together to develop a national strategy that incorporates the Nation's Federal, State, and local resources and builds a surveillance system to protect animal health and promote free trade through surveillance, control, and prevention of foreign, emerging, and endemic diseases.

The NAHSS is envisioned to be a national-level surveillance system for animal diseases that affect the economic well-being of the U.S. livestock industry and trade markets, as well as animal diseases that are of significant risk to public health or wildlife species.

The NAHSS, composed of monitoring programs and surveillance systems, will function to integrate the collection, collation, and analysis of animal health data and promptly disseminate animal health information, especially to those partners responsible for maintaining animal health. The key factors for realizing this vision are:

- Surveillance that is flexible in that it provides information enabling quick response to emerging and foreign animal diseases, and allows for the continual monitoring of the status of domestic diseases as needed for information to control, eradicate, or manage disease;
- Monitoring systems that provide a current and thorough understanding of industry and management practices that influence surveillance planning and disease control;
- Standardized surveillance plans with pre-established information collection streams that are rapidly adaptable to new diseases;
- Surveillance that delivers timely information through a network of disease experts in the field who provide front-line observation and specimen collection;
- Surveillance strategies that provide near real-time detection of disease arising from natural or man-made introductions;
- Laboratories with state-of-the-art technology to process surveillance specimens;
- Information technology that is standardized and coordinated between laboratories and national databases, and provides rapidly accessible integrated disease data;

- Metrics, methods, and tools to prioritize, measure, and monitor surveillance activities to maximize information quality and cost efficiency; and
- Communication and collaboration between State, Federal, and industry partners in animal health, public health, wildlife, and agriculture intelligence gathering.

2008 NAHSS Highlights

In 2008, NAHSS planning activities focused around three main themes: evaluation of existing surveillance, standardization of surveillance processes, and continued development of comprehensive surveillance systems for high impact diseases.

The development and application of methodology to evaluate the priority and efficiency of surveillance are critical in order to address the growing need for cost-efficient, enhanced animal health surveillance. One such method of efficiency evaluation is assessment of surveillance sensitivity—the probability that a surveillance system or component of a system will detect a given disease in a specified timeframe. Sensitivity combined with the probability of disease introduction, the value or consequences of a disease outbreak, the cost of surveillance, and the ability to take action that will mitigate the event provide the framework central to ongoing evaluations of current VS surveillance activities.

Using the same evaluation principles, VS developed a prototype Tool for the Assessment of Intervention Options (TAIO) in 2008. The TAIO is a decision support tool designed to help assess and compare the value of different response options for a specific disease event or incursion. Standardization of surveillance processes continued to be a priority for the NAHSS partners in 2008. Substantial progress was achieved in developing a library of case definitions for World Organization for Animal Health (OIE)-listed diseases, creating a proposed national list of reportable animal diseases, and creating standardized surveillance strategies to be applied in an outbreak. In 2008, the importance of a standardized planning process was reflected in the development of business plans for many VS programs, including bovine spongiform encephalopathy (BSE) surveillance and comprehensive swine surveillance, as well as the business plan for the National Animal Health Monitoring System. The NAHLN also undertook several standardization activities in 2008, including the institution of a standardized laboratory review process and revised laboratory qualification checklist to ensure uniform performance across laboratories. (Read more about the NAHLN later in this chapter.)

As the NAHSS moves toward VS' 2015 vision, comprehensive monitoring and surveillance remains an important goal. Central to the NAHSS concept are collaboration, coordination between NAHSS partners, and flexibility to adapt to changes in the disease environment. In 2008, one example was the development of a swine influenza virus (SIV) surveillance pilot—a collaborative effort between APHIS, industry, and the Centers for Disease Control and Prevention (CDC). Additional collaborations with other government organizations in 2008 included APHIS' participation in the Homeland Security Presidential Directive 21 effort to develop a national biosurveillance program, and APHIS' partnership with the Armed Forces Medical Intelligence Center. Furthermore, several projects involving swine disease, avian influenza (AI), bovine brucellosis, and tuberculosis surveillance strengthened the focus on the wildlife-livestock interface and the importance of joint efforts with wildlife agencies in the control of these diseases.

Timely transmission of surveillance data is another key factor in achieving VS' 2015 vision. In support of the vision, the NAHLN information technology system continued its expansion in 2008 with efforts focusing on transmitting laboratory test results through standardized electronic messages. Finally, partnerships within the global surveillance community continued to strengthen in 2008. These international relationships have become critical for sharing new surveillance methodology, veterinary infrastructure capacity building, and emphasizing transparency of surveillance data.

In early 2009, the American Zoological Association initiated an effort in conjunction with APHIS to evaluate and develop standardized surveillance plans for zoos.

Foreign Animal Disease Surveillance and Investigations

A foreign animal disease (FAD) is defined as a transmissible livestock or poultry disease that is believed to be absent from the United States and its territories and that has a potential for significant U.S. animal health and economic impacts. APHIS works with State animal health officials and accredited private veterinary professionals to identify, control, and eradicate such animal diseases and diminish their impact.

Efforts to detect FAD events in the United States include surveillance conducted as a component of disease-specific programs; reporting by producers and private veterinarians; and field investigations conducted by Federal, State, and private accredited veterinarians. Additional detection efforts include State diagnostic laboratory surveillance conducted by diagnosticians when routine cases yield test results considered suspicious for FADs. Such results are reported to Federal and State animal health authorities for further investigation.

The NAHLN was developed to screen samples for FADs. From calendar year (CY) 1997 through CY 2008, the number of FAD investigations per year ranged from a low of 254 in 1997 to a high of 1,013 in 2004. The high number of investigations in both 2004 and 2005 (995 investigations) reflects the occurrence of a widespread vesicular stomatitis outbreak.

Of the 290 investigations conducted in 2008, 9 resulted in confirmed FAD findings. One FAD investigation (of a performance horse in Florida) was positive for equine piroplasmosis (*Theileria equi*), four were positive for wildebeest-associated malignant catarrhal fever (MCF) [alcelaphine herpesvirus type 1], and four were equine cases positive for contagious equine metritis (CEM), a transmissible, exotic, venereal disease of horses caused by the bacterium *Taylorella equienitalis*. The MCF investigations involved cattle pastured near a wildebeest pasture in Texas, with one investigation on the originating premises and three on premises in Alabama, Georgia, and Louisiana. The index case for the 2008 CEM investigations was on an equine breeding stable in Kentucky, with another positive premises identified in Kentucky and two positive premises in Indiana in 2008. This investigation is continuing in 2009. In all cases, early identification and quick response minimized further spread of disease. See Chapter 1 for more information on these two FAD events.

In 2008, vesicular conditions (blisterlike lesions) of the muzzle and feet were the most common complaint investigated. There were 167 vesicular complaints: 90 in equids (horses, donkeys, and mules), 35 in cattle, 25 in goats, 8 in sheep, 5 in pigs, 3 in deer, and 1 in an alpaca. Concern about vesicular lesions in ruminants, camelids, captive cervids, and swine would include not only vesicular stomatitis but also foot-and-mouth disease (FMD), a highly contagious viral infection that primarily affects cloven-hoofed domestic and wild animals. If FMD were to enter the United States and spread throughout the country, it would have a severe economic impact. In equids, the only FAD concern resulting from vesicular conditions is vesicular stomatitis. None of the 167 vesicular complaints identified in 2008 was positive for either vesicular stomatitis or FMD.

APHIS Surveillance Activities in 2008

Avian Influenza Surveillance

APHIS' AI Surveillance Program addresses the following poultry populations: the large-volume commercial poultry industry; the small-volume, high-value commercial poultry industry; the live bird marketing system (LBMS); and backyard poultry flocks. The program also includes nonpoultry avian populations, including migratory waterfowl and zoo or exhibition birds. The VS National AI Surveillance Plan can be found online at *www.aphis.usda.gov/vs/nahss/poultry/ai/avian_influenza_surveillance_plan_062907.pdf*.

APHIS works closely with States and the commercial poultry industry in its AI surveillance effort. One industry partner is the National Chicken Council (NCC), which represents 98 percent of the U.S. broiler industry and conducts rigorous testing

for AI. Under the NCC's AI Monitoring Plan, which uses private laboratory testing, every participating company tests all broiler flocks before slaughter. APHIS collaborates with the NCC to maintain secure data-reporting systems that allow its testing data to be used in national AI surveillance. The NAHSS Web site, *www.aphis.usda.gov/vs/nahss/poultry/index.htm*, presents the NCC summary surveillance data. Consumers and international partners can easily access these data and learn about the surveillance measures the United States is taking to ensure the safety of poultry exports to other countries.

Commercial Industry Program and Backyard Birds—Breeder flocks, as well as commercial meat and egg production flocks, are monitored for AI through the National Poultry Improvement Plan (NPIP) administered by VS. In fiscal year (FY) 2008, more than 1.8 million tests were performed as part of the NPIP surveillance program. Low pathogenic notifiable AI (LPNAI) strains were detected in commercial flocks twice during FY 2008. The first detection occurred in an Arkansas commercial broiler multiplier flock of 16,000 birds. Routine NPIP preslaughter serum testing detected antibodies to the low pathogenic avian influenza (LPAI) H7N3 subtype. Virus isolation confirmed LPAI H7N3. In accordance with State NPIP LPNAI response plans, the premises was depopulated. The second reportable LPNAI detection occurred in an Idaho gamebird facility (which included pheasants, ducks, quail, chukars, and pigeons) during routine testing of three dead pheasants. Additional testing of the flock detected LPAI H5N8 virus and antibodies in the pheasants and ducks. The flock was depopulated.

During FY 2008, LPNAI was detected in five backyard flocks in four States (South Dakota, Massachusetts, North Carolina, and New Hampshire).

- In South Dakota, a mixed-species operation had H5N2 antibodies detected in turkeys, but no virus was isolated. The flock was depopulated with on-site slaughter and controlled marketing of virus-negative birds.
- In Massachusetts, there were two LPNAI incidences in backyard flocks. The first involved a mixed-species operation on which antibodies to H5N2 were detected in pheasants. Real-time reverse transcriptase polymerase chain reaction (rRT-PCR) testing was H5 positive, but no virus was isolated. The flock was released from quarantine following two negative virologic tests. In the second Massachusetts LPNAI incident, antibodies to H5N2 were detected on a mixed-species operation. Virus isolation and rRT-PCR were negative. The positive birds were euthanized, and the remaining flock was released from quarantine after repeated negative testing.
- In North Carolina, H7N7 virus and antibodies were detected and determined to be LPAI by sequencing and pathogenicity testing. The flock was depopulated.
- H7N7 antibodies were detected in a New Hampshire mixed-species flock. Virus isolation and rRT-PCR were negative. The flock was released from quarantine following two negative virologic tests.

Live Bird Marketing System Program—The domestic LPAI program provides surveillance to detect H5 and H7 LPAI in the LBMS. Surveillance for notifiable AI in the LBMS remained a high priority in 2008. APHIS has initiated cooperative agreements with 40 States and 2 territories to conduct LBMS surveillance.

From July 1, 2007, to June 30, 2008, a total of 103,797 tests were performed as part of the LBMS. All specimens that tested positive were submitted to the National Veterinary Services Laboratories (NVSL) for confirmation. Low pathogenic H5N2 AI virus was isolated from 51 specimens in 19 submissions during FY 2008. The H5N2 subtype AI virus was isolated from 19 specimens from New York, 30 specimens from New Jersey, and 2 specimens from Pennsylvania. In addition, an H7 was isolated from nine specimens as follows: one H7N3 specimen from New Jersey, seven H7N7 specimens from New Jersey, and one H7N7 specimen from Pennsylvania. The H5 viruses were shown to be low pathogenic by the chicken pathogenicity test and the deduced amino acid profile at the hemagglutinin cleavage site.

Avian Influenza Surveillance in Wild Waterfowl—In FY 2008, funding continued for the early detection of highly pathogenic avian influenza (HPAI) in wild migratory birds. Surveillance activities were

initiated in 2006 in all 50 States and continue to date. Figure 3.1 illustrates samples collected as part of the collaborative interagency HPAI surveillance effort of wild migratory birds. Surveillance consists of the capture and sampling of apparently healthy wild birds—primarily waterfowl and shorebirds—and investigations of morbidity and mortality events in all species of wild birds. This collaborative interagency effort involves APHIS' Wildlife Services (WS) and VS programs, the U.S. Department of the Interior, State wildlife and natural resource agencies, and nongovernmental wildlife organizations.

Figure 3.1: FY 2008 collection sites for wild bird samples and environmental fecal samples in the United States

Specimens collected from apparently healthy wild birds were screened at veterinary diagnostic laboratories in the NAHLN; the laboratory personnel used rRT-PCR to detect type A influenza virus-specific RNA. The samples from sick or dead birds were submitted to the NAHLN, to the U.S. Geological Survey's National Wildlife Health Center, or to NVSL. Fecal samples collected from the environment were submitted to WS for screening with rRT-PCR assays. All presumptive H5 and H7 positive wild bird and fecal samples were submitted to NVSL for confirmation and virus isolation.

Between October 2007 and September 2008, more than 69,000 wild birds were tested, yielding 499 presumptive H5 and H7 positive specimens. More than 25,000 environmental fecal samples from wild birds were also analyzed, resulting in 8 presumptive H5 and H7 positive specimens. More than 6,000 wild bird and environmental fecal samples tested positive for type A influenza virus-specific RNA, and virus was isolated from 155 wild bird samples collected in the United States. The predominant subtype isolated was H5N2, with 25 isolations from 15 States. No HPAI was detected; however, LPAI H5N1 was isolated from two specimens submitted from Michigan and Iowa. All H5 and H7 AI viruses were characterized as LPAI viruses of North American lineage.

Bovine Spongiform Encephalopathy Surveillance

BSE is an extremely rare central nervous system (CNS) disease in cattle that has raised public health concerns. In cattle that display CNS signs, such as changes in temperament, abnormal posture, and ataxia, BSE is one of the possible diagnoses. APHIS has conducted surveillance for BSE since 1990. In August 2006, USDA implemented an ongoing surveillance plan commensurate with the extremely low level of risk in the United States; this plan continues to exceed surveillance guidelines set by the OIE for controlled BSE risk status. The controlled risk status classification provides acknowledgment from the OIE that the science-based mitigation measures in place in the United States effectively protect animal health and food safety. A 2006 analysis of surveillance data concluded that BSE might occur in this country, but levels would be extremely low—less than one case per million in the U.S. adult cattle population.

In FY 2008, more than 40,000 cattle were sampled as part of the ongoing surveillance program, with no disease detected. Surveillance efforts focus on those cattle in which the disease is most likely to be found. The targeted populations are cattle exhibiting signs of CNS disorders or any other signs that may be associated with BSE, including emaciation or injury. The surveillance program also targets cattle that die of unknown causes, as well as nonambulatory cattle. Healthy slaughter cattle are not included in the sampling because the likelihood of detecting BSE in this population has been shown to be extremely low.

This level of sampling on an ongoing basis assures that the United States is capable of detecting as few as one infected animal per million U.S. adult cattle. Ongoing surveillance allows the United States to assess any change in the BSE status of U.S. cattle and identify any significant rise in BSE prevalence in this country.

Classical Swine Fever Surveillance

The United States has been free of classical swine fever (CSF) since 1978. CSF is still endemic in many other countries in the Western Hemisphere, including Mexico, Cuba, Haiti, and the Dominican Republic. APHIS implemented a comprehensive CSF surveillance program in 2006 with the goals of rapidly detecting CSF virus in U.S. swine and mitigating the impacts of a large-scale outbreak. Surveillance is conducted through the cooperative efforts of State and Federal government agencies, tribal authorities, producers, and private practitioners. The surveillance program focuses on testing targeted swine populations, or surveillance streams, in high-risk States. These populations are:

- Sick pigs submitted to veterinary diagnostic laboratories;
- Pigs condemned at slaughter by USDA's Food Safety and Inspection Service;
- Feral swine;
- High-risk swine populations including waste-feeding operations and high-risk herds in Florida, Texas, and Puerto Rico; and
- Swine FAD investigations submitted to the VS Foreign Animal Disease Diagnostic Laboratory (FADDL) as suspicious for CSF.

Areas or States at high risk for CSF include those with garbage-feeding operations, backyard swine operations, feral swine hunting clubs, military bases, international airports or seaports, and corporations engaging in international movement of swine. CSF risk is higher in areas with greater numbers of swine and more swine imports. Additionally, farming operations using immigrant labor, particularly from countries where CSF is endemic, may pose a risk because of laborers who may illegally bring contaminated swine products to their workplace in the United States.

In FY 2008, 25 NAHLN laboratories and FADDL conducted CSF surveillance testing on a total of 18,341 specimens (table 3.1). All specimens were confirmed negative.

Additional information about the CSF surveillance program is available on the NAHSS Web site at *www.aphis.usda.gov/vs/nahss/swine/csf/index.htm*.

TABLE 3.1: Classical swine fever testing for FY 2008

Surveillance Stream	Number of Tested Specimens
Sick pigs submitted to veterinary diagnostic laboratories	3,187
Swine condemned at slaughter	1,602
Feral swine collected by APHIS in 30 States	2,302
Swine from high-risk herds (waste feeders and high-risk populations in Florida, Texas, and Puerto Rico) and other specimens tested for CSF	11,244
Swine foreign animal disease (FAD) investigations tested for CSF	6
Total	**18,341**

Equine Arboviral Web Reporting

APHIS provides weekly updates on the number of cases of diseases associated with West Nile virus and eastern and western equine encephalitis during the transmission season (approximately June through November) at *www.aphis.usda.gov/vs/nahss/equine*. In 2008, there were 179 equine cases of West Nile virus reported in 30 States and Puerto Rico, and 185 equine cases of eastern equine encephalitis reported in 15 States.

Equine arbovirus reporting is accomplished through collaboration with the CDC and State veterinary and public health officials. CDC provides arbovirus case information to APHIS from its ArboNET reporting system, an electronic-based surveillance and reporting system used to track and report arboviral activity. APHIS then disseminates the equine case information to State veterinary officials weekly for their confirmation, and posts the confirmed data on the NAHSS Web site. The Web site was developed at the request of the United States Animal Health Association's (USAHA)

Infectious Diseases of Horses Committee and the American Horse Council. The site is intended to provide timely and accurate equine arbovirus case information to individuals associated with the horse industry, including horse owners, animal health professionals, and regulatory officials, as well as public health officials and those in related academic and research fields.

Swine Influenza Virus Surveillance

SIV is commonly found in U.S. swine herds, often presenting as respiratory infection. Swine influenza is controlled primarily through biosecurity measures and vaccination programs. Like other influenza A viruses, SIV has the potential to rapidly mutate and exchange genetic material with other influenza viruses, including influenza viruses of birds and humans. As a result, new SIV genotypes are constantly being generated. Some of these new "reassortant" genotypes contain genetic material from humans and/or birds, as well as pigs, and may increase severity of disease and the virus' ability to move between animals and humans.

Circulating SIV subtypes create challenges for vaccine manufacturers, diagnostic laboratories, and swine producers. The number of SIV subtypes and genotypes now circulating among U.S. swine herds has reduced the effectiveness of SIV vaccination programs and the ability of diagnostic laboratories to rapidly identify the problem. This has increased economic losses for producers and increased the need for rapidly updated, effective vaccines and diagnostic reagents produced from current circulating genotypes of the virus.

Although not common, SIV can be directly transmitted from humans to pigs and vice versa, but pork and pork products are not a source of infection. While swine infections with SIV are not notifiable diseases to the OIE, human infection with novel influenza A viruses is designated as a nationally notifiable condition in the United States. Typically, a few human SIV cases are reported to CDC each year, and most include reports of exposure to swine. Three such cases were reported in 2008. Early in the year, one case was reported in Minnesota in a young adult exposed to pigs at a live animal market. In October, a teenager in Texas who reported several swine exposures tested positive for swine influenza. In late 2008, a young adult from South Dakota with reported links to swine through college activities experienced influenza-like symptoms and was found to be positive for swine influenza. When human cases of SIV are detected, animal and public health officials at the local, State, and Federal levels work together to investigate. The virus did not attain the ability to spread easily among people in any of these cases.

To better understand the epidemiology and ecology of SIV in swine and the epidemiology of human SIV infections, an interagency project was initiated in 2008. The project—which involves APHIS, the USDA-Agricultural Research Service's National Center for Animal Disease, and the CDC's National Center for Immunization and Respiratory Diseases Influenza Division—establishes a pilot program for SIV surveillance in swine and investigation of human SIV cases. This project will look at the incidence and distribution of different SIV strains in swine populations, identify and research novel swine isolates, and investigate cases of human SIV infection. In addition, Federal agencies will share isolates for developing diagnostic reagents and vaccines for animals and humans. The project has been jointly developed with industry and agency stakeholders.

Surveillance samples will be selected from laboratory samples that private veterinary practitioners submit for routine diagnosis of respiratory disease in pigs. Cases of interest include positive SIV cases in swine in which the disease is unusually severe, cases in which influenza viruses are novel to pigs (non-H1 or -H3 viruses), or cases in which human infection with SIV in association with influenza-related illness in swine has been reported.

National Animal Health Laboratory Network Update

The USDA Homeland Security Office established the NAHLN as part of a national strategy to

coordinate and link the testing capacities of the Federal veterinary diagnostic laboratories with the facilities, professional expertise, and support of State and university veterinary diagnostic laboratories. This network enhances the Nation's early detection of, response to, and recovery from animal health emergencies, including emerging diseases and FADs that threaten the Nation's food supply and public health.

Revisions to VS Memorandum 580.4

VS Memorandum 580.4 provides the procedures for investigating a suspected foreign animal or emerging disease and outlines the responsibilities of the VS Area Veterinarians-in-Charge (AVICs), the FAD diagnosticians, and the NVSL. In 2008, the memorandum was revised to include the potential use of NAHLN laboratories for initial testing of FAD investigation samples. A laboratory issues working group developed the supplemental materials and policies necessary to support the memorandum's revision. Revisions to the NAHLN checklist and policy document, as well as guidance for sample collection, scenarios, laboratory and State response plans, and discordant results, were developed and distributed to animal health professionals through the National Assembly of State Animal Health Officials and APHIS.

2008 National Animal Health Laboratory Network Highlights

Distribution of the Revised NAHLN Laboratory Qualification Checklist—The NAHLN Laboratory Qualification Checklist was revised to address laboratory responsibilities during FAD investigations, surveillance, and outbreaks. The checklist was distributed in 2008 to NAHLN laboratory directors, State animal health officials, and AVICs for their signatures.

Scenarios Testing—In February 2008, the NAHLN AI tabletop exercise was beta-tested in Iowa and Ohio. Participants gained enhanced awareness of laboratory issues they would encounter during an outbreak and had the opportunity to assess their response plans. After the February testing, NAHLN laboratory personnel and other animal health professionals participated in facilitated tabletop sessions throughout the United States during 2008. Thirty-eight exercises were conducted, involving 55 NAHLN laboratories and more than 700 participants. Internal and external stakeholders drafted and reviewed a summary report to identify gaps and prioritize necessary actions.

National Animal Health Laboratory Network Laboratory Review Process—NAHLN program personnel collaborated with the American Association of Veterinary Laboratory Diagnosticians (AAVLD) to establish a process to review NAHLN laboratories to ensure the development and implementation of a quality system consistent with AAVLD, OIE, and International Organization for Standardization standards. The review process was implemented in 2008 and will be expanded in 2009. In addition, a corrective action process was established and implemented to ensure that the root cause of deficiencies is identified and addressed.

Modeling to Determine Diagnostic Capacity Requirements—Simulation modeling is being used to help determine if adequate biosafety level-2 (BSL-2) and BSL-3 space is available in NAHLN laboratories to handle the number of samples generated in an outbreak—particularly of FMD—and during recovery, as well as to aid in determining the reagents and supplies needed in the National Veterinary Stockpile (NVS). Modeling will also help decisionmakers: (1) develop a contingency plan if adequate laboratory space and equipment are not available to test the number of samples generated during an extensive FMD outbreak, and (2) prioritize additional appropriate laboratory space and equipment needs. FMD modeling is important because of all the species impacted by the disease. VS personnel are working on models for other diseases and have one completed for AI as well.

Collaboration with the National Veterinary Stockpile—Representatives from the NVS, NVSL, and NAHLN have identified resource needs to support diagnostic testing during emergency response. The initial project focuses on AI, FMD, CSF, exotic Newcastle disease, and Rift Valley fever, and on day-to-day operations and surge requirements. The aggregate

requirements and resources have been identified and are now being compared with multiple scenarios to determine appropriate capabilities, including the necessary diagnostic tests, reagents, and supplies.

High-Throughput Equipment Training—Automated, high-throughput equipment has been purchased and distributed to NAHLN laboratories according to a risk-based model for the introduction and spread of HPAI.

The NVSL Diagnostic Virology Laboratory and Foreign Animal Disease Diagnostic Laboratory collaborated with NAHLN to host training sessions for the use of high-throughput testing systems. Representatives from 31 NAHLN laboratories participated in training that included an overview of high-throughput systems, instruction on equipment programming, and hands-on equipment use. The systems have been validated for use with rRT-PCR diagnostic assays for AI, CSF, and FMD.

National Animal Health Laboratory Network Emergency Response Symposium—NAHLN organized an emergency response symposium held in conjunction with the 2008 AAVLD and USAHA annual meeting. Topics included:

- Disease response plans;
- APHIS and State roles and responsibilities during an outbreak;
- Laboratory capacity;
- Use of bar-coding and information technology (IT) to increase efficiency;
- NAHLN AI and other exercises;
- The NVS FMD vaccine bank;
- Use of mobile laboratories; and
- Integrated response.

Surveillance Activities—In 2008, NAHLN laboratories participated in surveillance programs for CSF (36 laboratories), BSE (7 laboratories), and chronic wasting disease and scrapie (24 laboratories). Forty-five laboratories participated in wild bird AI surveillance with APHIS' WS.

NAHLN Information Technology System—The NAHLN IT system was developed with data messaging and standards to ensure that accurate and consistent diagnostic information is quickly and securely transmitted. Routine test results have been securely submitted via a Web-based system for more than 3 years. Efforts in 2008 focused on transmitting test results through standardized electronic messaging. Laboratories are now able to send CSF test result messages to the production system of the NAHLN IT system.

National Animal Health Laboratory Network Web Site—Information on the NAHLN IT system, surveillance efforts, and other NAHLN-related publications can also be found at *www.aphis.usda.gov/animal_health/nahln/*.

National Animal Health Reporting System

The NAHRS gathers data from State animal health officials on the presence of confirmed OIE-reportable diseases in specific livestock, poultry, and aquaculture species in the United States. NAHRS is a joint effort of the USAHA, AAVLD, and APHIS. Coordinated by the National Surveillance Unit, the system was designed to function as one part of a comprehensive and integrated animal health surveillance system.

The United States meets its OIE reporting obligations using a variety of sources, including the NAHRS, FAD reports, and national program disease surveillance reports. Table 2.1 in appendix 2 lists the U.S. status of the occurrence of OIE-reportable diseases.

NAHRS is a voluntary, cooperative system for reporting animal diseases. In 2008, 48 States reported disease information to NAHRS. States that do not participate in NAHRS are still required to report to the FAD surveillance and VS national program disease surveillance data systems.

The NAHRS online reporting tool enables State animal health officials to complete their monthly NAHRS reports via the Internet, with assurance of secure data transfer and information confidentiality. State animal health officials may also use the NAHRS online tool to view summary reports as well as past monthly reports.

2008 National Animal Health Reporting System Highlights

Enhanced Aquaculture Reporting—Efforts to enhance aquaculture disease reporting continued in 2008 with expansion of the NAHRS online reporting application to include all OIE-reportable aquaculture diseases. This reporting application will be launched in 2009.

Equine Infectious Anemia Reporting—In 2008, the NAHRS equine infectious anemia (EIA) online reporting module was launched, providing States the option of reporting EIA data through NAHRS rather than to VS Equine Program staff.

National List of Reportable Animal Diseases—APHIS, in cooperation with USAHA, AAVLD, State animal health officials, and industry representatives, is exploring the development of a National List of Reportable Animal Diseases and appropriate reporting criteria. The national disease list would enhance current animal disease reporting requirements through individual State-reportable disease lists and Federal regulatory reporting requirements. The NAHRS steering committee, representing States, industry, laboratories, and academic institutions, will work with APHIS on this project in 2009. More information is available at the NAHRS Web site, *www.aphis.usda.gov/vs/ceah/ncahs/nahrs/*.

National Bio- and Agro-Defense Facility

APHIS is developing a world-class animal disease biocontainment facility in conjunction with the U.S. Department of Homeland Security (DHS) Science and Technology Directorate. It will be called the National Bio- and Agro-Defense Facility (NBAF). In 2008, Manhattan, Kansas, was selected by DHS as the site for the NBAF. The facility will be constructed on the campus of Kansas State University. The work currently done by the Foreign Animal Disease Diagnostic Laboratory (FADDL) is scheduled to be transferred from Plum Island, New York, to the new facility. Scientists at FADDL are devoted to diagnosing foreign diseases of animals. They partner with scientists of DHS and USDA's Agricultural Research Service, also located on Plum Island, in foreign animal disease research.

This facility will enable basic and advanced research, diagnostic testing and validation, countermeasure development (i.e., vaccines and antiviral therapies) and diagnostic training for high-consequence livestock diseases with potentially devastating impacts on U.S. agriculture and public health.

CHAPTER 4

CHAPTER 4

Animal Disease Eradication, Control, and Certification

This chapter describes APHIS programs that are designed to eradicate, control, or prevent diseases that threaten the biological and commercial health of U.S. livestock and poultry industries. Disease surveillance is a critical component of these efforts, and this chapter also discusses the enhanced surveillance plans being developed for some program diseases.

Eradication Programs

Diseases targeted in APHIS eradication programs include scrapie in sheep and goats, tuberculosis (TB) in cattle and cervids, pseudorabies and brucellosis in swine, and brucellosis in cattle and bison.

Scrapie in Sheep and Goats

Since 1952, APHIS has worked to control scrapie in the United States. In 2000, as a result of increasing industry and public concern about transmissible spongiform encephalopathies (TSEs) and the discovery of new TSE diagnostic and control methods, APHIS initiated an accelerated scrapie eradication program.

Status of Program Components—The primary components of the scrapie eradication program are animal identification, surveillance, disease investigations, and certification of flocks through the Scrapie Flock Certification Program (SFCP).

Animal Identification—As of September 30, 2008, 144,818 premises with sheep and/or goats were recorded in the scrapie national database (a premises that contains both sheep and goats might be listed twice, once for each species). Of these premises, 113,609 had requested official eartags. Both of these numbers have risen steadily since 2004.

Surveillance—The Regulatory Scrapie Slaughter Surveillance (RSSS) program, initiated on April 1, 2003, identifies scrapie-infected flocks through targeted slaughter surveillance of sheep and goat populations that have been recognized as having higher-than-average scrapie prevalence. These targeted populations include mature black- or mottle-faced sheep and any mature sheep or goats showing clinical signs that could be associated with scrapie, such as poor body condition, wool loss, or gait abnormalities.

During fiscal year (FY) 2008, as part of the RSSS program, 43,914 sheep and goat samples, collected from 98 slaughter plants in 27 States, were tested for scrapie using immunohistochemistry testing procedures on brain and/or lymph node specimens. These tests identified 42 scrapie-positive animals (table 4.1); follow-up information is provided below in "Disease Investigations."

TABLE 4.1: Scrapie cases, FY 2003–08

	Number of cases by year					
Test or examination	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Field necropsy[1]	315	374	461	243	253	128
Regulatory live animal[2]	32	20	31	37	19	6
RSSS[3]	[4]23	[5]85	[5]105	70	59	42
Total	**370**	**479**	**597**	**350**	**331**	**176**

[1] Includes necropsy validations.
[2] Third eyelids and rectal biopsies; includes test validations.
[3] RSSS = Regulatory Scrapie Slaughter Surveillance.
[4] Includes only part of FY 2003 (April 1 to September 30, 2003).
[5] Number revised from 2007 U.S. Animal Health Report.

The Caprine Scrapie Prevalence Study, a short-term surveillance project, was conducted from May 2007 through March 2008 to estimate the national prevalence of scrapie in adult goats at slaughter. A total of 3,032 goats were sampled for scrapie testing as part of this study (1,515 in FY 2007 and 1,517 in FY 2008). None of these goats tested positive for scrapie, indicating that the scrapie prevalence in U.S. adult slaughter goats is less than 0.1 percent with 95-percent confidence. The prevalence of scrapie in U.S. goats is greater than zero, however, because five positive goats were identified in FY 2008 through investigation and testing of a goat with clinical signs. The index scrapie-positive goat was diagnosed from tissues collected at necropsy after unsuccessful treatment for pruritis, skin thickening, bilateral hair loss, and hypersensitivity. The other four positive goats were nonclinical scrapie cases identified by testing in the clinical goat's herd of origin.

Disease Investigations—Under the scrapie eradication program, any animal confirmed positive by the National Veterinary Services Laboratories (NVSL) is traced back to its flock of origin and, if different, the flock in which it was born and any other flock in which it might have lambed. The flock in which the animal lambed and the flock of birth are designated as infected and source flocks, respectively. Infected and source flocks are placed under movement restrictions until a flock cleanup plan has been completed.

In FY 2008, investigations of RSSS-positive cases, clinical suspect animals, on-farm surveillance, and trace-outs from infected and source flocks resulted in the identification of 61 previously undetected infected and/or source flocks. The number of newly identified infected and source flocks has declined each year since FY 2005 (table 4.2). During disease investigations, samples for scrapie testing are collected from exposed and potentially exposed genetically susceptible animals and clinical suspects, as well as depopulated animals from infected and source flocks. In FY 2008, this testing identified 134 scrapie cases: 128 from field necropsy and 6 from live-animal testing (table 4.1). A scrapie case is defined as an animal for which a diagnosis of scrapie has been made by NVSL using a U.S. Department of Agriculture (USDA)-approved test (typically immunohistochemistry testing of the obex and/or lymphoid tissue, but other tests, including the Western blot and enzyme-linked immunosorbent assay, may also be used).

Certification of Flocks—The SFCP[1] is a cooperative effort among producers, State and Federal animal health agencies, and industry representatives to enable enrolled flocks to participate in one of three levels of monitoring and two levels of certification:

- Complete Monitored—Requires annual inspection and inventory reconciliation, application of official identification, recordkeeping, and testing of animals displaying clinical signs. If female animals from flocks of lower status are added, the status of the flock is lowered. If scrapie is found in or traced to the flock, the flock is removed from the program.
- Complete Monitored Certified—Achieved after gaining 7 years of status in the complete monitored category.
- Selective Monitored—Designed for producers of slaughter lambs to allow for scrapie surveillance in large production flocks.
- Export Monitored—Designed to meet World Organization for Animal Health (OIE) guidelines, must meet all the requirements of the complete monitored category for 7 years and test for scrapie

TABLE 4.2: Infected and source flocks detected, FY 2003–08

	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Infected	61	83	108	52	30	25
Source	19	35	71	68	46	36
Total Flocks	**80**	**118**	**179**	**120**	**76**	**61**

[1] www.aphis.usda.gov/animal_health/animal_diseases/scrapie/downloads/sfcp.pdf

TABLE 4.3: Scrapie Flock Certification Program participation, FY 2002–08

Fiscal year, as of 9/30	Total Participating Flocks	Status: Enrolled	Status: Certified	Status: Selective Monitored	Status: Export
2002	[1]1,542	[1]1,455	78	9	0
2003	1,776	1,663	105	8	0
2004	1,868	1,726	135	7	0
2005	1,961	1,770	188	3	0
2006	[1]2,047	[1]1,747	297	3	0
2007	2,047	1,611	427	4	5
2008	1,988	1,422	534	4	28

[1] Number revised from 2007 U.S. Animal Health Report.

all sheep and goats more than 14 months old that die on farm (other than through normal slaughter).

- Export Monitored Certified—Achieved after gaining 7 years of status in the export monitored category.

By the end of FY 2008, 1,988 flocks were participating in the SFCP (table 4.3).

National Scrapie Surveillance Plan—The National Scrapie Surveillance Plan has been finalized and posted at *www.aphis.usda.gov/vs/nahss/sheep/national_scrapie_surveillance_plan_08192008.pdf*. The plan provides a comprehensive review of scrapie surveillance in the United States, explains the basis for implementing State-of-origin sampling targets and ultimately flock-level surveillance, and establishes minimum targets for FY 2009 and 2010.

For the Future—Work continues to expand surveillance for scrapie and to increase the traceability of sheep and goats presented for sampling.

Tuberculosis in Cattle and Cervids

The publication "Bovine Tuberculosis Eradication: Uniform Methods and Rules" (UM&R) gives the minimum standards adopted and approved by the VS Deputy Administrator in January 2005.[2] For more detailed information about the requirements of the bovine TB program, see the UM&R.

[2] www.aphis.usda.gov/animal_health/animal_diseases/tuberculosis/downloads/tb-umr.pdf

Status—From FY 2000 to 2008, 74 TB-affected herds have been detected in the United States. This 74-herd total comprises 48 beef herds, 22 dairy herds, 2 mixed-use cattle herds, and 2 captive cervid herds (1 of elk and 1 of white-tailed deer). The annual number of affected herds per year during this period ranged from 4 to 11.

In FY 2008, 11 affected herds were found, an increase from 7 affected herds in FY 2007. Three of these 11 herds were located in Michigan and were detected through annual testing. Four herds were located in Minnesota and were detected as a result of annual testing and area testing. Of three herds detected in California, the first was detected through slaughter surveillance and the additional two herds through the resulting epidemiological investigation. One affected herd was detected in New Mexico as a result of market testing.

At the end of 2008, 46 U.S. States, Michigan's Upper Peninsula, Puerto Rico, and the U.S. Virgin Islands were considered Accredited TB Free (table 4.4). New Mexico, California, part of Michigan's Lower Peninsula, and most of Minnesota were classified as Modified Accredited Advanced. A total of 11 counties plus portions of 2 other counties in northern lower Michigan were Modified Accredited, as were portions of 4 counties in northwestern Minnesota. Specific information for affected States in 2008 follows:

Michigan—Three new affected herds were detected in FY 2008; all were beef herds and were depopulated. Annual herd testing is ongoing in the Modified Accredited Zone (MAZ). Within the highest endemic area of the MAZ, the apparent prevalence

TABLE 4.4: Bovine tuberculosis accreditation categories and State status—end of calendar year 2008

Category	Prevalence of TB	States (numbers as of 12/31/08)
Accredited Free	Zero for cattle and bison	46 U.S. States, Michigan's Upper Peninsula, all of Puerto Rico, and the U.S. Virgin Islands
Modified Accredited Advanced	Less than 0.01 percent of total cattle and bison herds	California, New Mexico, most of Minnesota, part of Michigan's Lower Peninsula
Modified Accredited (Regionalized)	Less than 0.1 percent of cattle and bison herds	11 counties in the northern part of Michigan's Lower Peninsula and parts of 2 other counties; part of 4 counties in northwestern Minnesota
Accredited Preparatory	Less than 0.5 percent of the total number of cattle and bison herds	—
Nonaccredited	Either unknown or 0.5 percent or more of the total number of cattle and bison herds	—

of TB in wild deer has been 2.3, 1.4, and 1.8 percent for 2006, 2007, and 2008, respectively. Outside of this endemic area within the MAZ, the apparent prevalence of TB in wild deer has been 0.2 to 0.3 percent for 2006 through 2008. One dairy herd, classed as a "carryover herd" from FY 2004, remains under a test-and-removal herd plan. A second dairy herd that had been under a test-and-removal herd plan was released in early 2008, after 4 years under quarantine. Both of these herds were detected through annual area testing.

Minnesota—Minnesota had four positive beef herds detected and depopulated in FY 2008. These herds were detected through area testing and retesting of designated high-risk herds. Modified Accredited Advanced States or zones with fewer than 30,000 herds may have no more than 3 affected herds during 12 consecutive months; consequently, Minnesota's status was reduced to Modified Accredited from Modified Accredited Advanced in April 2008. Minnesota applied for and received split-State status in October 2008; the majority of the State returned to Modified Accredited Advanced status and an MAZ was established in the northwestern corner of the State.

Surveillance and population reduction of free-ranging white-tailed deer in the MAZ continued in 2008. Surveillance detected 6 positive (0.7 percent) of 883 tested deer, the same prevalence of infection detected in 2007, when 11 positive (0.7 percent) deer were found out of 1,654 tested.

New Mexico—In the Accredited Free portion of New Mexico, an affected mixed-use herd, consisting of dairy and beef cows and bulls and feeder steers, was detected through market testing in 2008. The herd was detected when a dairy cow from the affected herd was tuberculin-tested at a market for interstate-movement purposes.

New Mexico also had one affected dairy herd in the Accredited Free portion of the State in FY 2007. Because Accredited Free States and zones may have no more than one affected herd in a 48-month period, the detection of the positive mixed-use herd in 2008 caused the Accredited Free portion of the State to be downgraded to Modified Accredited Advanced in September 2008. With the entire State now in Modified Accredited Advanced status, New Mexico has applied for split-State status.

California—The epidemiological investigation resulting from the December 2007 detection of bovine TB at a slaughter plant in California continues. The index herd was depopulated; of two additional infected large dairy herds found through the investigation, one was depopulated and the other is under a test-and-removal plan. During 2008, officials from USDA and the California Department of Food and Agriculture conducted 271 herd tests involving more than 377,000 cattle in California alone. For a summary of this investigation and resulting activities, see Chapter 1.

Slaughter Surveillance—In FY 2008, 34 cases of bovine TB (*Mycobacterium bovis*, or *M. bovis*) were found at slaughter, an increase from 24 cases the year before (table 4.5). One case occurred in an adult dairy cow and the remaining 33 cases occurred in feedlot cattle. The national granuloma[3] submission

[3] Granulomas are types of inflammatory lesions that can be found in cattle with TB.

TABLE 4.5: Slaughter surveillance

FY	*M. bovis* cases	Granuloma submissions	
		Total submissions*	Number per 10,000 adult cattle slaughtered
2004	35	6,367	9.3
2005	40	9,439	16.2
2006	28	9,565	16.4
2007	24	10,286	16.6
2008	34	10,666	15.9

*Primarily from adult cattle.

rate for adult cattle for FY 2008 was 15.9 submissions per 10,000 adult cattle killed, exceeding the target rate of 5 submissions per 10,000 adult cattle killed.

The adult dairy cow mentioned above was the index case that led to the detection of three affected dairy herds in California (described above).

Of the 33 *M. bovis* cases identified in feedlot steers by slaughter surveillance, 9 (27 percent) involved Mexican-origin animals. An outbreak involving 19 of the 33 feedlot steers (58 percent) occurred within a large Texas feedlot. The infected cattle were former rodeo steers assembled from sales in Oklahoma and Kansas. The animals originated from several different States; no additional infected animals were detected during subsequent epidemiological investigations. One of these 19 animals had official Mexican eartags, and several others had an "M" brand, indicating that they were Mexican-origin animals. Genotyping of all outbreak isolates revealed that these 19 animals were infected with the same strain of *M. bovis*, supporting the hypothesis that disease transmission occurred while the animals were in market channels or after they arrived in the feedlot. Two feedlot cases occurred in cattle imported from Canada, and one case traced back to a known infected herd from the Modified Accredited Zone of Minnesota. The outcome of the remaining three cases in fed cattle is pending epidemiological investigation.

Cervids—No TB-infected captive cervid herds were found in 2008.

For the Future—In response to ongoing challenges to the TB program, a process to review and revise the TB program was implemented in 2008. Ongoing challenges include wildlife as a reservoir; changes in the dairy and beef cattle industries; regulations and approaches to disease control that warrant updating; and, perhaps most important, fiscal limitations. TB listening sessions open to the public were held in December 2008, and public input from those sessions is being used as a starting point for drafting new policy for the TB program, beginning in early 2009.

APHIS is developing a sera bank at NVSL in collaboration with international partners. The bank will provide industry stakeholders with well-characterized serum samples, from both TB-infected and uninfected program species, for use in validating developmental tests for TB.

APHIS continues to work with Mexico to help advance its TB eradication program and to significantly reduce the risk of importing TB-infected and -exposed animals into the United States. During 2008, the countries continued discussions regarding the 5-year plan, *Strategic Plan for Reducing the Risk of Importing Tuberculosis Infected Cattle from Mexico 2008-2012*, which the United States developed and presented to Mexico. This plan requires that the Mexican TB Eradication Program achieve equivalency with the U.S. program by the end of 2012.

APHIS' VS and International Services work together to conduct program reviews in Mexican states in order for USDA to recognize their status for purposes of importation. During FY 2008, USDA conducted reviews in six Mexican states or zones.

Pseudorabies in Swine

The Pseudorabies Eradication State-Federal-Industry Program Standards[4] describe pseudorabies program activities, which include surveillance, herd certification, and herd cleanup. These standards were developed by State, Federal, and industry representatives and are endorsed by swine health practitioners and State animal health officials in cooperation with the United States Animal Health Association (USAHA).

Status—In FY 2008, all 50 States, Puerto Rico, and the U.S. Virgin Islands filed annual reports with VS' National Center for Animal Health Programs' swine staff for review. These filings were analyzed to ensure

[4] www.aphis.usda.gov/animal_health/animal_diseases/pseudorabies/downloads/program_stds.pdf

that surveillance of the breeding herd population was adequate and that the Feral–Transitional Swine Management Plan (if required) was complete.

As of December 31, 2008, there were no commercial production swine herds infected with pseudorabies virus (PRV) in the United States. Nine transitional herds, however, were identified through surveillance as infected in FY 2008; transitional swine are defined as captive feral swine or domestic swine that have reasonable opportunity to be exposed to feral swine. These infected transitional herds were depopulated. Epidemiological investigations disclosed no evidence that infection had spread from the infected transitional herds to commercial herds.

Pseudorabies Surveillance—A comprehensive surveillance plan designed to rapidly detect introduction of PRV into commercial swine was finalized in 2008. Although pseudorabies has been eradicated from commercial production swine, it still exists in feral swine and transitional herds allowed exposure to feral swine. The distribution of feral swine continues to expand; if PRV were to be reintroduced into commercial swine, the source most likely would be free-roaming feral hogs, wild boars at hunting clubs, or infected transitional swine.

The revised National Pseudorabies Surveillance Plan[5] has three objectives: rapid detection; demonstration of freedom from PRV; and monitoring of international or domestic sources of PRV. Each objective contains sampling streams. To meet the objective of rapid detection, sampling will be focused on suspicious PRV cases, sick pigs submitted to diagnostic labs, herds classified as high risk, and herds exposed to feral swine. To demonstrate freedom from PRV, sampling will focus on the testing of culled sows and boars at slaughter and meat juice from market hogs at slaughter. Sampling for the third objective, monitoring international and domestic sources of PRV, will focus on monitoring the feral swine reservoir, the number and distribution of swine hunting preserves, and international PRV status.

For the Future—APHIS will continue efforts to implement the pseudorabies surveillance plan. The plan will be implemented in stages, with an estimated full implementation date of 2012. Additionally, APHIS plans to modify the existing regulatory structure. If this regulatory concept is accepted, a comprehensive program for swine diseases will be created.

Brucellosis in Swine

The swine brucellosis eradication program is administered, supervised, and funded via cooperative efforts between State and Federal animal health regulatory agencies. The program guidelines are described in the Swine Brucellosis Control/Eradication State-Federal-Industry Uniform Methods and Rules[6] (SB UM&R). The SB UM&R was developed with expert advice from State, Federal, and industry advisory committees.

Like the pseudorabies program, the swine brucellosis eradication program recognizes feral swine as an infected reservoir that could infect the commercial swine herd. Swine brucellosis caused by *Brucella suis* is commonly found in feral swine and domestic herds allowed exposure to feral swine.

Surveillance for swine brucellosis continues through sampling cull sows and boars. The *Code of Federal Regulations* requires all stage III States (States thought to be free of swine brucellosis) to sample at least 5 percent of their breeding population through market surveillance yearly.

Status—As of December 31, 2008, all States and U.S. territories, except Texas, remained in stage III (free) status of the Swine Brucellosis Control and Eradication Program. No commercial production swine herds were identified as infected with swine brucellosis. Four transitional herds, however, were identified through surveillance as infected with swine brucellosis in FY 2008; these herds were depopulated. Additionally, epidemiological investigations disclosed no evidence that infection spread from the infected transitional herds to commercial herds. Exclusion plans remain vital in preventing or minimizing contact with feral swine.

[5] www.aphis.usda.gov/vs/nahss/swine/prv/prv_surveillance_plan_final_draft_04_16_08.pdf

[6] www.aphis.usda.gov/animal_health/animal_dis_spec/swine/downloads/sbruumr.pdf

TABLE 4.6: Brucellosis certification categories and State status—2008

Designation	Infection rate	No. of States with designation
Class Free	No domestic cattle or bison herds found to be infected for 12 consecutive months while under an active surveillance program	49 States, Puerto Rico, U.S. Virgin Islands
Class A	Herd infection rate less than 0.10 percent	1 (Montana)*
Class B	Herd infection rate between 0.10 percent and 1.0 percent	0

*Texas attained Class Free status on February 1, 2008. Montana was reclassified from Class Free status to Class A status on September 3, 2008 (subsequently regaining Class Free status in July 2009).

Note: States or Areas not having at least Class B status are considered "No Status."

For the Future—VS' National Surveillance Unit (NSU) is designing a new swine brucellosis surveillance plan. Because feral swine are recognized as the disease reservoir for both swine brucellosis and pseudorabies, the brucellosis surveillance plan will likely contain many of the same principles and sampling streams as the pseudorabies surveillance plan. When developed, the swine brucellosis plan will be part of the overall comprehensive swine surveillance system.

Brucellosis in Cattle and Bison

The brucellosis eradication program is based on active surveillance of domestic cattle and bison herds by each State. The program's UM&R document sets forth minimum standards for States to achieve eradication and conduct continued surveillance, primarily through Market Cattle Identification (MCI) testing and the Brucellosis Milk Surveillance Test (BMST).[7]

Status—During 2008, for the first time in the 74-year history of the brucellosis program, all 50 States, Puerto Rico, and the U.S. Virgin Islands were simultaneously designated brucellosis Class Free. This milestone occurred when the State of Texas was declared brucellosis-free on February 1, 2008. In May 2008, however, the State of Montana disclosed a second brucellosis-affected cattle herd within a 24-month period, resulting in reclassification to brucellosis Class A State status on September 3, 2008.

As of December 31, 2008, 49 States, Puerto Rico, and the U.S. Virgin Islands were officially declared free of brucellosis (table 4.6). Specific information regarding Montana's reclassification follows.

Montana—In June 2008, a cow originating from a cattle herd in southern Montana was disclosed as being infected with *Brucella abortus*. This herd was tested as part of Montana's efforts to test and develop brucellosis-risk-mitigation herd plans for herds near the Greater Yellowstone Area. The brucellosis-affected herd was depopulated with indemnity, and a thorough epidemiological investigation was conducted. No additional brucellosis-affected cattle herds were disclosed. Infected free-ranging elk are thought to be the most likely source of infection. A year earlier, in May 2007, a single brucellosis-affected cattle herd was disclosed in southern Montana. With the finding of two brucellosis-affected cattle herds within 24 months, Montana no longer met the conditions for Class Free status and was subsequently reclassified to Class A State status on September 3, 2008. Previously, Montana had been classified as brucellosis Class Free since June 1985.

Other Program Components—As previously noted, the two primary surveillance activities conducted for bovine brucellosis are MCI testing and BMSTs. During FY 2008, approximately 7.349 million head of cattle were tested under the MCI surveillance program. State- and federally inspected establishments slaughtering test-eligible cattle participate in the MCI surveillance program. Test-eligible cattle include cows and bulls 2 years of age and older. In FY 2008, 94.3 percent of all test-eligible slaughter cattle were tested. Brucellosis program standards require a minimum of 90 percent successful traceback of all MCI reactor cattle and a minimum of 95 percent successful case closure.

[7] For details see www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/downloads/umr_bovine_bruc.pdf

In FY 2008, 97.24 percent of all MCI reactors were successfully traced and investigated, resulting in successful case closures. Approximately 629,100 additional head of cattle were tested on farms or ranches during FY 2008, bringing the total cattle tested for brucellosis in FY 2008 to 7.98 million head (table 4.7).

TABLE 4.7: Number of cattle tested for brucellosis (million head), 2004–08

			Market Cattle Identification (MCI) Program	
FY	Total	Farm/ ranch	Slaughter plants	Markets
2004	9.1	0.8	5.5	2.8
2005	8.7	0.6	5.2	2.9
2006	8.8	0.9	4.7	3.2
2007	8.8	0.8	4.7	3.3
2008	8.0*	0.6	4.6	2.7

*Sum of categories may not add to total due to rounding.

BMST surveillance is conducted in all commercial dairies a minimum of two times per year in Class Free States and a minimum of four times per year in Class A States. Suspicious BMST results are followed up with an epidemiological investigation. According to herd inventory data reported on individual State annual reports, there were 61,250 dairy operations in the United States in FY 2008. Approximately 138,000 BMSTs were conducted in FY 2008, and 110 of those tests yielded suspicious results after repeat screening (repetitive brucellosis ring test and/or heat inactivation ring test). All suspicious BMST results in FY 2008 were confirmed negative by subsequent epidemiological investigations and additional herd testing (table 4.8).

TABLE 4.8: Brucellosis Milk Surveillance Test results, 2004–08

FY	No. of tests	No. suspicious on screening	No. positive
2004	184,000*	200	0
2005	171,000	200	0
2006	164,000	186	0
2007	142,700	126	0
2008	138,000	110	0

*Estimated

Approximately 3.799 million calves were vaccinated for brucellosis in FY 2008. The national calfhood vaccination policy recommends proper calfhood vaccination in high-risk herds and areas, and whole-herd adult vaccination when appropriate in high-risk herds and areas. The policy also recommends elimination of mandatory vaccination in all States.

Bovine Brucellosis Surveillance Planning—An evaluation of the current brucellosis surveillance program identified redundancies in surveillance activities. A Brucellosis Surveillance Planning Working Group proposed a plan to improve the efficiency and effectiveness of the national brucellosis surveillance program by eliminating redundancies in brucellosis surveillance testing and addressing imbalances in surveillance in lower risk States. Proposed changes to brucellosis surveillance include reducing slaughter surveillance, eliminating the brucellosis ring test, eliminating Federal funding for first-point testing in lower risk States where it is not required, and standardizing slaughter surveillance testing using the rapid automated presumptive test and the fluorescence polarization assay for initial slaughter surveillance sample testing.

VS' NSU worked with the Brucellosis Laboratory Consolidation and Testing Standardization Working Group to assess laboratory capabilities for bovine brucellosis slaughter surveillance sample testing. This assessment is evaluating the laboratories' potential to consolidate brucellosis slaughter surveillance testing, based on size and costs. The objectives of the brucellosis laboratory consolidation plan are to increase cost efficiency of slaughter surveillance testing, increase effectiveness by standardizing slaughter surveillance testing, and maintain testing accuracy and timely reporting of results. This assessment will ensure that APHIS creates an efficient and effective brucellosis slaughter surveillance system to support the U.S. brucellosis surveillance program as recognized in national and international trade.

Brucellosis Activities Related to the Greater Yellowstone Area—The Greater Yellowstone Area (GYA) is one of the last known reservoirs of brucellosis in the country. Brucellosis-infected wildlife, primarily elk, have been implicated in the transmission of brucellosis to multiple cattle herds in

the GYA during the past 4 years. All three GYA States lost their Brucellosis Class Free State status at some point during the past 4 years: Wyoming and Idaho have successfully regained Class Free State status, and Montana will be eligible to regain Class Free State status in May 2009.[8]

APHIS, in collaboration with the GYA States, is developing a concept for use when a State is affected by brucellosis. This concept creates an area with increased surveillance to mitigate risks, reduce the statewide impact of the brucellosis finding, and allow the rest of the United States to be considered free of brucellosis. The establishment of such an area would facilitate the elimination of brucellosis from livestock and provide clear, consistent control and surveillance guidance to livestock producers.

In FY 2008, APHIS continued its involvement in several developmental projects, including the Bison Quarantine Feasibility Study, brucellosis transmission studies in bison and elk, and immunocontraceptive studies. Working closely with the U.S. Department of the Interior's National Park Service, APHIS has been able to maintain a viable bison population and prevent transmission of brucellosis to domestic livestock. APHIS personnel assisted with Interagency Bison Management Plan (IBMP) management operations. The IBMP partner agencies are committed to the adaptive management framework of the IBMP. In FY 2008, the partners met to deliberate on recent recommendations by the U.S. Government Accountability Office; assess the effectiveness and outcomes of IBMP management activities (highlighting winter 2007–08); and, considering prevailing conditions, develop and incorporate short- and long-term adaptive management adjustments to the IBMP for winter 2008–09 and beyond.

The Bison Quarantine Feasibility Study is now ready to translocate its first cohort of brucellosis-free Yellowstone bison to a suitable location outside the GYA. Five Native American organizations have applied to receive the first group of 22 cows, 16 calves, and 4 bulls as a first step in conserving valuable Yellowstone bison genetics on landscapes removed from the GYA.

[8] In July 2009, USDA amended its brucellosis regulations to remove Montana from the list of Class A States and add it to the list of Class Free States.

For the Future—The United States is very near eradication of brucellosis from the national domestic cattle and bison herd. APHIS is considering a new approach toward national recognition of brucellosis freedom in domestic cattle and bison. Appropriate and adequate national brucellosis surveillance activities and levels will be defined to verify that the United States is free of brucellosis and to ensure timely detection of new occurrences, thus providing integrity to a national brucellosis disease-status designation. Development of plans to implement the consolidation of brucellosis surveillance testing and use of a standardized testing protocol will continue.

Control, Certification, and Other Programs

Other animal disease programs include chronic wasting disease (CWD) in cervids, Johne's disease in cattle, trichinae in swine, the Swine Health Protection Inspection Program, infectious salmon anemia (ISA) virus, viral hemorrhagic septicemia (VHS), and equine infectious anemia (EIA).

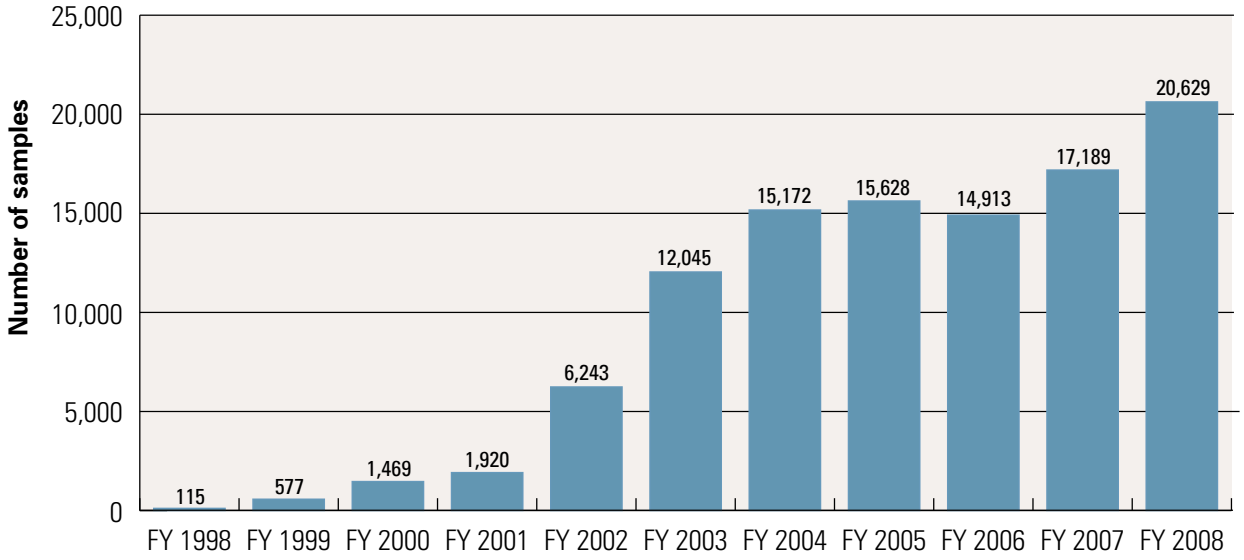
Chronic Wasting Disease in Cervids

APHIS and State CWD surveillance in farmed animals began in late 1997. APHIS began supporting CWD surveillance in wildlife in 1997. Since beginning to receive line-item funding for CWD in FY 2003, APHIS has provided assistance, through cooperative agreements, to State wildlife agencies and tribes to address the disease in free-ranging deer, elk, and moose.

A proposed CWD herd-certification program for farmed cervid operations has been in process since late 2003. Program goals are to control and eventually eradicate CWD from farmed cervid herds. The program is intended to be a cooperative State-Federal-industry program.

Status—Since FY 2004, more than 14,900 farmed cervids have been tested for CWD each year (fig. 4.1). In 2008, four new farmed cervid herds, including the first positive herd in the State of Michigan, were found to have animals positive for CWD. Cumulatively, from 1997 through 2008, CWD was

Figure 4.1: Number of farmed cervids tested for chronic wasting disease, FY 1998–2008



identified in 33 farmed elk herds and 12 farmed white-tailed deer herds in 10 States (table 4.9).

TABLE 4.9: Number of farmed cervid herds with animals positive for chronic wasting disease, by State, CY 1997–2008

State	1997–2005	2006	2007	2008	Total 1997–2008
Colorado	14	—	—	1	15
Kansas	1	—	—	—	1
Michigan	—	—	—	1	1
Minnesota	2	1	—	—	3
Montana	1	—	—	—	1
Nebraska	5	—	—	—	5
New York	2	—	—	—	2
Oklahoma	1	—	—	—	1
South Dakota	7	—	—	—	7
Wisconsin	7	—	—	2	9
Total	**40**	**1**	**0**	**4**	**45**

Of these 45 positive herds identified as of December 31, 2008, 38 were depopulated, 6 (5 in Colorado and 1 in Wisconsin) remained under State quarantine, and 1 herd was released from quarantine several years ago after undergoing rigorous surveillance for more than 5 years with no further evidence of disease.

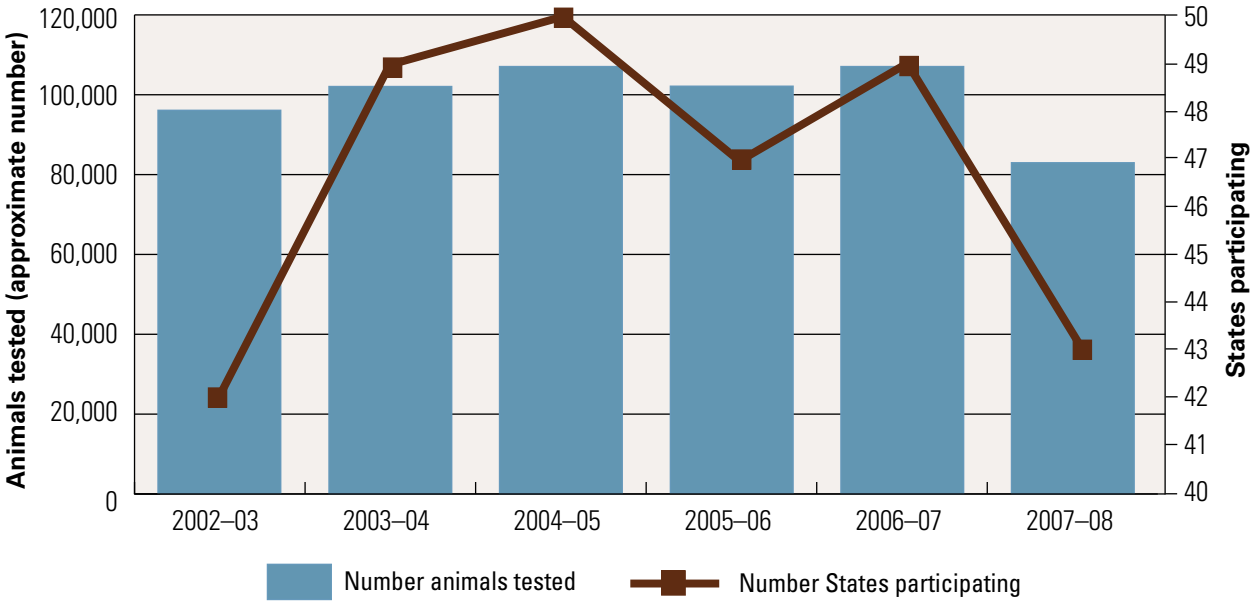
Since 2002, most States have been participating in CWD surveillance in free-ranging deer, elk, and more recently, moose. From the hunting seasons of 2002-03 through 2006-07, more than 90,000 animals were tested each year; these animals were hunter-killed or targeted because they showed signs consistent with CWD (fig. 4.2). The decline in the number of animals tested for the 2007-08 hunting season reflects the beginning of a shift from active surveillance of regular hunter harvest to targeted surveillance of animals suspected of having CWD.

For the Future—Several concerns were raised during the final comment period for the rule establishing the Federal CWD herd certification program and interstate movement restrictions. As a result, APHIS delayed implementation of the rule. A new supplemental proposed rule addressing those concerns was published for public comment in March 2009.

Johne's Disease in Cattle

The Voluntary Bovine Johne's Disease Control Program is a cooperative effort administered by States and supported by the Federal Government and industry. The program provides national standards for controlling Johne's disease, with the goals of reducing the spread of the causative bacterium, *Mycobacterium avium* subspecies *paratuberculosis* (MAP), to noninfected herds,

Figure 4.2: Surveillance testing of hunter-killed and targeted animals for chronic wasting disease



and decreasing disease prevalence in infected herds.[9] The program has three basic elements: education, management, and testing.

Status—There are 6,019 herds enrolled in the Johne's disease control program, with 1,014 herds enrolled in the test-negative component of the program (table 4.10).

Herds in the test-negative component of the program must use an approved laboratory for testing. Approved laboratories are required to pass an annual proficiency test. For Johne's disease testing, 86 laboratories are approved for serology, 39 are approved for MAP fecal culture, and 37 are approved for polymerase chain reaction/DNA testing. In calendar year (CY) 2008, these laboratories reported conducting 367,170 serum enzyme-linked immunosorbent assays (ELISAs), 97,372 milk ELISAs, and 36,669 fecal cultures, in addition to 87 pooled fecal samples (5 bovine per pool) and 47 environmental samples. A decline in Federal funding is the main reason that fewer serum ELISAs and fecal cultures have been performed in recent years.

Trichinae in Swine

With modern pork-production systems essentially eliminating trichinae as a food-safety risk, pilot programs were established to explore alternatives to individual carcass testing to demonstrate that pork is free of *Trichinella* spp. Initiated as a pilot program

TABLE 4.10: Johne's disease control program statistics, CY 2000–08

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Herds in Johne's control programs	1,952	1,925	3,248	3,268	6,189	6,448	8,738	8,650	6,019
Johne's test-negative herds	390	514	631	543	972	1,632	1,792	1,672	1,014
ELISA tests performed on cattle	359,601	342,045	592,350	480,586	673,299	697,264	784,978	400,445	367,170
Cultures performed on cattle	44,961	43,218	98,094	96,222	101,786	105,685	125,336	63,392	36,669

[9] For more details, see www.aphis.usda.gov/animal_health/animal_diseases/johnes/downloads/johnes-umr.pdf

in 1997, the voluntary U.S. Trichinae Certification Program (USTCP) became an official USDA program in October 2008, with publication of regulations in the *Code of Federal Regulations* (see Title 9 Part 149).

Uniform program standards detailing the requirements of this certification program have been developed, along with additional Federal regulations in support of the program.

The USTCP is based on scientific knowledge of *Trichinella* spp. epidemiology and numerous studies demonstrating that specific "good production practices" can prevent pigs' exposure to this zoonotic parasite. The program is consistent with recommended methods for control of *Trichinella* in domestic pigs, as described by the International Commission on Trichinellosis.

Three USDA agencies—APHIS, the Food Safety and Inspection Service (FSIS), and the Agricultural Marketing Service (AMS)—collaborate to verify that certified pork-production sites manage and produce pigs according to the requirements of the program's "good production practices." USDA also verifies the identity of pork from the certified production unit through slaughter and processing. Production sites participating in the USTCP may be certified as "trichinae safe" if sanctioned production practices are followed.

During the pilot study, objective measures of these good production practices were obtained through review of production records and inspection of production sites. An objective audit based on risk factors related to swine exposure to *Trichinella* was developed for on-farm production practices. The audit includes aspects of farm management, biosecurity, feed and feed storage, rodent control programs, and general hygiene.

Production site audits are performed by veterinarians trained in auditing procedures, *Trichinella* risk-factor identification, and *Trichinella* good production practices. Program sites are audited on a regular status-determined schedule as established by regulations and official standards of the USTCP.

USDA oversees the auditing process by qualifying program auditors and by conducting random spot audits. Spot audits verify that the program's good production practices are maintained between scheduled audits and ensure that the audit process is conducted with integrity and consistency across the program.

The USTCP calls for swine slaughter facilities to segregate pigs and edible pork products originating from certified sites from pigs and edible pork products received from noncertified sites. This process is verified by FSIS. Swine slaughter facilities processing pigs from certified sites are responsible for conducting verification testing to confirm the trichinae-safe status of pigs originating from certified production sites. On a regular basis, statistically valid samples of pigs from certified herds are tested at slaughter to verify that practices to reduce on-farm trichinae-infection risks are working. This process-verification testing is performed using a USDA-approved tissue or blood-based postmortem test and is regulated by AMS.

Status—From CY 2000 to 2008, more than 500 audits were completed on farms, and a great majority of these indicated compliance with the good production practices as defined in the program. These compliant sites were granted status as "enrolled" or "certified" in the program.

For the Future—Efforts will focus on promoting and implementing the program throughout the U.S. pork industry and establishing the program as a way to ensure the *Trichinella*-safe status of fresh pork.

The on-farm certification mechanism establishes a process for ensuring the quality and safety of animal-derived food products from farm through slaughter and is intended to serve as a model for the development of other on-farm quality and safety initiatives.

Swine Health Protection Inspection Program

The Swine Health Protection Act, Public Law 96–468, serves to regulate food waste and ensure that all food waste fed to swine is properly treated to kill disease organisms. Facilities that treat waste must possess a valid permit issued by APHIS or by the chief agricultural or animal health official of the State. Licensed facilities must follow regulations regarding the handling and treatment of food waste, facility standards (rodent control, equipment disinfection), cooking standards, and recordkeeping. Licensed operations also are required to allow Federal and State inspections.

Status—In FY 2008, 27 States and Puerto Rico allowed feeding food waste to swine and issued or renewed permits to operate garbage-treatment facilities. There were 2,783 licensed food-waste cooking and feeding premises (feeders) at the end of the fiscal year (table 4.11), and 8,183 routine inspections were made of these licensed premises during the year.

TABLE 4.11: Statistics on licensing of facilities feeding food waste to swine, FY 2005–2008

Number	FY 2005	FY 2006	FY 2007	FY 2008
States allowing food-waste feeding[1]	26	29	29	27
Licensed premises	2,557	2,078	1,951	2,783
Routine inspections	9,631	9,889	9,562	8,183
Searches for nonlicensed feeders	28,845	27,202	39,107	36,729
Nonlicensed feeders found	101	95	87	96

[1] Puerto Rico also allowed food-waste feeding.

Because of the potential for foreign animal disease (FAD) incursions, ensuring that all food-waste feeders are properly licensed is crucial. Field personnel conducted 36,729 searches for nonlicensed food-waste feeders. Through these efforts, 96 nonlicensed feeders were found; most of these were then licensed and became subject to routine inspections.

Infectious Salmon Anemia Virus

In 2001, ISA virus infection was detected at salmon-rearing sites in Cobscook Bay, Maine. In December 2001, the Secretary of Agriculture declared an ISA disease emergency, which permitted allocation of funds to APHIS to provide indemnity and epidemiological and surveillance assistance to Maine's Atlantic salmon farming industry.

The ISA program was initiated in early January 2002 in partnership with the Maine Department of Marine Resources. Under the ISA program, surveillance is mandatory at all marine aquaculture sites in Maine where Atlantic salmon are raised. The company veterinarians at these sites perform the surveillance inspections at a frequency dictated by the ISA status of the site, but at least monthly. These inspections include a visual overview of the site, a review of mortality records, the collection and submission of 10 moribund salmon or fresh mortalities, and a completed submission form that is sent with the salmon tissues to an APHIS-approved laboratory. Biosecurity audits are performed semiannually on high-risk sites and yearly on low-risk sites. Audit reports identify observed strengths and weaknesses, recommend improvements, and prioritize response times according to apparent relative risk.

In 2008, over 2 million smolts were stocked in Machias Bay, Eastern Bay, and Blue Hill Bay, and on five sites southwest of Cobscook Bay. In the Cobscook Bay area, harvest of over 2.5 million disease-free, market-size fish was initiated in October 2007 and nearly complete by the end of 2008. During 2008, 1,104 surveillance samples were collected during 119 veterinary inspections at 15 cage sites in Maine, and 9 biosecurity audits were conducted. Since the program began in 2002, a total of 13,347 fish have been collected during 1,432 veterinary inspections, and 104 biosecurity audits have been conducted.

Maine waters have been ISA disease-free since the last case was confirmed in February 2006. A new bay management strategy continued in 2008 with stocking in areas southwest of Cobscook Bay. The management strategy was implemented in conjunction with provincial authorities in New Brunswick, Canada, based on geographic boundaries determined by hydrographic exchange during a single complete tidal cycle. Cobscook Bay will again be stocked in the spring of 2009 after all sites in the bay are fallowed for at least 2 months.

Viral Hemorrhagic Septicemia

VHS is a highly contagious disease of certain fresh and saltwater fish, caused by a rhabdovirus. It is listed as a notifiable disease by the OIE. The pathogen produces variable clinical signs in fish including lethargy, skin darkening, exophthalmia, pale gills, a distended abdomen, and external and internal hemorrhaging. The disease can result in substantial mortality in infected fish. However, infected fish in which the disease is not as well developed may not

show any clinical signs or die, and may be lifelong carriers and shed the virus.

Four genotypes of VHS virus have been identified. Genotypes I, II, and III are mainly found in Europe or Asia and are highly pathogenic to rainbow trout. The fourth genotype, referred to as North American type IV, has been found in wild fish from the East and West coasts of North America periodically since 1988. The North American VHSV genotype was initially associated with the marine environment and, in commercially important salmonids, appeared to cause less morbidity and mortality than the European/Asian VHSV genotypes.

In 2005 and 2006, however, VHS outbreaks were reported in wild freshwater fish from the Great Lakes in both Canada and the United States. The mortality associated with individual outbreaks ranged from just a few fish to many thousands per outbreak. These outbreaks were the first freshwater isolations of VHS virus in the United States and were found by researchers to be a distinct sublineage of VHSV IV, termed VHSV IV(b). APHIS, along with the Canadian Food Inspection Agency and the U.S. Fish and Wildlife Service, developed a VHSV IV(b) surveillance plan for bilateral use in freshwater systems in Canada and the United States. Surveillance methods combine standard diagnostic test data with historical data and expert opinion on risk to predict the distribution of VHS occurrences in freshwater fish populations of the United States and Canada. An international panel of 30 fish health experts identified 9 factors that estimate the likelihood of VHSV IV(b) occurring in any particular freshwater watershed. The identified risk factors include hydrologic connectivity, geographic proximity, and/or a history of untested-fish transfers from the affected Great Lakes and associated watersheds.

A 2006 Federal Order prohibited movement of 37 species of live fish into the United States from Ontario and Quebec, Canada, the 2 Provinces that reported VHS outbreaks. This order also prohibited the interstate movement of the same fish species from eight States (New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Minnesota, and Wisconsin) that have reported an occurrence of VHS or are at immediate risk of acquiring the disease. Following stakeholder feedback, the Federal Order was amended to allow for restricted movements, under certain conditions, out of the affected States. No cases of VHSV IV(b) have been diagnosed or reported outside of the States bordering the Great Lakes or in any cultured populations of known susceptible species. In September 2008, APHIS published an interim rule that was intended to replace the Federal Order. Implementation of that interim rule has been delayed indefinitely as the agency addresses comments submitted regarding the rule. In the meantime, the Federal Order remains in effect.

In FY 2008, Congress appropriated $5.6 million for VHS activities. APHIS used $1.8 million of the appropriated funds to offer cooperative agreements with State agencies and tribal groups to conduct surveillance of farmed and wild populations at greatest locational risk of acquiring the disease. In addition, APHIS developed an outreach campaign to educate people about potential pathogen vectors not easily controlled by regulatory actions, such as activities related to recreational fishing. VHSV IV(b) surveillance suggests that the pathogen is centered in the Great Lakes region. To date, there have been no detections in cultured populations, or in any populations outside States bordering the Great Lakes. Surveillance efforts inform regulatory and management decisions relating to the distribution and control of VHSV IV(b).

Equine Infectious Anemia

Identified in France in 1843 and first tentatively diagnosed in the United States in 1888, EIA has received substantial attention over the years. EIA can be difficult to differentiate from other fever-producing diseases, including anthrax, influenza, and equine encephalitis. Because there is no vaccine or treatment for the disease, many countries use control programs based on serologic testing.

Currently in the United States, the States carry out the major regulatory actions to control EIA. States' rules encompass a broad scope of EIA concerns but vary considerably. To facilitate the development of a uniform control program for EIA and the interstate movement of horses, USDA created the EIA UM&R, which can be accessed at *www.aphis.usda.gov/vs/nahss/equine/eia/eia_umr_jan_10_2007.pdf*.

Issued in 1998 and most recently revised in January 2007 to incorporate current science on testing, the UM&R contains minimum standards for detecting, controlling, and preventing EIA. The provisions in the UM&R are approved by APHIS and are recommended by USAHA, the American Horse Council, and the American Association of Equine Practitioners (AAEP).

Status—To evaluate the prospects of an EIA national certification program, APHIS has prepared a possible budget, completed a cost-benefit analysis for the industry, and developed an EIA prevalence model for the purposes of regionalization. The cost-benefit analysis concluded that implementing regionalization for EIA (in a five-region scenario) would save the horse industry $11.1 million from an overall reduction in testing. APHIS is drafting a proposed rule to incorporate select elements of the UM&R into the *Code of Federal Regulations*.

During FY 2008, 1,876,078 horses were tested for EIA in the 50 States and Puerto Rico, and 113 were positive (table 4.12). The number of premises with new reactors was 84.

For the Future—Attendees at the 2007 EIA National Direction Meeting, the 2008 USAHA Infectious Diseases of Horses Committee, and the 2008 AAEP Infectious Disease Committee are promoting incorporation of the following recommendations, with direct VS assistance, into a proposed National EIA Certification Program:

- *Universal acceptance of negative ELISA test results for EIA.* Because the official EIA ELISA test has lower levels of false-negative results than the agar gel immunodiffusion (AGID), it should be the first test of choice.
- *EIA testing requirement nationally for change of ownership.* This will provide EIA surveillance of untested reservoirs in the United States. States that require testing for change of ownership have found it effective for finding new cases of EIA in previously untested horses.
- *Regionalization using the VS EIA prevalence model.* In areas of the country where EIA is expected to occur at a rate of less than 0.01 percent in the untested population, the chance of encountering an infected horse today is essentially zero. Therefore, the minimum testing for States with lower prevalence could be set at 2 years, with the minimum testing for States with higher prevalence set at 1 year. Similarly, horses could be moved among lower prevalence States or from a lower prevalence State to a higher prevalence State with a test conducted within 2 years, while movement of horses among higher prevalence States or from a higher prevalence area to a lower prevalence State would require a test conducted within 1 year.

TABLE 4.12: Summary of equine infectious anemia testing for FY 2008

State	Positive	Horses tested	Tested negative	No. of tests	No. of premises with new reactors
Alabama	1	19,191	19,190	19,191	1
Alaska	0	535	535	578	0
Arizona	1	14,775	14,774	14,775	1
Arkansas	14	40,540	40,526	40,540	10
California	1	35,026	35,025	35,202	1
Colorado	3	28,441	28,438	28,441	1
Connecticut	0	2,376	2,376	2,376	0
Delaware	0	3,683	3,683	3,683	0
Florida	3	145,876	145,873	145,876	1
Georgia	0	51,841	51,841	51,841	0
Hawaii	0	754	754	754	0
Idaho	0	15,260	15,260	15,260	0
Illinois	0	57,512	57,512	57,512	0

continued

State	Positive	Horses tested	Tested negative	No. of tests	No. of premises with new reactors
Indiana	3	30,452	30,449	30,452	2
Iowa	0	27,797	27,797	27,797	0
Kansas	2	12,687	12,685	12,687	0
Kentucky	1	117,417	117,416	117,417	1
Louisiana	7	54,618	54,611	54,850	6
Maine	0	5,505	5,505	5,505	0
Maryland	0	35,292	35,292	35,292	0
Massachusetts	6	4,716	4,710	4,716	1
Michigan	0	36,761	36,761	36,796	0
Minnesota	0	45,803	45,803	45,803	0
Mississippi	6	38,945	38,939	38,945	6
Missouri	3	71,495	71,492	71,495	3
Montana	0	18,414	18,414	18,414	0
Nebraska	0	16,030	16,030	16,030	0
Nevada	0	7,017	7,017	7,017	0
New Hampshire	0	17,169	17,169	17,169	0
New Jersey	0	16,906	16,906	16,906	0
New Mexico	4	20,962	20,958	20,962	2
New York	1	57,434	57,433	57,434	1
North Carolina	1	52,224	52,223	52,224	1
North Dakota	0	12,847	12,847	12,847	0
Ohio	1	40,034	40,033	40,034	1
Oklahoma	15	97,575	97,560	97,808	6
Oregon	0	7,402	7,402	7,402	0
Pennsylvania	0	58,342	58,342	58,342	0
Rhode Island	0	2,286	2,286	2,286	0
South Carolina	0	40,769	40,769	40,769	0
South Dakota	0	13,854	13,854	13,854	0
Tennessee	3	72,687	72,684	72,687	3
Texas	36	254,248	254,212	255,133	35
Utah	0	13,581	13,581	13,581	0
Vermont	0	9,136	9,136	9,136	0
Virginia	0	67,096	67,096	67,096	0
Washington	0	3,895	3,895	3,895	0
West Virginia	1	18,055	18,054	18,055	1
Wisconsin	0	46,541	46,541	46,541	0
Wyoming	0	14,276	14,276	14,276	0
Total	**113**	**1,876,078**	**1,875,965**	**1,877,682**	**84**
Puerto Rico	0	22	22	42	0

CHAPTER 5

CHAPTER 5

Monitoring and Surveillance for Animal Diseases

One of the goals of the National Animal Health Surveillance System is monitoring and surveillance for diseases with a major impact on animal production and marketing. This chapter describes some of the national studies coordinated by the National Animal Health Monitoring System (NAHMS) program unit. In addition, the chapter looks at vaccination practices in several industries in the United States—beef cow-calf, beef feedlot, dairy, equine, poultry, sheep, and swine.

National Animal Health Monitoring System Studies

NAHMS studies have focused on food animals as well as on equids. National studies on swine, dairy, and poultry commodities are produced about every 5 years or more, and on other commodities depending on information needs of commodity stakeholders.

Approximately 2 years prior to designing a study, NAHMS involves the targeted industry, government, and related groups in identifying critical information gaps. The study is then designed to optimize collection of data through questionnaires and biologic samples. The States selected for a NAHMS study typically represent at least 70 percent of the targeted animal population and a similar percentage of operations at the national level.

Beef 2007–08

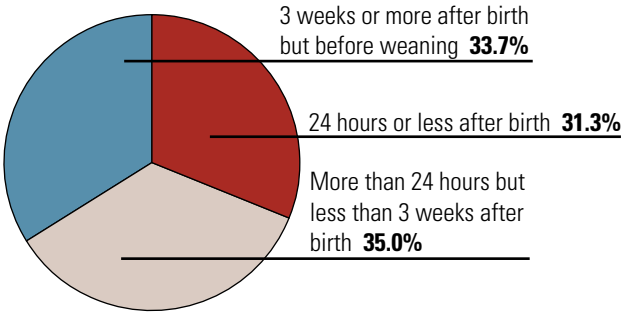
The two beef studies prior to the Beef 2007–08 study collected data on health and health management of cows and calves on beef operations throughout the United States. In addition, samples were collected to evaluate the prevalence of potential food-safety pathogens such as *Salmonella*. Food and water samples were also evaluated to characterize the trace mineral status of animals (zinc and selenium) and the quality of water being provided. The Beef 2007–08 objectives were developed to continue characterizing health and health management on cow-calf operations and, in addition, to collect data on management practices to support product quality assurance efforts; characterize control strategies for bovine viral diarrhea virus (BVDV) on operations, as well as the prevalence and distribution of animals persistently infected with BVDV; and describe the prevalence of potential food-safety pathogens for these operations.

A total of 24 States,[10] representing 79.6 percent of U.S. cow-calf operations and 87.8 percent of U.S. beef cows, participated in the study. Following are a few examples of the types of information available from this study.

Overall, 3.6 percent of beef calves that were born alive died prior to weaning. The risk of death was similar across herd sizes and regions. Approximately one-third of the unweaned calf losses occurred in each of these periods: birth to 24 hours, 24 hours to 3 weeks, and 3 weeks to weaning (fig. 5.1). Over one-half (51.3 percent) of the losses among calves less than 3 weeks of age were due to calving-related problems or weather-related causes. For calves from 3 weeks of age to weaning, 54.0 percent of the losses were attributed to digestive problems or respiratory problems (22.6 and 31.4 percent, respectively).

[10] Alabama, Arkansas, California, Colorado, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Tennessee, Texas, Virginia, and Wyoming.

Figure 5.1: For operations with unweaned calves that died or were lost in 2007, percentage of losses by age



Culling of cows in 2007 for purposes other than breeding occurred on 65.5 percent of operations. The proportion of operations doing some culling of cows was strongly related to herd size, with 92.7 percent of herds with 200 or more cows culling some cows, while 57.4 percent of operations with 1 to 49 cows culled some. Overall, 11.8 percent of beef cows were culled for purposes other than breeding in 2007. The leading reasons for culling cows for purposes other than breeding were age or bad teeth. These reasons accounted for 55.7 percent of operations that culled cattle for purposes other than breeding and 32.1 percent of cows culled for purposes other than breeding. The next leading reason was pregnancy status, which accounted for 41.8 percent of operations that culled cattle for purposes other than breeding and 33.0 percent of cows culled for purposes other than breeding.

Goat 2009

In its first study of the U.S. goat industry, NAHMS will obtain baseline information about the U.S. goat population, focusing on health and management practices.

The NAHMS Goat 2009 study will address priority issues of the U.S. goat industry and other stakeholders. Twenty-one of the major goat-producing States will participate in Goat 2009.[11] These States represent 75.5 percent of U.S. goat operations and 82.2 percent of U.S. goats.

The Goat 2009 study will address the following objectives:

- Provide a baseline description of animal health, nutrition, and management practices in the U.S. goat industry;
- Determine producer awareness of VS program diseases;
- Describe producer-reported occurrence of infectious diseases (including brucellosis, scrapie, caprine arthritis encephalitis, Johne's disease, and caseous lymphadenitis) and the management and biosecurity practices important for controlling them;
- Describe practices important for controlling internal parasites and reducing anthelmintic resistance; and
- Determine producer awareness of sore mouth (contagious ecthyma) and practices to prevent its transmission.

Vaccination Practices

Livestock producers have many options for preventing or controlling infectious diseases, including reducing the likelihood of exposure to infectious agents and optimizing resistance to disease when exposed. Resistance to infectious diseases can be enhanced nonspecifically through attention to good nutrition and parasite control. Vaccination can enhance the resistance of animals to specific pathogens and therefore reduce the likelihood of disease in exposed animals. If exposure to infectious disease agents occurs, the degree of immunity, amount of exposure, and virulence of the disease agent all play roles in the outcome. The choice of vaccines is based on multiple factors, including the age and use of the animal, the likelihood of exposure to the causative agent, the consequences of the disease if infection occurs after exposure, the cost and efficacy of the vaccine, and the safety of the vaccine. For some sectors of the livestock industry (e.g., horses), veterinary associations have made

[11] Alabama, California, Colorado, Florida, Georgia, Indiana, Iowa, Kentucky, Michigan, Missouri, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Virginia, Washington, and Wisconsin.

recommendations regarding core vaccines versus risk-based vaccines, taking into account the quality and efficacy of the vaccine.

NAHMS has developed information on vaccination practices in several industries in the United States—beef cow-calf, beef feedlot, dairy, equine, poultry, sheep, and swine.

Beef Cow–Calf

In the NAHMS Beef 2007–08 study, data were collected on biosecurity practices, including vaccination, for cow-calf operations.

Overall, 69.4 percent of cow-calf operations vaccinated some of their beef cattle or calves in 2007. Among those operations vaccinating, the most common vaccines used for cows were for the control of *Leptospira*, bovine viral diarrhea (BVD), and infectious bovine rhinotracheitis (IBR) (45.7, 40.1, and 35.4 percent of operations respectively). The most commonly used vaccines for calves from 22 days of age through weaning were for control of *Clostridium* spp. (excluding *Cl. perfringens* and *Cl. tetani*), BVD, IBR, and parainfluenza Type 3 (PI3) (83.2, 45.8, 42.7, and 38.3 percent of vaccinating operations respectively) (table 5.1).

Postweaning respiratory disease in calves can severely impact morbidity and mortality among beef calves. Vaccines are available to control a number of viruses and bacteria that cause respiratory disease in cattle. Optimal vaccination strategies make use of preweaning vaccination to decrease the risk of postweaning respiratory disease events. While 42.1 percent of producers did not vaccinate calves for control of respiratory disease prior to sale, approximately one-fourth (24.9 percent) vaccinated calves once and 29.0 percent vaccinated calves twice before sale.

Producers make decisions about vaccinating animals based on many criteria, including perceived risk of exposure to the disease agent, perceptions of vaccine efficacy, ease of implementation, and cost. The data from Beef 2007–08 suggest that there are no uniform vaccination strategies on cow-calf operations in the United States.

TABLE 5.1: For operations that vaccinated any beef cattle or calves in 2007, percentage of cow-calf operations that used the following vaccines in 2007, by age group

	Percent operations	
	Calves 22 days through weaning	Cows
GENERAL (respiratory and/or reproductive)		
Infectious bovine rhinotracheitis (IBR, also known as rednose)	42.7	35.4
Bovine viral diarrhea (BVD)	45.8	40.1
Histophilus somni	24.0	11.4
RESPIRATORY		
Parainfluenza 3 virus (PI3)	38.3	32.6
Bovine respiratory syncytial virus (BRSV)	36.6	30.4
Pasteurella/Mannheimia	18.2	6.4
REPRODUCTIVE		
Brucella abortus	9.2	1.4
Leptospira	15.1	45.7
Campylobacter (vibrio)	NA	27.4
Tritrichomonas	NA	1.5
Neospora	NA	0.4
CLOSTRIDIAL		
Clostridium chauvoei (blackleg) and/or *Cl. septicum* (malignant edema) and/or *Cl. novyi* and/or *Cl. sordellii* (2- or 4-way)	83.2	20.9
Cl. perfringens C and D (enterotoxemia, overeating)	48.6	16.7
Cl. tetani (tetanus)	25.4	8.2
DIGESTIVE		
Rota/Corona	0.3	7.6
E. coli	1.0	8.0
Salmonella	0.0	0.5
OTHER		
Anaplasma	0.0	0.4
Johne's	0.0	NA
Moraxella bovis (pinkeye)	15.4	6.7
Wart virus	0.0	0.3

Beef Feedlot

NAHMS collected data on health and management of feedlot cattle in 1999. The Feedlot '99 study included those facilities with at least 1,000-head capacity in the 12 leading cattle feeding States. Questionnaires were administered by personal interview to a stratified random sample of feedlot operators. These operations represented 84.3 percent of the feedlots with a 1,000-head or more capacity in the United States, and 95.8 percent of the U.S. cattle on feed inventory on those feedlots as of January 1, 1999 (or 77.3 percent of all cattle on feed in the United States).

All feedlots with 8,000-head capacity and more, and 95.7 percent of those with 1,000- to 7,999-head capacity, vaccinated some cattle for IBR. The next most commonly used vaccine was for control of BVDV (94.4 percent of all feedlots with at least 1,000-head capacity). The net effect of these vaccination efforts was that 96.9 percent of cattle placed on feedlots with 1,000-head capacity or more were vaccinated for control of IBR, and 87.7 percent of cattle were vaccinated for control of BVDV (table 5.2).

Overall 73.3 percent of cattle placed in feedlots were vaccinated for control of clostridial disease one or more times, while 32.2 percent of cattle were vaccinated for control of leptosprirosis.

The data from the Feedlot '99 study suggest that vaccination of feedlot cattle with some antigens (such as IBR and BVD) is routine. This is likely due to their central role in the occurrence of the bovine respiratory disease complex, which is the major source of animal morbidity and mortality in U.S. cattle feedlots.

Dairy Cattle

The Dairy 2007 study was NAHMS' fourth national study of dairy operations. The study was conducted in 17 of the Nation's major dairy States and provided participants, stakeholders, and the industry as a whole with valuable information representing 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows.

More than 60 percent of dairy operations vaccinated heifers or cows against BVD, IBR, PI3, bovine respiratory syncytial virus (BRSV), and leptospirosis (table 5.3). These vaccines are commonly marketed as a single combination vaccine requiring only one injection, and this may explain why the percentages within a cattle class are similar. Although a majority of dairy producers vaccinate their animals against the most common viral diseases, use of other efficacious vaccines, such as those against *E. coli* mastitis, were not commonly used. Vaccine use on an individual operation is commonly predicated on the disease history of the herd, or recommendations from vaccine manufacturers and/or the operation's herd veterinarian.

Equids

The Equine 2005 study was NAHMS' second study of the U.S. equine industry. It was designed to gather information on the Nation's equine population to serve as a basis for education, service, and research related to equine infectious disease control.

As defined by the American Veterinary Medical Association, a core vaccine is one "that protects from

TABLE 5.2: Percentage of beef cattle given the following injectable vaccines, by feedlot capacity

	Feedlot capacity (number head)					
	1,000–7,999		8,000 or greater		All feedlots	
Pathogen	% Operations	% Cattle	% Operations	% Cattle	% Operations	% Cattle
BVDV	93.5	89.5	96.8	87.3	94.4	87.7
IBR	95.7	95.1	100.0	97.3	96.9	96.9
PI3	86.2	79.8	86.6	72.3	86.3	73.5
BRSV	87.3	87.3	87.6	67.8	87.4	70.9
Haemophilus somnus	65.1	49.7	54.1	30.7	62.1	33.8
Pasteurella spp.	52.9	34.9	54.3	26.1	53.3	27.5

TABLE 5.3: Dairy 2007 study—Percentage of dairy operations that normally vaccinated dairy heifers and cows against the following diseases

Disease	Percent operations	
	Heifers	Cows
Bovine viral diarrhea (BVD)	73.7	75.0
Infectious bovine rhinotracheitis (IBR)	70.4	71.3
Parainfluenza type 3 (PI3)	61.0	61.9
Bovine respiratory syncytial virus (BRSV)	64.9	65.0
Haemophilus somnus	34.2	33.6
Leptospirosis	67.7	70.0
Salmonella	21.5	23.0
E. coli mastitis	24.1	33.5
Clostridia	34.6	27.7
Brucellosis	41.6	NA
Mycobacterium avium subspecies *paratuberculosis* (Johne's disease)	5.0	NA
Neospora	6.3	5.9
Other	6.8	7.4
Any disease	83.0	82.2

diseases that are endemic to a region, those with potential public health significance, required by law, virulent/highly infectious, and/or those posing a risk of severe disease. Core vaccines have clearly demonstrated efficacy and safety, and thus exhibit a high enough level of patient benefit and low enough level of risk to justify their use in the majority of animals." The American Association of Equine Practitioners (AAEP) released updated guidelines on vaccination for horses in 2007 suggesting that core vaccines were tetanus toxoid, Eastern and Western equine encephalitis (EEE/WEE) vaccine, West Nile virus (WNV) vaccine, and rabies vaccine.

Based on the NAHMS Equine 2005 study, the most commonly administered vaccines by operations with 5 or more equids in the 28 States in the study were the core vaccines identified by the AAEP, with the exception of the rabies vaccine.

Overall, 94.4 percent of operations that administered one or more vaccines to resident[12] horses during the previous 12 months knew which vaccines were given. Of these operations, 44.5 percent vaccinated one or more resident horses against rabies, 72.5 percent against influenza, 75.6 percent against EEE/WEE, 81.3 percent against tetanus, and 85.3 percent against WNV (table 5.4). There were regional differences for several diseases. For example, 48.6 percent of operations in the Northeast region, 38.0 percent in the South region, 28.8 percent in the Central region, and 18.4 percent in the West region vaccinated one or more resident horses against rabies. The data from the Equine 2005 study suggested that education of equine owners regarding the risk versus benefit of rabies vaccination is needed if it is to become one of the more commonly used vaccines in equids in the United States.

Based on the Equine 2005 study, 75.9 percent of operations gave some type of vaccine to resident equids during the previous 12 months. Operations with a primary function of farm/ranch (67.8 percent) or residences with equids for personal use (74.9 percent) were less likely to administer one or more vaccines to equids than operations with a primary function of boarding and/or training (96.8 percent) and breeding farms (89.7 percent).

Poultry

Vaccination strategies used by the poultry industry differ depending on use of the bird (e.g., broilers versus layers) as well as disease status of the farm or local area. In 1999, NAHMS conducted a study of the U.S. table egg layer industry. Operations with 30,000 or more layers in 15 States representing 82 percent of U.S. table egg layers in 1997 were eligible to participate in the study. Producers were asked about booster vaccinations given to layers 20 weeks of age and older. Overall, 40.9 percent of farm sites vaccinated against Newcastle disease and 41.0 percent vaccinated against infectious bronchitis. It is important to note that this study was conducted 10 years ago, prior to the 2002 exotic Newcastle disease (END) outbreak that occurred in Southern California. Vaccination practices may have changed since then, based on that END outbreak.

[12] An equid that spent or was expected to spend more time at the operation than at any other operation; the operation was its home base.

TABLE 5.4: Equine 2005 study—For equine operations that vaccinated and knew which diseases their horses were vaccinated against during the previous 12 months, and that had resident horses of the specified age class/type, percentage of operations that vaccinated all or some resident horses against the following diseases, by age class/type

Disease	Percent operations			
	Age class/type			
	Resident horses less than 1 year	Broodmares	Other resident horses over 1 year	Any resident horse
Flu (influenza)	58.2	77.3	72.3	72.5
Strangles *(Streptococcus equi)*	26.7	35.6	35.7	36.1
Rhinopneumonitis (herpesvirus)	51.2	69.7	61.5	63.7
Rabies	33.0	41.6	44.6	44.5
West Nile virus	65.5	83.1	85.6	85.3
Eastern and Western equine encephalitis (sleeping sickness)	59.0	79.2	76.0	75.6
Tetanus	73.7	83.0	79.6	81.3
Equine viral arteritis	12.0	16.6	15.7	16.0
Venezuelan equine encephalitis	21.5	26.2	24.8	24.5
Clostridium perfringens (C and D)	3.8	4.0	3.3	3.5
Potomac horse fever	10.6	12.9	14.3	14.5
Rotavirus	4.1	6.7	5.4	5.8
Anthrax	2.6	2.5	2.3	2.4
Equine protozoal myelitis	3.4	4.7	4.7	4.9
Other	0.8	0.9	0.5	0.7

More recently, in 2004 NAHMS conducted a study of backyard flocks and gamefowl breeders. Backyard flocks having fewer than 1,000 birds located within 1 mile of a commercial poultry operation in 18 States comprised the inference population. These 18 States accounted for 80 percent of the Nation's broilers produced, 74 percent of egg production, and 84 percent of turkeys raised. Additionally, a questionnaire was mailed to the entire membership of the United Gamefowl Breeder Association (UGBA) as well as State associations not affiliated with UGBA (totaling approximately 10,000 names between the UGBA and non-affiliated State associations). This study found that only 2.8 percent of backyard flock owners vaccinated any birds during the previous 12 months, while at least some birds in over one-half (58.6 percent) of gamefowl breeder flocks were vaccinated. The percentage of gamefowl breeder flocks that received vaccines increased with flock size; 78.3 percent of flocks with 500 or more birds received vaccines. The most common vaccinations given were for control of pox, Newcastle disease, and infectious bronchitis (49.8, 28.5, and 19.1 percent of flocks respectively).

In summary, backyard flock owners rarely vaccinate chickens. As small hobby poultry flocks are increasing in popularity in the United States, this population of producers would benefit from educational campaigns regarding infectious disease prevention, including vaccination and other biosecurity practices.

Sheep

In 2001, NAHMS conducted a study of the U.S. sheep industry in 22 States, which represented 87.4 percent of sheep and 72.3 percent of sheep operations. Data were collected on sheep health and management practices. In addition, for larger operations (those with more than 20 sheep), detailed data were collected on vaccination and other biosecurity practices for ewes, nursing lambs, breeding rams, and feeder lambs. Preventive management practices, which reduce the incidence of disease in a flock and promote good biosecurity, include animal

vaccination strategies. The vaccination of weaned animals intended for market promotes the shipment and arrival of healthy animals at feedlots, auctions, and markets. Overall, 50.5 percent of operations with feeder lambs gave at least one type of vaccine to their lambs after they were weaned.

While vaccines can reduce the occurrence and severity of infections, using the same needle for more than one animal can transmit pathogens between animals. Overall, 81.7 percent of operations used the same needle on more than one animal when giving injections or vaccinations during 2000.

The three types of vaccine given by the largest percentage of producers to sheep on their operations were *Clostridium perfringens* C and D toxoid; tetanus toxoid; and Clostridia 7- or 8-way vaccines.[13] The most commonly administered vaccine across all sheep (lambs, ewes, rams) was for control of *Clostridium perfringens* types C and D. Overall, 48.4 percent of operations gave this vaccine to replacement ewes, 66.9 percent to nursing lambs, 36.0 percent to breeding rams, and 44.8 percent to their feeder lambs intended for market. *Clostridium perfringens* is a normal inhabitant of the ruminant gut, but under certain circumstances can proliferate, produce large amounts of toxins, and cause disease and rapid death. These circumstances often include a change in diet to more high-energy feeds.

Campylobacter is an infectious disease of sheep and a common cause of abortion in pregnant ewes. Control of abortion can be accomplished by vaccination of ewes, rams, and replacement breeding stock. Overall, 15.5 percent of operations gave the vibrio (*Campylobacter*) vaccine to their breeding or replacement ewes.

Vaccination is only one of the important health management strategies used to improve biosecurity. The efficacy and side effects of a vaccine, along with the risk of occurrence of disease and associated costs of disease prevention versus occurrence of disease, need to be considered when developing a vaccination program for any livestock population.

Swine

The fourth swine commodity study by NAHMS, Swine 2006, focused on many aspects of biosecurity measures used by swine producers. Swine producers use many management methods to maintain herd biosecurity, one of which is controlling disease pathology in the herd by vaccination.

One of the greatest economic losses via disease that the swine industry endures comes from porcine reproductive and respiratory syndrome (PRRS). PRRS can affect all management stages of pigs when present on a farm. In nursery and grower/finisher pigs, the effect of PRRS in a herd naïve to the virus can be associated with a high mortality rate, as well as morbidity in surviving pigs that fail to eat and grow due to respiratory disease. Reduced feed intake and growth rates in these pigs are also common in herds where PRRS is endemic.

TABLE 5.5: Swine 2006 study—Percentage of swine sites that usually vaccinated nursery pigs against the following diseases, by size of site

	Percent sites			
	Size of site (total inventory)			
Vaccination	**Small** (fewer than 2,000)	**Medium** (2,000–4,999)	**Large** (5,000 or more)	**All sites**
Mycoplasma	46.3	62.2	81.2	52.6
PRRS	7.9	9.8	13.6	8.8
Swine influenza H1N1	6.7	22.1	20.0	10.4
Swine influenza H3N2	6.0	19.7	20.0	9.6
Both H1N1 and H3N2	6.0	17.5	20.0	9.2
Either H1N1 or H3N2	6.7	24.4	20.0	10.8

[13] Clostridia 7- or 8-way vaccines usually contain a combination of *Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. sordellii, Cl. perfringens* types C and D, and *Cl. hemolyticum.*

TABLE 5.6: Percentage of swine sites that usually vaccinated breeding females against porcine reproductive and respiratory syndrome, by size of site

Percent sites			
Size of site (total inventory)			
Small (fewer than 2,000)	**Medium** (2,000–4,999)	**Large** (5,000 or more)	**All sites**
24.4	28.6	34.0	27.3

TABLE 5.7: Percentage of sites that usually vaccinated pigs against the following diseases while in the grower/finisher phase, by size of site

	Percent sites			
	Size of site (total inventory)			
Vaccination	**Small** (fewer than 2,000)	**Medium** (2,000–4,999)	**Large** (5,000 or more)	**All sites**
Mycoplasma	2.9	6.3	7.8	4.1
PRRS	0.0	0.0	0.0	0.0
Swine influenza H1N1	1.7	6.1	15.1	4.2
Swine influenza H3N2	1.9	4.2	15.1	3.9
Both H1N1 and H3N2	1.7	4.2	15.1	3.8
Either H1N1 or H3N2	1.9	6.1	15.1	4.3

The effects of the PRRS virus can be amplified in herds co-infected with other infectious agents, particularly *Mycoplasma hyopneumoniae* and swine influenza. Swine influenza infection in pigs is generally due to two serotypes—H1N1 and H3N2.

In the NAHMS Swine 2006 study, over one-half of all sites with nursery pigs (52.6 percent) vaccinated these pigs against *Mycoplasma*, ranging from 46.3 percent of small sites (fewer than 2,000 pigs) to 81.2 percent of large sites (5,000 pigs or more). On average, sites first vaccinated nursery pigs against *Mycoplasma* pneumonia at 4.4 weeks of age in 2006. Fewer than 1 in 10 sites (8.8 percent) vaccinated nursery pigs against PRRS (table 5.5). Approximately 1 in 10 sites vaccinated against both swine influenza H1N1 and H3N2. Sites first vaccinated nursery pigs against swine influenza at about 6 weeks of age.

About 27 percent of sites with breeding females usually vaccinated them against PRRS, ranging from 24.4 percent of small sites to 34.0 percent of large sites (table 5.6).

About 4 percent of all sites with grower/finisher pigs vaccinated them against *Mycoplasma* pneumonia, ranging from 2.9 percent of small sites to 7.8 percent of large sites (table 5.7). A lower percentage of sites with a grower/finisher phase vaccinated pigs against *Mycoplasma*, PRRS, and swine influenza H1N1 and H3N2 than sites with a nursery phase (table 5.5).

In spite of the impact of PRRS on swine operations, few producers vaccinate for PRRS in weaned market pigs. This lack of vaccine use may be due to producers' use of management techniques such as multi-site production or personnel entry restrictions to combat this disease. Alternatively, operators may be choosing to vaccinate for *Mycoplasma* to decrease that disease's role in worsening PRRS infection.

Summary

Vaccination can be used as an aid in infection control. Vaccination programs within a livestock population and across livestock commodities will vary based on risk of disease exposure and consequences of disease occurrence, as well as cost and efficacy of the vaccine available to control the disease. Trends in vaccine use can also be determined through sequential NAHMS studies for a given livestock commodity. These data are useful for risk assessment, targeting producer and veterinarian education, and evaluating trends over time, such as in response to education programs. NAHMS collects other information across livestock commodities related to biosecurity. Additional information is available at *http://nahms.aphis.usda.gov*.

CHAPTER 6

CHAPTER 6

Overview of U.S. Livestock, Poultry, and Aquaculture Production in 2008

Available Statistics

Official statistics for U.S. livestock, poultry, and aquaculture populations are published by the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA). These statistics are based on the Census of Agriculture conducted every 5 years (e.g., 2002 and 2007) and surveys conducted monthly, quarterly, or annually as determined by the particular commodity.

The Census of Agriculture, a complete enumeration of the entire agricultural segment of the economy, is conducted every 5 years and is the only source of detailed, county-level data of all farms and ranches in all 50 States selling or intending to sell agricultural products worth $1,000 or more in a year. During spring 2008, the most recent Census of Agriculture (2007) was conducted. Animal inventory levels were those as of December 31, 2007, and productivity measures such as births, deaths, and sales were for the calendar year 2007. Census 2007 reports are available at *www.agcensus.usda.gov/*.

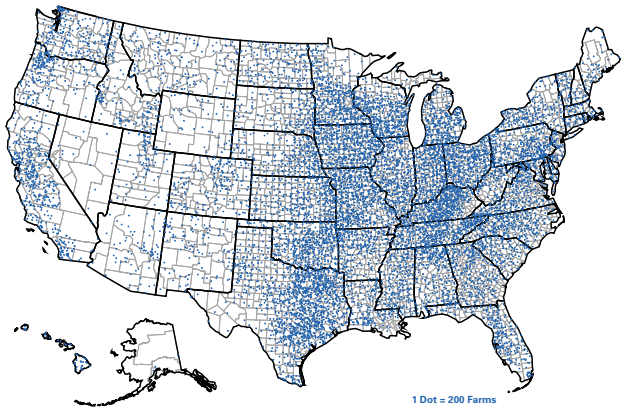
In NASS' ongoing sample survey and estimation programs, data are collected and estimates are published within the same month to provide users with the most up-to-date and timely information. This information is collected and published even during years the Census is conducted. The massive data-collecting, editing, and summarizing effort required to prepare the Census naturally results in a publication lag. Sample survey estimates and final Census reports rarely show exactly the same numbers. However, the ongoing sample surveys provide the most up-to-date statistics between the Census years and are themselves subject to revision when current-year estimates are made. In fact, after each 5-year Census of Agriculture, NASS reviews all of the previous 5 years' worth of sample survey estimates, revises the figures, and publishes the results as "Final Estimates." For these reasons, statistics in the 2007 Animal Health Report for one year, compared to similar statistics published for 2007 in the 2008 Animal Health Report, may not always match.

Number of Farms

Estimates for the number of U.S. farms were based on the definition of a farm as "any establishment from which $1,000 or more of agricultural products were sold or would be normally sold during the year." Map 1 illustrates the distribution of farms across the United States based on the 2007 Census. In general, there were fewer farms in the western half of the United States; however, western farms and ranches were generally larger than those in the eastern half of the United States (map 2). A higher percentage of land area in the Central United States was dedicated to land in farms (map 3). In 2008, there were 2.2 million farms, 0.2 percent fewer than in 2007. Total land in farms was 919.9 million acres in 2008, which represents a decrease from 921.5 million acres in 2007. The average farm size was 418 acres in 2008, unchanged from the previous year.

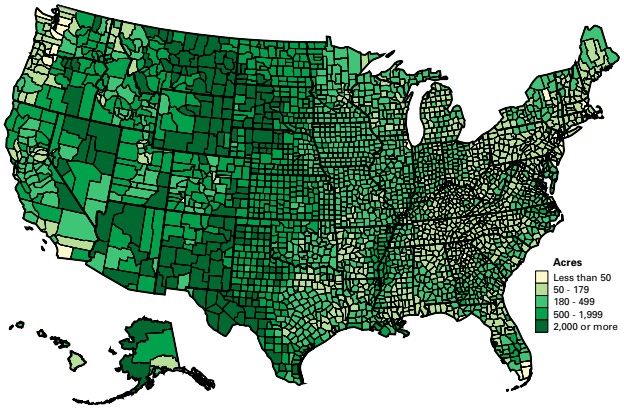
Map 1: Number of farms, 2007

United States Total: 2,204,792



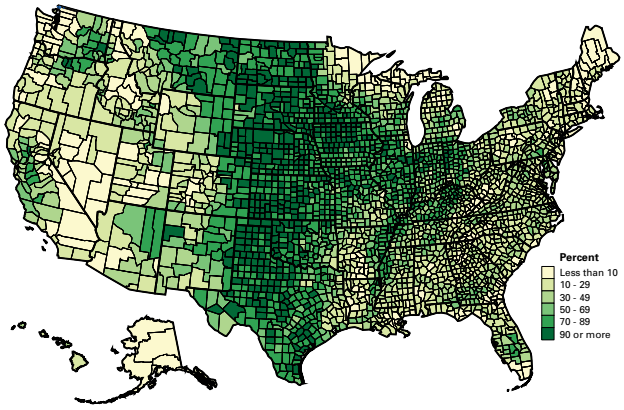
Map 2: Average size of farms in acres: 2007

United States Average: 418



Map 3: Acres of land in farms as percent of land area in acres: 2007

United States: 40.8 Percent



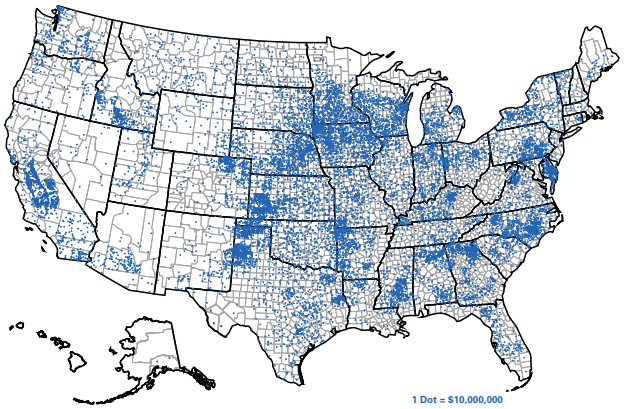
Relative Magnitude of Industries, by Value of Production

The Central and Eastern States had a higher value of livestock and poultry in 2007, compared with the Western States (map 4). In recent years, the total value of production has been split nearly equally between crop and livestock (and poultry) production. In the 2007 Census of Agriculture, 51.7 percent of total value of production came from livestock and poultry. The coastal areas and North Central portions of the United States generally made a smaller livestock and poultry contribution to the total market value (map 5). These areas had heavy concentrations of crop, fruit, and vegetable products.

Table A1.1 in appendix 1 identifies specific major livestock, poultry, and crop commodity

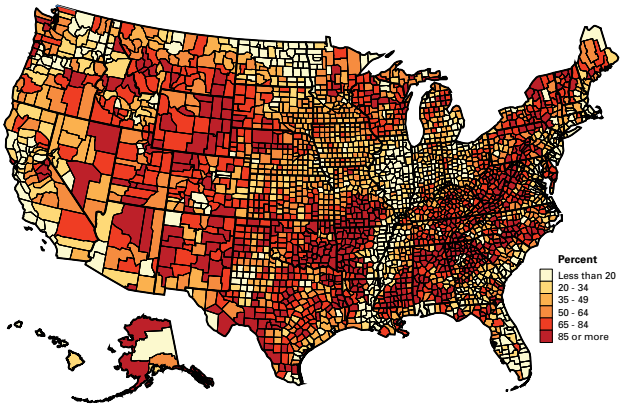
Map 4: Value of livestock, poultry, and their products sold: 2007

United States Total: $153,562,563,000



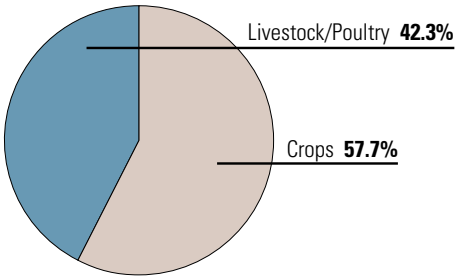
Map 5: Value of livestock, poultry, and their products sold as percent of total market value of agricultural products sold: 2007

United States: 51.7 Percent



values for 2008. Figure 6.1 shows that livestock and poultry accounted for less than half the total value of production (42.3 percent). Note that poultry contributed 29.6 percent of the total value of livestock, poultry, and their products (fig. 6.2).

Figure 6.1: Value of production in 2008: crops *v.* livestock and poultry as a percentage of total*



*Specific commodities

Introduction to the Livestock, Poultry, and Aquaculture Industries

In 2008, almost half the farms in the United States had cattle and calves. (USDA defines a cattle operation as any place having one or more head of cattle on December 31, 2007. This is a change from the previous definition of an operation as any place having one or more head on hand at any time during the year.) Only a small number of cattle operations (67,000) were dairies (milk production). Numbers of operations with hogs and operations with sheep were roughly similar (73,150 and 82,330, respectively), although the comparative values of production were dissimilar (table 6.1). *Note:* Detailed statistics for each commodity are provided in tables A1.1 through A1.13 in appendix 1.

Figure 6.2: Value of production in 2008: specific commodities as a percentage of respective total livestock, poultry, and their products

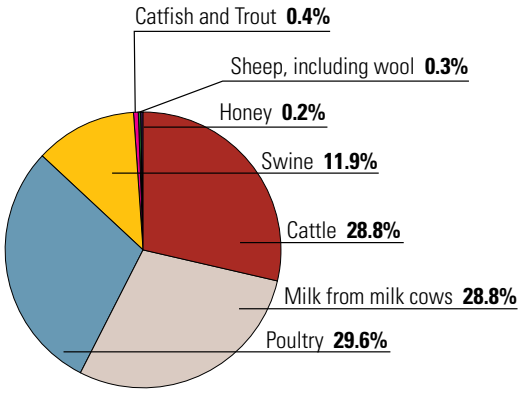


TABLE 6.1: Livestock, poultry, and aquaculture statistics for 2008

Commodity	Inventory (1,000)	Number of operations[1]	Value of production ($1,000)	Appendix reference for detail
All cattle and calves	[2]94,491	956,500	34,858,846	A1.2
Milk cows	[2]9,333	67,000	[3]NA	A1.3
Milk	[6]Detail	NA	34,976,573	A1.3
Beef cows	[2]31,671	757,000	NA	A1.4
Cattle on feed	[2]13,851	82,170	NA	A1.5
Hogs and pigs	[4]66,768	73,150	14,435,204	A1.6
Sheep and lambs (plus wool)	[2]5,747	82,330	382,665	A1.7
Goats	[2]3,070	149,800	NA	A1.7
Poultry	[6]Detail	NA	35,876,569	A1.8
Equine	[5]5,317	NA	NA	A1.9
Catfish	[6]Detail	[7]1,306	409,998	A1.10
Trout	[6]Detail	[8]463	79,709	A1.10
Honey	[6]Detail	NA	226,814	A1.11

[1] Number of operations—For cattle, beef cow, milk cow, hog and pig, sheep and lamb, and goat and kid operations, any place having one or more head on hand on December 31.
[2] Inventory as of January 1, 2009.
[3] Not available.
[4] Inventory as of December 1, 2008.
[5] Inventory as of January 1, 1999.
[6] Detailed breakout of inventory is shown in respective appendixes.
[7] Number of operations as of January 1, 2009.
[8] Number of operations selling trout.

Cattle and Calves (Beef and Dairy)

In 2007, the Nation's nearly 100 million cattle and calves (beef and dairy) were dispersed widely across the country, with a greater concentration generally in the Central States (map 6).

Overall, the number of cattle and calves in the United States increased from 1869 to 1975 and then declined during the next two decades, despite a slight upturn in the mid-1990s. Historically, changes in the cattle population cycle occur at roughly 10-year intervals. Recently, the Nation's inventory of cattle and calves has remained relatively steady (fig. 6.3).

Map 6: Cattle and calves—inventory 2007

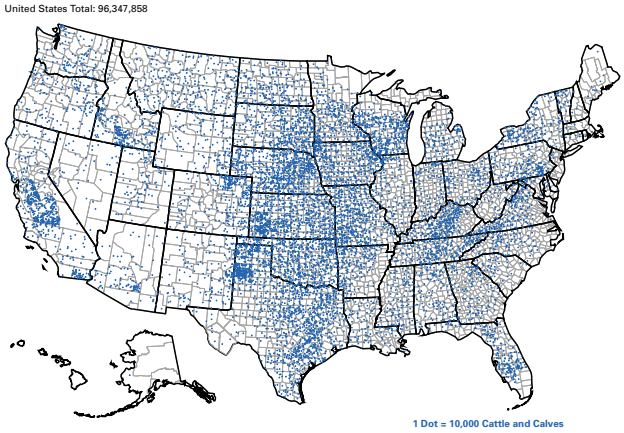
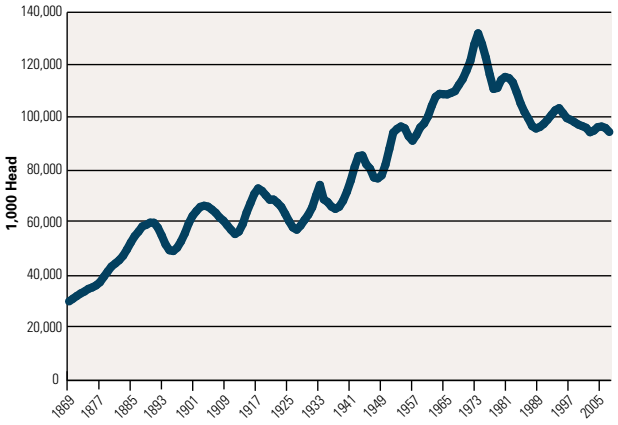
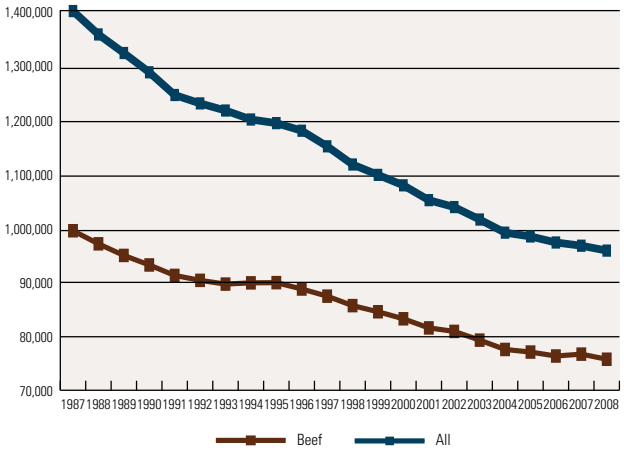


Figure 6.3: Cattle and calves: U.S. inventory on January 1 for selected years, 1869–2009
2009 inventory = 94.5 million



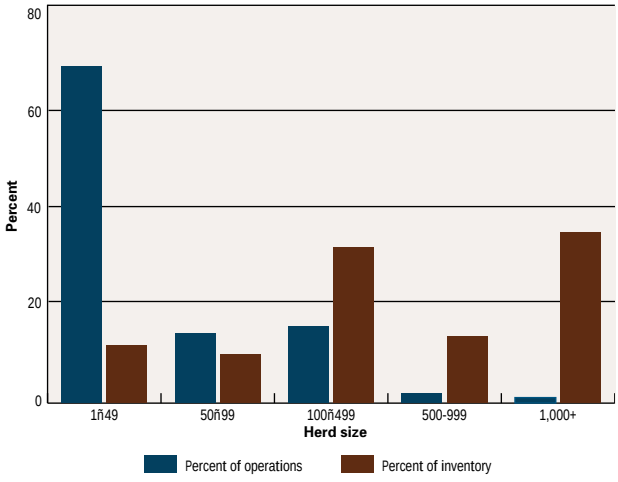
The number of operations with cattle (or calves) has declined steadily during the past 15 years. A general decline has also occurred in the number of beef cow operations, except increases were noted in 1994, 1995, and 2007 (fig. 6.4). These declines are due primarily to a decrease in the number of small operations, or operations with fewer than 50 head of cattle.

Figure 6.4: Number of all cattle and beef cow operations, United States, 1988–2008



In 2008, small cattle operations (1–49 head) accounted for 67.6 percent of all operations but only 11.5 percent of the total inventory of cattle and calves. Large operations (500 or more head) accounted for just 3.1 percent of all operations but accounted for 47.6 percent of the total U.S. inventory of cattle and calves (fig. 6.5 and also table A1.2 in appendix 1).

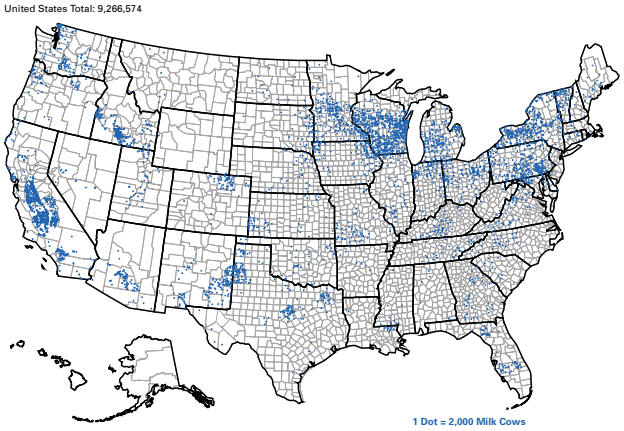
Figure 6.5: Cattle and calves: percent operations and inventory by herd size



Milk Cows—Dairy

In the United States, milk cows are concentrated in California, Wisconsin, Minnesota, and States in the Northeast (map 7).

Map 7: Milk cows—inventory: 2007



The U.S. population of milk cows has remained relatively stable over the last 10 years. In contrast, the number of milk cow operations in 2008 was only 57.2 percent of the number of milk cow operations in 1998 (fig. 6.6). Large operations (500 or more milk cows) were a small percentage of all milk cow operations, but accounted for a large percentage of the total number of milk cows (fig. 6.7).

Figure 6.6: Milk cows: number of operations, 1988–2008

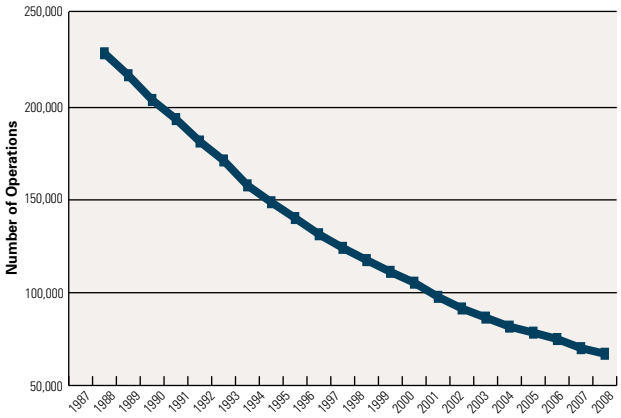
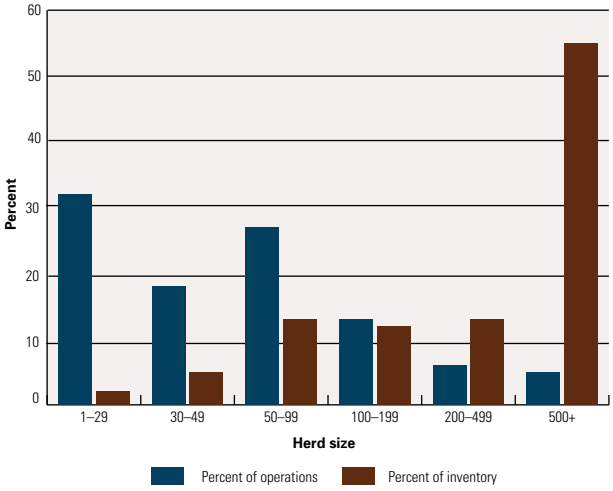


Figure 6.7: Milk cows: percent operations and inventory by herd size

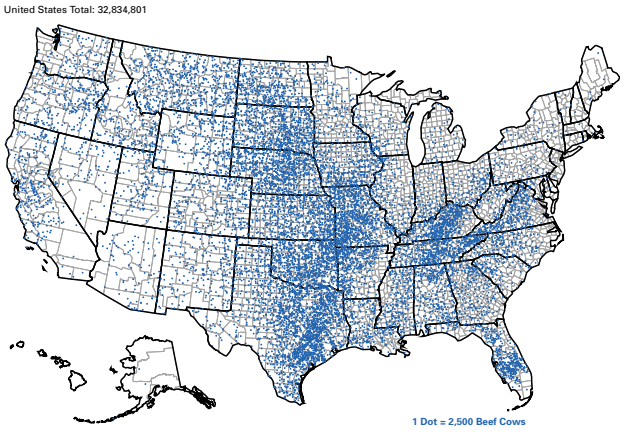


Annual milk production per cow increased from 17,185 pounds in 1998 to 20,396 pounds in 2008—a 17-percent increase. Table A1.3 in appendix 1 documents dairy production for 2007 and 2008.

Beef Cows

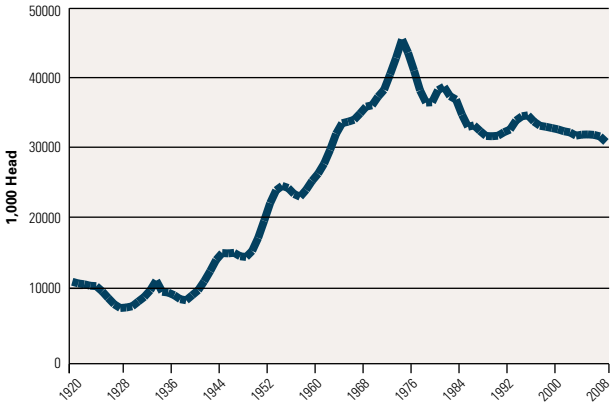
In 2007, beef cows were distributed widely across the United States. In general, however, States in the central part of the Nation had a higher number of beef cows (map 8).

Map 8: Beef cows—inventory: 2007



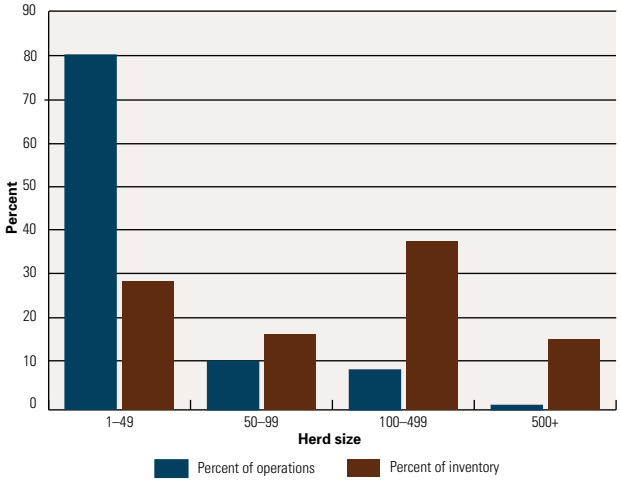
The trend in the number of beef cows (fig. 6.8) follows the overall trend shown for the total inventory of cattle and calves (fig. 6.3). Essentially, inventory levels have remained stable over the last decade. Beef cows accounted for 77.2 percent of the total cow inventory on January 1, 2009.

Figure 6.8: Beef cows: U.S. inventory on January 1 for selected years, 1920–2009



In 2008, there were 757,000 beef cow operations in the United States. The number of beef cow operations has declined from 1995 to 2006, followed by an increase in 2007 and a decrease in 2008. This decrease is most notable in the number of small operations (1–49 head). Following a common trend seen in other livestock commodities, the population of beef cows on large operations (100 or more head) has increased and now accounts for 54.4 percent of total U.S. beef cow inventory as of January 1, 2009 (fig. 6.9 and table A1.4 in appendix 1). These large operations account for only 9.7 percent of all beef cow operations in the United States, but have more than half the total beef cow inventory.

Figure 6.9: Beef cows: percent operations and inventory by herd size



Cattle on Feed

Cattle on feed are fed a ration of grain or other concentrate in preparation for slaughter, and the majority are in feedlots in States with large grain supplies.

On January 1, 2009, three States (Kansas, Nebraska, and Texas) accounted for nearly two-thirds (66.1 percent) of the inventory of cattle on feed. Large numbers of cattle on feed are in relatively few feedlots; 128 feedlots (0.1 percent of all feedlots) accounted for 39.9 percent of the total U.S. cattle-on-feed inventory (table A1.5 in appendix 1). Inventory numbers in feedlots typically reach high points in December, January, and February, and low points in August and September because of the seasonal availability of grazing resources and the predominance of spring-born calves (fig. 6.10). As a result, commercial cattle slaughter typically

reaches a high point in May and June (fig. 6.11). Steers and heifers accounted for 80.0 percent of federally inspected slaughter cattle in 2008. Of the 34.4 million head of commercially inspected cattle slaughtered, 98.4 percent were federally inspected (table A1.2 in appendix 1).

Figure 6.10: U.S. cattle on feedlots with capacity of 1,000 or more head, 2006–08

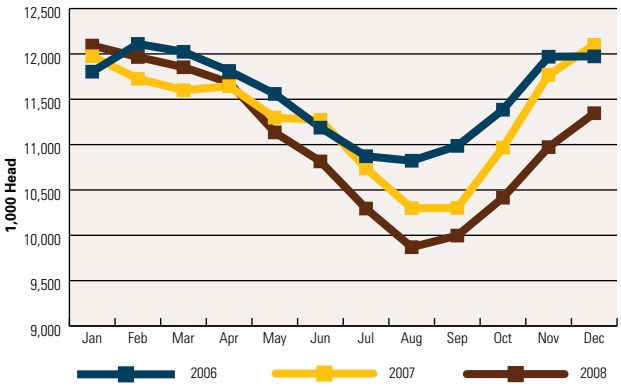
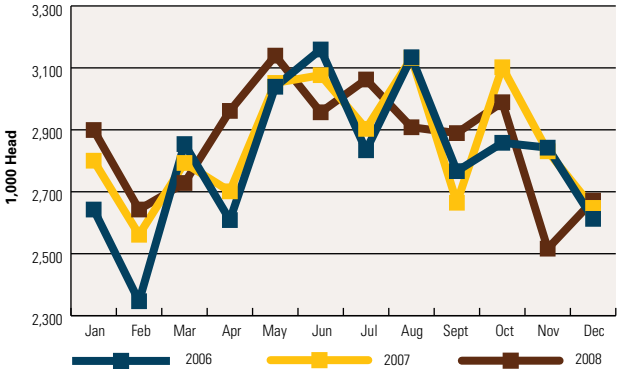


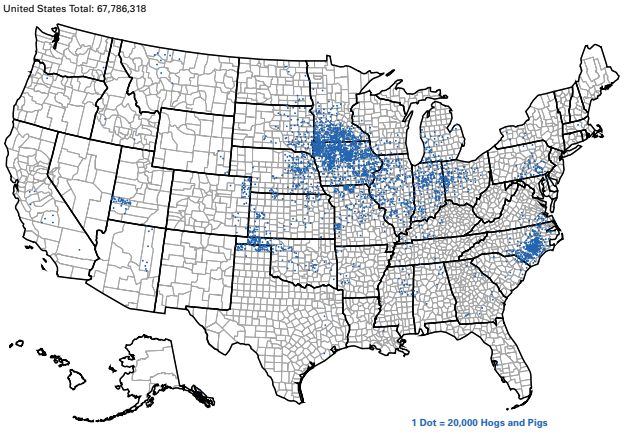
Figure 6.11: Cattle: U.S. commercial slaughter by month, 2006–08



Hogs

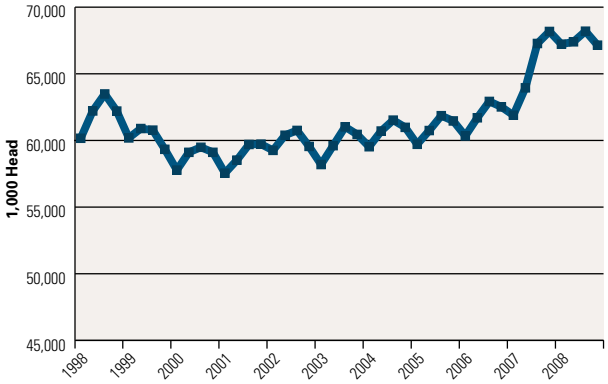
Historically, hog production has been most common in the upper Midwest (map 9). On December 1, 2008, Iowa, the largest hog-producing State, had 29.6 percent of the U.S. inventory of all hogs and pigs. During the past two decades, North Carolina has increased its production and is now the Nation's second-largest hog-producing State, with 14.4 percent of the inventory. The practice of shipping pigs from production areas (e.g., North Carolina) to grower–finisher areas in the upper Midwest continued in 2008.

Map 9: Hogs and pigs—inventory: 2007



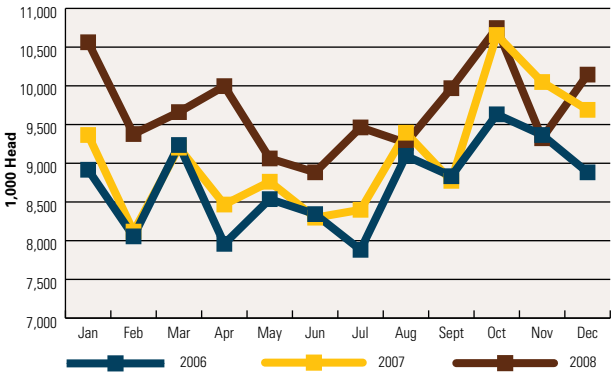
In the United States, hog and pig inventory levels are estimated and published quarterly (December, March, June, and September). Over the past decade, the U.S. inventory of all hogs and pigs has fluctuated from quarter to quarter. Typically, inventory numbers reach a low point on March 1 and peak on September 1 (fig. 6.12).

Figure 6.12: Hogs and Pigs: U.S. inventory, by quarter, 1998–2008



In 2 of the last 3 years, the number of hogs slaughtered commercially reached a low point in June, then peaked in October (fig. 6.13) in preparation for the holiday season. Commercial hog slaughter totaled 116.5 million head in 2008, 7 percent higher than 2007.

Figure 6.13: Hogs: U.S. commercial slaughter, by month, 2006–08



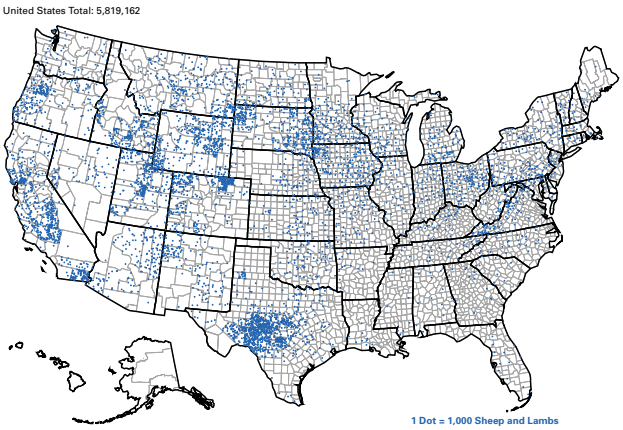
The number of operations with hogs (and pigs) declined steadily during the past decade, decreasing by 35.6 percent over the last 10 years (since 1998). The majority of hog operations (69.3 percent) had fewer than 100 head, but these operations accounted for only 0.9 percent of the inventory. During the past decade, there has been a steady increase in the number of large operations (5,000 or more head), with the exception of a slight decline in 2003. Large operations (4.0 percent of all operations) now maintain more than half (61.1 percent) of the U.S. hog inventory.

In 2008, the United States had 73,150 hog operations with a production value of $14.4 billion (table A1.6 in appendix 1).

Sheep and Goats

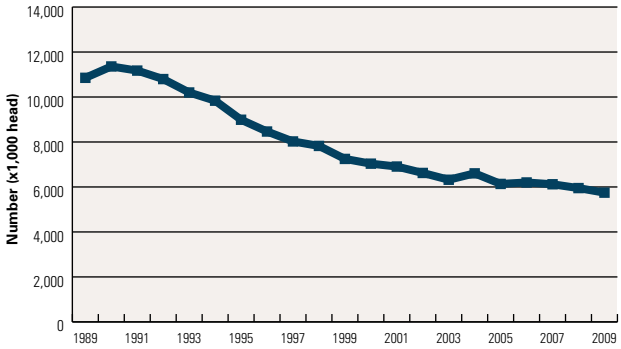
The U.S. sheep industry is located primarily in the Western and Central States (map 10). Typically, the Western States are characterized by large range flocks, whereas those in the Central and Eastern States are mostly small, fenced flocks.

Map 10: Sheep and lambs—inventory: 2007



The number of sheep has declined steadily since the late 1980s (10.9 million head in 1988), with the exception of a brief peak in inventory in 1990 (11.4 million head); however, there were small increases noted on both January 1, 2005, and January 1, 2006, followed by decreases on January 1 of the next 3 years (fig. 6.14). Total sheep and lamb inventory on January 1, 2009, was 5.75 million head.

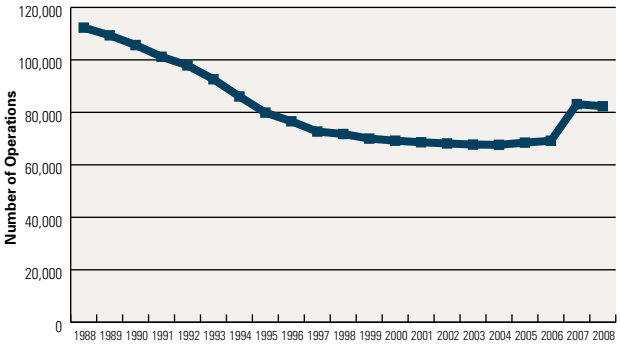
Figure 6.14: Sheep and lambs: U.S. inventory on January 1, 1989–2009



The number of operations with sheep since the late 1980s has declined gradually until 2005 and

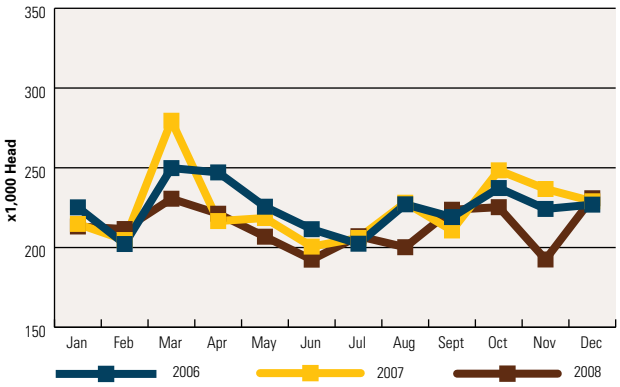
2006 (1-percent increases, respectively). However, a 20-percent increase was shown between 2006 and 2007, followed by a slight decrease in 2008 to 82,330 operations (fig. 6.15).

Figure 6.15: Sheep and lambs: U.S. number of operations, 1988–2008



Almost one-third of all sheep (32.6 percent) are located on a large number of small operations (1–99 head); 92.5 percent of the 82,330 total operations had fewer than 100 head of sheep and lambs (table A1.7 in appendix 1). Commercial sheep and lamb slaughter totaled 2.6 million head in 2008. Slaughter typically peaks in March or April (fig. 6.16).

Figure 6.16: Sheep: U.S. commercial slaughter, by month 2006–08



There were 3.07 million goats in the United States on January 1, 2009, which represents a 1.5-percent decrease over the January 1, 2008, population. Breeding goats accounted for 2.5 million head and there were 528,000 market goats. Breeding goats were comprised of 1.9 million does, 185,000 bucks, and 460,000 replacement kids under 1 year old. The number of kids born during 2008 was estimated at 1.96 million head. The number of Angora goats decreased 9.8 percent (205,000 and 185,000 head, respectively), while the number of milk goats increased 3.7 percent (323,000 and 335,000 head, respectively). Meat and other goats totaled 2.6 million head, which was down 1.5 percent from January 1, 2008. There were 149,800 operations with goats in the United States in 2008 (table A1.7 in appendix 1).

Poultry Industries

The poultry industries are economically important to the Eastern States—especially the Southeastern States (map 11). The value of poultry and eggs is a high percentage of the total value of agricultural products sold in these States. In terms of value of production, the broiler segment of the poultry industries dominates other segments—eggs, turkeys, and chickens (excluding broilers). Broilers account for nearly two-thirds of the value of production (fig. 6.17). The quantity of production for each segment has increased rapidly over the past 50 years (figs. 6.18–20).

Map 11: Value of poultry and eggs sold as percent of total market value of agricultural products sold: 2007

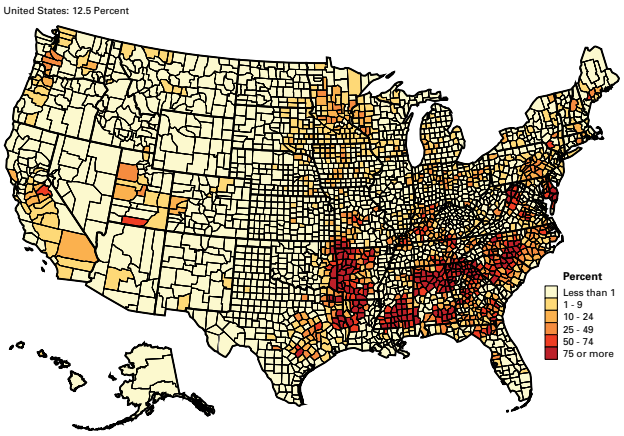


Figure 6.17: U.S. value of production: Broilers, eggs, turkeys, chickens, and total, 1998–2008

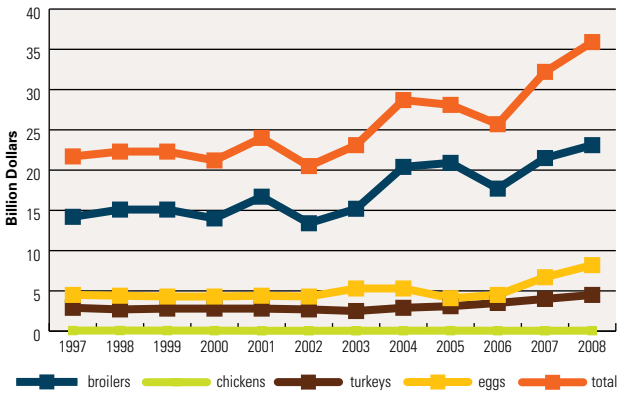


Figure 6.18: U.S. broiler production 1960–2008

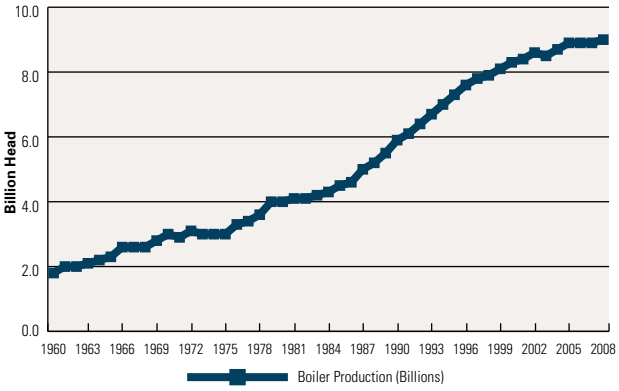


Figure 6.19: U.S. egg production 1960–2008

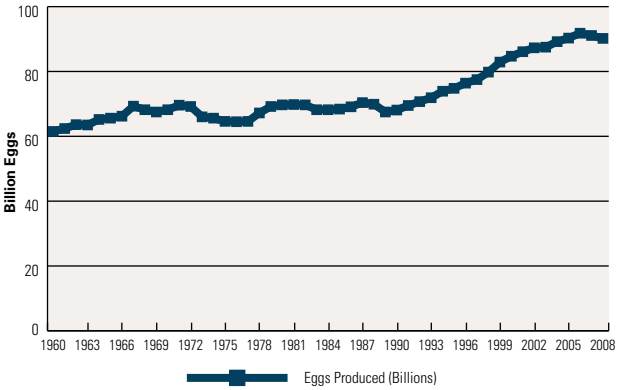
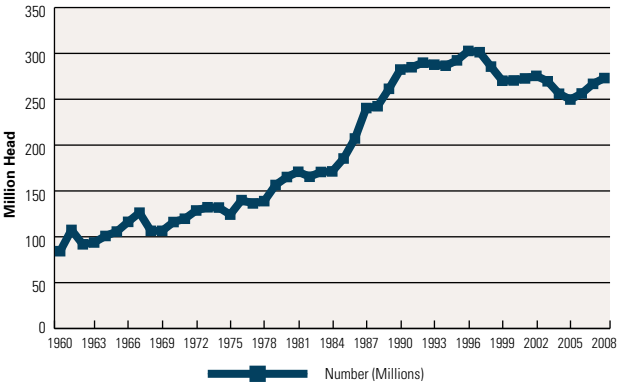
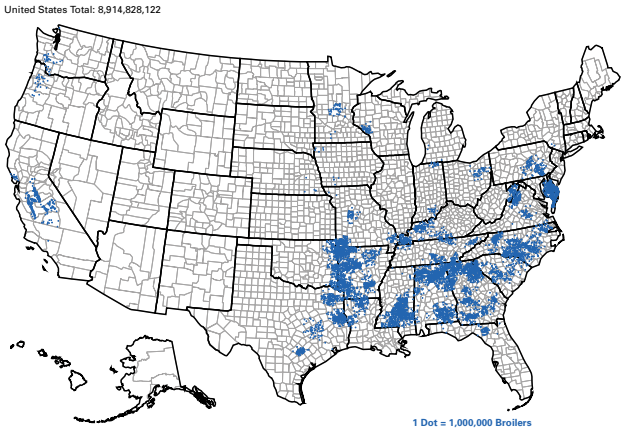


Figure 6.20: U.S. turkey production 1960–2008

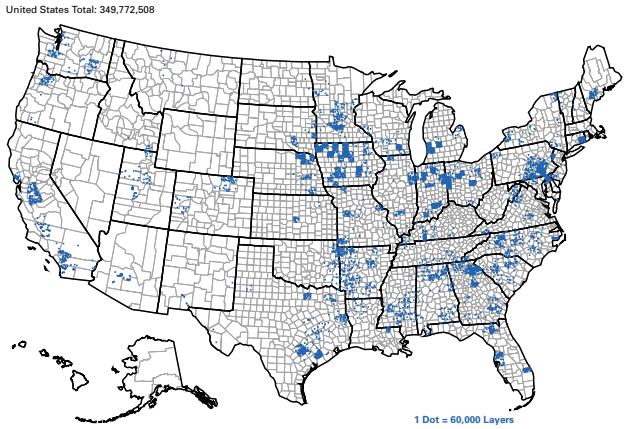


Broiler production is concentrated heavily in the Southeast (map 12), whereas layers are dispersed more widely over the Central and Eastern States (map 13).

Map 12: Number of broilers and other meat-type chickens sold: 2007

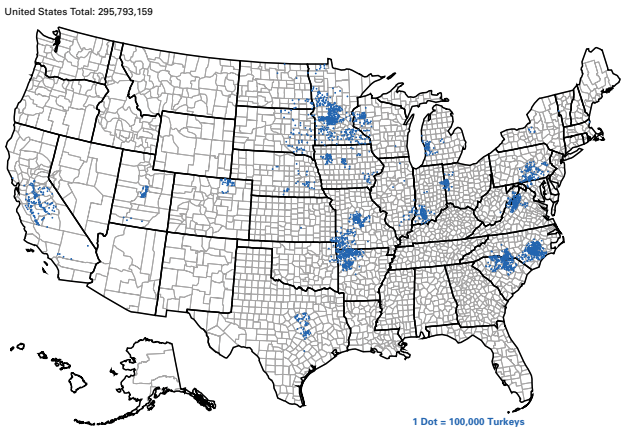


Map 13: Layers—inventory 2007



Turkey production is concentrated in the eastern half of the United States (map 14). Arkansas, Minnesota, and North Carolina accounted for 43.6 percent of the 273 million turkeys raised in 2008.

Map 14: Number of turkeys sold: 2007



The broiler and layer industries are characterized by a relatively small number of large companies. USDA does not provide annual estimates of the number of companies or production sites. The value of broiler production was 64.4 percent of the $35.9 billion poultry industries' production in 2008. Egg production accounted for 22.9 percent of the total value of production (table A1.8 in appendix 1).

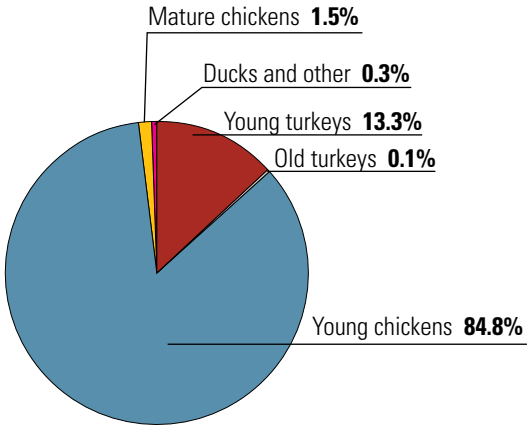
Hatchery statistics for 2008 include 9.46 billion broiler-type chickens hatched, 467 million egg-type chicks hatched, and 306 million poults hatched in turkey hatcheries. The collective capacity of the 318 chicken hatcheries on January 1, 2009, was 904 million eggs, and the capacity of the 55 turkey hatcheries was 39.5 million eggs.

More than 99 percent of total U.S. poultry slaughter of the major species is done in federally inspected slaughter plants.

In 2008, approximately 320 plants slaughtered poultry under Federal inspection. Young chickens were slaughtered in 35 States, and young turkeys were slaughtered in 26 States.

Slaughter of young chickens[14] accounted for 84.8 percent of the total live weight of poultry slaughtered in 2008 (fig. 6.21). The average live weight of young chickens slaughtered has steadily increased over the previous decade.

Figure 6.21: Poultry: total live weight slaughtered in 2008



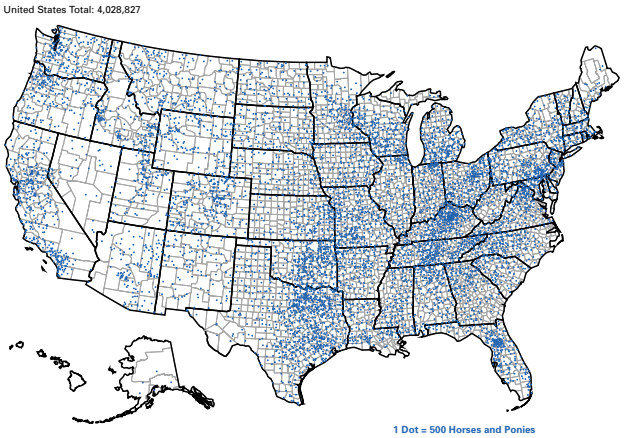
[14] Young chickens are commercially grown broilers, fryers, and other young, immature birds (e.g., roasters and capons).

Equine Industry

Statistics on the demographics of the U.S. equine industry are sparse. USDA does not have an equine statistics program; the only estimates available for the entire domestic equine population date from 1998 and 1999.

The 2007 Census of Agriculture estimated 4.03 million horses and ponies reported on 575,942 farms. Map 15 illustrates the broad and even distribution of horses and ponies across the United States. The 2007 Census also reported 283,806 mules, burros, and donkeys located on 99,746 farms. *Note:* The Census estimates do not include equids on nonfarm places. The current definition of a farm, first used in 1974, is a place that could or did actually sell $1,000 of agricultural products annually. In addition, as of 1987 any operation that has five or more equids (other than commercial enterprises such as race tracks) qualifies as a farm, even if it has no other agricultural activity.

Map 15: Horses and ponies—inventory: 2007



The Census figures may be compared with the last statistics published by USDA for equine inventories on all places. As of January 1, 1998, the inventory of equids on both farms and nonfarms totaled 5.25 million head. A year later, that figure was 5.32 million head (table A1.9 in appendix 1). In addition, 39.1 percent of the January 1, 1998, total was estimated to be on nonfarm locations. The estimated value of equine sales was $1.64 billion for 1997 and $1.75 billion for 1998.

USDA publishes no estimates for the number of all operations with equids and collects no information by size of equid operation for the United States.

Fish and Other Aquaculture Products

The 2007 Census of Agriculture estimated the value of aquaculture products (domestic farm-raised) sold at $1.4 billion, or about 1 percent of the total $153.6 billion sales for all livestock, poultry, and their products in the United States. Combined catfish and trout sold accounted for 47.1 percent of the $1.4 billion total. NASS collects information on the catfish and trout industries through monthly catfish processing surveys, semiannual catfish production surveys, and an annual trout survey (table A1.10 in appendix 1).

Domestic catfish production in 2008 was concentrated in three Southern States: Alabama, Arkansas, and Mississippi. Mississippi accounted for 49.0 percent of the total pounds of food-size catfish. At $410.0 million, the total value of catfish sales for 2008 was down 9.8 percent from 2007 (table A1.10 in appendix 1). Food-size catfish accounted for 94.9 percent of total sales.

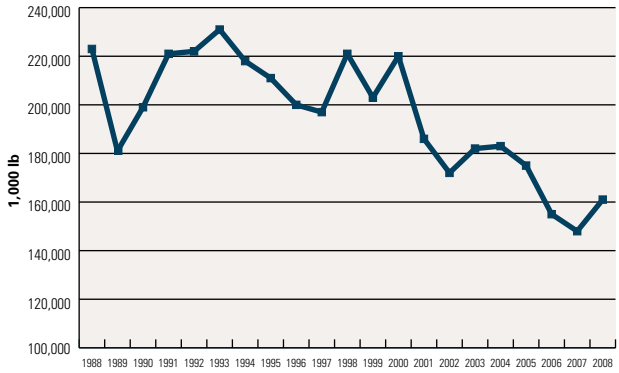
Domestic trout production was dispersed more widely across the United States. Idaho accounted for 44.3 percent of the total value of fish sold, followed by California at 10.4 percent and North Carolina at 9.0 percent. The total value of all trout sales, both fish and eggs, was $86.4 million in 2008—a decrease of 9.6 percent from 2007.

Honey Production

In 2008, honey production from producers with five or more colonies totaled 160.9 million pounds, which represents an 8-percent increase from 2007 (table A1.11 in appendix 1; fig. 6.22). This increase, combined with a 31-percent increase in honey prices, resulted in a $226.8 million value of production in 2008, up 42.0 percent from the previous year. The distribution of honey production is widespread

across the United States, although North Dakota accounted for 21.8 percent of the total production.

Figure 6.22: U.S. honey production, 1988–2008



Miscellaneous

The 2007 Census of Agriculture reported several miscellaneous livestock and poultry commodities, which are shown in table A1.12 in appendix 1.

Number of Livestock Slaughter Plants in the United States

On January 1, 2009, there were 818 federally inspected U.S. slaughter plants. Federally inspected plants are those that transport meat interstate and must employ Federal inspectors to ensure compliance with USDA standards. There are additional plants considered federally inspected, called Talmedge–Aiken plants. Although USDA is responsible for inspection in these plants, actual Federal inspection is carried out by State employees, who ensure that Federal regulations are being followed. During 2008, 630 plants slaughtered cattle (table A1.13 in appendix 1), and 14 of these largest plants slaughtered 55 percent of the total cattle slaughtered. Six of the 251 plants that slaughtered calves accounted for 55 percent of the total, and 4 of the 496 plants that slaughtered sheep or lambs in 2008 produced 65 percent of the total number of head slaughtered. In 2008, 412 plants slaughtered goats. Hogs were slaughtered at 618 plants; 12 of the largest plants accounted for 55 percent of the total.

Iowa, Kansas, Nebraska, and Texas accounted for 49.7 percent of U.S. commercial red-meat production in 2008. Monthly commercial red-meat production typically reaches a low point in February (fig. 6.23). Beef and pork dominated commercial red-meat production in 2008 (52.9 and 46.5 percent, respectively), as shown in figure 6.24.

Figure 6.23: U.S. commercial red meat production, by month, 2006–08

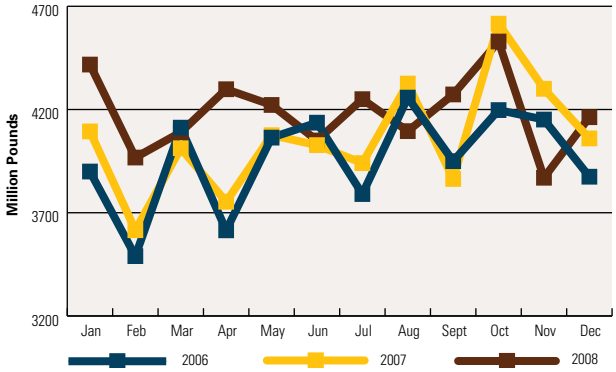
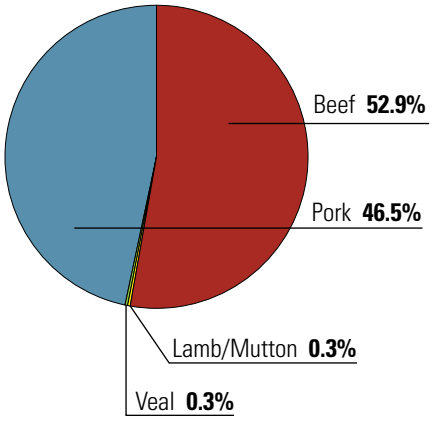


Figure 6.24: U.S. commercial red meat production, by percentage, 2008



On January 1, 2009, there were 2,030 slaughter plants in the United States that were State-inspected or custom-exempt, compared with 2,119 such plants on January 1, 2008. State-inspected plants sell and transport exclusively intrastate. State inspectors ensure compliance with individual State standards as well as with Federal meat and poultry inspection statutes. Custom-exempt plants do not sell meat, but operate on a custom-slaughter basis only. The animals and meat are not federally inspected, but the facilities must meet local health requirements.

CHAPTER 7

CHAPTER 7

The Changing Veterinary Health Mission

The national animal health landscape has changed significantly in recent years. As these changes continue, APHIS' mission and role is also evolving so that the agency can confront the new challenges they pose. This chapter describes some of the programs and activities APHIS has already undertaken to meet these challenges. One such activity is VS 2015, a strategic vision developed by VS management to guide the organization in making changes that will better position it to meet animal health needs in 2015. Because of the increasing need for an international focus on animal disease control efforts, we highlight some of APHIS' international collaborations and activities. This chapter also highlights the expanding animal health–public health interface and some of the ongoing APHIS activities in this area.

VS 2015: The Vision for VS

The VS 2015 vision outlines some of the ways the animal agriculture industry is changing, and why USDA's programs must keep pace with those changes. Many diseases have been effectively controlled or nearly eradicated in the United States, emphasizing the need for new surveillance and monitoring strategies for these programs. Also, changes in industry structure—with an increase in the number of large-scale, production-intensive farm operations—have altered the type of government services needed.

Other changes in the animal health environment include:

- Advances in technology. New diagnostics, vaccines, and novel treatment technologies are changing veterinary medicine and management of animal disease events. Emerging treatment possibilities may reduce the need for traditional eradication programs that rely on large-scale depopulation activities.
- Public awareness of animal diseases that affect human health. This increased awareness of highly pathogenic avian influenza, bovine spongiform encephalopathy, West Nile virus, and other diseases has escalated consumer/public demand for leadership at the intersection of animal and public health concerns.
- Increasing demand for animals and animal products, especially in developing countries.
- Tightening budgets. With Federal funding resources strained and Federal budgets stretched, there is an increased awareness of the need to utilize available resources and work within existing financial constraints.

VS management has identified three essential areas of focus for the future. These areas are disease prevention, preparedness, detection, and early response; expanded interstate and international certification services; and the public health–animal health interface.

Increased Focus on Disease Prevention, Preparedness, Detection, and Early Response

VS' goal is to lessen the frequency of animal health events by emphasizing prevention and preparedness. VS leads the effort in coordinating effective incident management and responses and deploying critical veterinary supplies and equipment. VS investigates potential emerging animal health threats and applies decision criteria to determine appropriate early responses. The National Animal Health Laboratory

Network (NAHLN) enhances the early detection of, response to, and recovery from animal health emergencies, including emerging diseases and foreign animal diseases that threaten the Nation's food supply and public health. VS is designing and directing comprehensive national animal health surveillance systems capable of (1) finding foreign and emerging diseases as well as domestic diseases for which control or eradication programs exist, and (2) supporting international reporting and trade verification requirements. A description of VS emergency planning functions, the NAHLN, and major surveillance and disease control or eradication programs is included in Chapters 2, 3, and 4.

International Collaboration—When needed, APHIS extends prevention and early response efforts to address animal health issues occurring outside the United States. VS works with other APHIS units to identify, prioritize, plan, and direct APHIS-funded animal health surveillance and disease control or eradication programs overseas. APHIS assists other countries as they develop their animal health capacities and provides leadership in the development of global animal health standards and methods.

As part of these international efforts to address animal health issues, APHIS collaborates with the World Organization for Animal Health (OIE), which has a global network of 160 reference laboratories that are disease-specific and 20 collaborating centers that deal with specific spheres of competence, such as epidemiology or risk analysis. VS' National Veterinary Services Laboratories (NVSL) and Center for Veterinary Biologics (CVB) serve as OIE Collaborating Centers for the Diagnosis of Animal Diseases and Vaccine Evaluation in the Americas. VS' Centers for Epidemiology and Animal Health is a Collaborating Center for Animal Disease Surveillance Systems and Risk Analysis.

APHIS also assists the OIE in other areas. During 2008, those efforts included:

- Collaborating with various OIE ad hoc groups focused on epidemiology, disease modeling, implementation of compensation mechanisms, and wildlife disease information;
- Participating in the steering committee for the OIE–Food and Agriculture Organization's network on avian influenza (AI);
- Conducting training courses relating to spatial analysis, epidemiology, and risk assessment, and disease modeling for international participants; and
- Establishing cooperative efforts with the Interamerican Institute for Cooperation on Agriculture, the Regional International Organization for Animal and Plant Health, the European Food Safety Authority, and the International Livestock Research Institute.

Expanded Interstate and International Certification Services

Certifying animals, animal products, and veterinary biologics for interstate and international movement continues to be VS' most intensive interface with the public. APHIS is committed to upgrading its processes to meet the speed of business that today's environment demands. APHIS is increasingly aligning its trade protocols with international standardization efforts. APHIS will also expand VS' services to include certifying that animals and animal products meet standards established by industries and by other organizations or agencies. APHIS will partner with other agencies to provide integrated government certification approaches to meet the demand for "farm-to-fork" verification of animal-derived products and foods.

The Public Health–Animal Health Interface

While animal health remains a cornerstone of APHIS' work, the agency also engages in health issues impacting public health when those issues are connected to animal populations of any kind. APHIS provides national leadership on the animal health component associated with food safety and public health issues. This leadership includes identifying science-based interventions along the animal production chain to protect public health. In addition, APHIS' VS and Wildlife Services units work with wildlife entities to address health issues that impact production agriculture and wildlife health.

The convergence of people, animals, and the environment has created a new dynamic that interconnects the health of all. In the last three decades, approximately 75 percent of emerging human infectious diseases have been zoonotic. In 2007, the American Veterinary Medical Association (AVMA), with support from the American Medical Association, adopted a vision supporting a "One Medicine" concept and formed a One Health Initiative Task Force. The AVMA defines "One Health" as the collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health of people, animals, and the environment.

Consumer Protection—APHIS is involved in many collaborative efforts involving zoonotic diseases, public health, and food safety. These include increased monitoring of salmonellosis and other agents presenting either food safety or zoonotic concerns.

To better understand the ecology of *Salmonella* in humans and animals, a number of monitoring systems exist to track changing patterns of disease (serotype distribution, host species affected, distribution on food items, antimicrobial resistance patterns, etc.). VS' NVSL carries out one such effort to monitor the distribution of *Salmonella* serotypes among animals.

NVSL receives and serotypes *Salmonella* isolates submitted by animal disease diagnostic laboratories throughout the United States. The *Salmonella* are isolated from cases of clinical disease and from herd and flock monitoring. NVSL also includes data on *Salmonella* that USDA's Food Safety and Inspection Service has isolated through its Hazard Analysis and Critical Control Points testing. From December 1, 2007, through November 30, 2008, NVSL reported serotyping results for 16,331 *Salmonella* isolates from animals and epidemiologically related sources. The most frequently identified serotypes were *Salmonella typhimurium*, *S. kentucky*, *S. heidelberg*, *S. cerro*, and *S. enteriditis*. Of the 16,331 isolates, 33 percent were from clinical disease cases and 36 percent were from monitoring samples. The remaining isolates were from research, or did not list a clinical role. A total of 262 serotypes were identified from isolates recovered from animals, their environment, or feed in 40 States and the District of Columbia. The 10 most common serotypes accounted for 58 percent of the total isolates reported.

NVSL collaborates with the Centers for Disease Control and Prevention (CDC) on PulseNET, a national network of public health and food regulatory agency laboratories. Using pulsed-field gel electrophoresis (PFGE), PulseNET participants perform standardized molecular subtyping of foodborne disease-causing bacteria. PFGE can be used to distinguish strains of organisms such as *Escherichia coli* O157:H7, *Salmonella*, *Shigella*, *Listeria*, or *Campylobacter* at the DNA level. PFGE patterns for *Salmonella* are posted to either CDC's PulseNet for comparison with patterns from human isolates, or to USDA's VetNet for comparison with other animal isolates. USDA established VetNet to subtype zoonotic pathogens submitted to the animal arm of the National Antimicrobial Resistance Monitoring System (NARMS). NARMS is a collaborative effort between the Food and Drug Administration's (FDA) Center for Veterinary Medicine, USDA, and CDC. The NARMS program monitors changes in selected enteric bacterial organisms'[15] antimicrobial drug susceptibilities to several antimicrobial drugs important in human and animal medicine.

The CDC-coordinated PulseNET consists of State health departments, local health departments, and Federal agencies including CDC, USDA, and FDA. PulseNET also works closely with similar networks in Canada, Latin America, Europe, and the Asia Pacific region.

Other Public Health and Food Safety Efforts—Other APHIS efforts and initiatives involving public health, food safety, and zoonotic diseases include:

- Ongoing AI activities, as well as increased collaboration and coordination with the public health community concerning pandemic AI.
- Collaboration with CDC on ArboNET, an Internet-based arbovirus surveillance and reporting system managed by State health departments and the CDC. (Reports of equine cases of arboviral disease are reported to ArboNET. For more information, see Chapter 3.)

[15] In humans, animals, and retail meats.

- Participation on the Interagency Consortium of Laboratory Networks (ICLN). ICLN was established in 2005 to promote collaboration, communication, and technical acuity throughout the government's overall response strategy. This group, led by the U.S. Department of Homeland Security, includes CDC, USDA, the U.S. Environmental Protection Agency, and the U.S. Departments of Defense, Energy, Commerce, Interior, Justice, and State.
- APHIS and USDA's Agricultural Research Service (ARS) participate in a working group with CDC and other partners to evaluate Rift Valley fever's (RVF) potential as a bioterrorism agent and as a vector-related emerging zoonotic disease in the United States. The group is developing a risk analysis and hazard categorization for RVF as well as an RVF surveillance plan.
- APHIS has established a collaboration with CDC and ARS for swine influenza surveillance. (See Chapter 3.)
- As a member laboratory of CDC's Laboratory Response Network, NVSL produces zoonotic-agent test reagents for the Network and for other laboratories. With other labs NVSL also participates in proficiency testing and training for these agents.
- The CVB licenses a wide variety of veterinary biological products for the prevention, diagnosis, treatment, or control of 208 different animal diseases, many of which are zoonoses.
- VS maintains a liaison position to the CDC, based in Atlanta, Georgia.

APPENDIXES

APPENDIX 1

Statistics on Major Commodities

TABLE A1.1: Value of production for selected agricultural commodities for 2007 and 2008

Commodity	2007 ($1,000)	Percentage of total value	2008 ($1,000)	Percentage of total value
Cattle	35,973,068	12.7	34,858,846	12.2
Milk from milk cows	35,665,894	12.5	34,976,573	12.2
Poultry	32,238,359	11.3	35,876,569	12.5
Swine	13,468,332	4.7	14,435,204	5.0
Catfish and trout	542,449	0.2	489,707	0.2
Sheep	362,941		350,179	
Wool	30,242		32,486	
Total sheep and wool	393,183	0.1	382,665	0.1
Honey	159,763	0.1	226,814	0.1
Total of preceding livestock and products[1]	*118,441,048*	*41.6*	*121,246,378*	*42.3*
Field and miscellaneous crops	135,594,777	47.7	134,040,317	46.8
Fruits and nuts	18,818,205	6.6	18,814,886	6.6
Commercial vegetables	11,657,369	4.1	12,271,525	4.3
Total value of preceding crops	*166,070,351*	*58.4*	*165,126,728*	*57.7*
All commodities above	***284,511,399***	***100.0***	***286,373,106***	***100.0***

[1] Production data for equids were not available.

TABLE A1.2: Cattle and calves production, 2007 and 2008

	2007	2008
Inventory on January 1 of following year (1,000 head)		
All cattle and calves	96,035	94,491
All cows	41,692	41,005
Cattle on feed	14,827	13,851
Operations with cattle and calves	965,510	956,500
Size of operation	**Percentage operations (percentage inventory)**	
1–49 head	66.9 (11.5)	67.6 (11.5)
50–99 head	14.3 (9.8)	13.9 (9.7)
100–499 head	15.7 (31.4)	15.4 (31.2)
500 or more head	3.1 (47.3)	3.1 (47.6)
Total	*100.0 (100.0)*	*100.0 (100.0)*
Calf crop (1,000 head)	36,759	36,113
Deaths—cattle (1,000 head)	1,856	1,760
Deaths—calves (1,000 head)	2,394	2,314
Commercial calves slaughtered (1,000 head)		
Federally inspected	745	942
Other	13	15
Total commercial	*758*	*957*
Commercial cattle slaughtered (1,000 head)		
Federally inspected		
Steers	17,285	16,949
Heifers	10,207	10,091
All cows	5,675	6,161
Bulls	554	605
Other	543	560
Total commercial	*34,264*	*[1]34,365*
Farm cattle and calves slaughtered (1,000 head)[2]	188	186
Total cattle and calves slaughtered (1,000 head)	***35,210***	***35,508***
Value of production ($1,000)	***35,973,068***	***34,858,846***

Source: USDA–NASS.

[1] Sum of categories may not add to total due to rounding.

[2] Farm slaughter includes animals slaughtered on farms primarily for home consumption. It excludes custom slaughter for farmers at commercial establishments but includes mobile slaughtering on farms.

TABLE A1.3: Milk cow production, 2007 and 2008

	2007	2008
Inventory on January 1 of following year (1,000 head)		
Milk cows	9,257	9,333
Milk replacement heifers	4,415	4,410
Operations with milk cows	69,995	67,000
Size of operation	**Percentage operations (percentage inventory)**	
1–29 head	31.0 (2.0)	31.8 (1.8)
30–49 head	17.5 (5.2)	17.8 (5.1)
50–99 head	27.6 (14.0)	26.5 (13.1)
100–199 head	12.9 (13.0)	13.0 (12.5)
200–499 head	6.2 (13.9)	5.9 (12.6)
500 or more head	4.8 (51.9)	5.0 (54.9)
Total	*100.0 (100.0)*	*100.0 (100.0)*
Cows slaughtered (1,000 head), federally inspected		
Dairy cows	2,497	2,591
Other cows	3,178	3,569
All cows	*5,675*	*[1]6,161*
Milk production		
Average number of milk cows during year (1,000 head)	9,189	9,315
Milk production per milk cow (lb)	20,204	20,396
Milk fat per milk cow (lb)	744	751
Percentage of fat	3.68	3.68
Total milk production (million lb)	185,654	189,992
Value of all milk produced (1,000 head)	**35,665,894**	**34,976,573**

Source: USDA–NASS.

[1] Sum of categories may not add to total due to rounding.

TABLE A1.4: Beef cow production, 2007 and 2008

	2007	2008
Inventory on January 1 of following year (1,000 head)		
Beef cows	32,435	31,671
Beef replacement heifers	5,647	5,526
Operations with beef cows	766,350	757,000
Size of operation	**Percentage operations (percentage inventory)**	
1–49 head	79.1 (28.7)	79.4 (28.5)
50–99 head	11.2 (17.2)	10.9 (17.1)
100–499 head	8.9 (38.0)	8.9 (38.0)
500 or more head	0.8 (16.1)	0.8 (16.4)
Total	*100.0 (100.0)*	*100.0 (100.0)*
Cows slaughtered (1,000 head), federally inspected		
Dairy cows	2,497	2,591
Other cows	3,178	3,569
All cows	*5,675*	*[1]6,161*

Source: USDA–NASS.

[1] Sum of categories may not add to total due to rounding.

TABLE A1.5: Cattle-on-feed production, 2007 and 2008

	2007	2008
Inventory on January 1 of following year (1,000 head) for all lots	14,827	13,851
Inventory on January 1 of following year (1,000 head) for lots with 1,000+ capacity		
Steers and steer calves	7,643	7,071
Heifers and heifer calves	4,379	4,100
Cows and bulls	70	63
Total	*12,092*	*11,234*

Feedlot capacity (head)	Number of feedlots 2008	Pct.	January 1, 2009, inventory (1,000 head)	Pct.	Marketed (1,000 head) 2007	Pct.
<1,000	80,000	97.4	2,617	18.9	4,045	15.3
1,000–1,999	810	1.0	414	3.0	779	2.9
2,000–3,999	570	0.7	780	5.7	1,390	5.3
4,000–7,999	350	0.4	1,070	7.7	1,970	7.5
8,000–15,999	180	0.2	1,250	9.0	2,535	9.6
16,000–31,999	132	0.2	2,190	15.8	4,400	16.6
≥ 32,000	128	0.1	5,530	39.9	11,330	42.8
All feedlots	*82,170*	*100.0*	*13,851*	*100.0*	*26,449*	*100.0*

Source: USDA–NASS.

TABLE A1.6: Hog and pig production, 2007 and 2008

	2007	2008
December 1 inventory (1,000 head)		
Breeding	6,233	6,061
Market	61,944	61,087
All hogs and pigs	*68,177*	*67,148*
Operations with hogs and pigs	75,450	73,150
Size of operation	**Percentage operations (percentage inventory)**	
1–99 head	69.5 (0.9)	69.3 (0.9)
100–499 head	9.4 (2.7)	9.2 (2.5)
500–999 head	4.8 (3.7)	4.8 (3.5)
1,000–1,999 head	5.4 (8.2)	5.4 (8.0)
2,000–4,999 head	7.1 (24.4)	7.3 (24.0)
≥ 5,000 head	3.8 (60.1)	4.0 (61.1)
Total	*100.0 (100.0)*	*100.0 (100.0)*
Pig crop (1,000 head)		
December–November[1]	112,874	114,667
Pigs per litter		
December–November[1]	9.22	9.41
Deaths (1,000 head)	9,021	9,086
Slaughtered (1,000 head), federally inspected		
Barrows and gilts	104,352	111,461
Sows	3,309	3,502
Stags and boars	477	458
Other	1,033	1,031
Total commercial slaughter	[2]109,172	116,452
Farm slaughter	106	106
Total slaughter	*109,278*	*116,558*
Value of production ($1,000)	**13,468,332**	**14,435,204**

Source: USDA–NASS.

[1] December of the preceding year.

[2] Sum of categories may not add to total due to rounding.

TABLE A1.7: Sheep and goat production in the United States, 2007 and 2008

	2007	2008
Sheep inventory on January 1 of following year (1,000 head)		
Ewes 1 year old and older	3,540	3,404
Rams 1 year old and older	195	195
All sheep and lambs	5,950	5,747
Operations with sheep	83,130	82,330
Size of operation	**Percentage operations (percentage inventory)[1]**	
1–99 head	92.5 (32.9)	92.5 (32.6)
100–499 head	6.1 (21.4)	6.2 (22.7)
500–4,999 head	1.3 (31.9)	1.2 (30.2)
≥ 5,000	0.1 (13.8)	0.1 (14.5)
Total	*100.0 (100.0)*	*100.0 (100.0)*
Lamb crop (1,000 head)	3,895	3,710
Deaths—sheep (1,000 head)	246	249
Deaths—lambs (1,000 head)	426	416
Slaughtered (1,000 head), federally inspected		
Mature sheep	116	122
Lambs	2,413	2,271
Other	165	162
Total commercial slaughter	*2,694*	*22,556*
Farm slaughter	*85*	*92*
Total slaughter	*2,779*	*2,648*
Wool production		
Sheep shorn (1,000 head)	4,657	4,434
Shorn wool production (1,000 lb)	34,723	32,963
Value of wool production ($1,000)	30,242	32,486
Value of production ($1,000)		
Sheep	362,941	350,179
Wool	30,242	32,486
Total	393,183	382,665
Goat inventory on January 1 of following year (1,000 head)		
Does, 1 year old and older		
Angora	141	132
Milk	206	215
Meat and other	1,575	1,550
All	*1,922*	*1,897*

continued

	2007	2008
Bucks		
Angora	11	10
Milk	22	21
Meat and other	154	154
All	*187*	*185*
All		
Angora	205	185
Milk	323	335
Meat and other	2,590	2,550
All goats	*3,118*	*3,070*
Operations with goats		
Angora	7,190	6,500
Milk	27,400	29,000
Meat and other	123,200	128,800
All	*144,510*	*149,800*
Kid crop		
Angora	109	96
Milk	230	240
Meat and other	1,662	1,627
All	*2,001*	*1,963*

Source: USDA–NASS.

[1] End-of-year survey for breeding sheep (inventory).

TABLE A1.8: Poultry production in the United States, 2007 and 2008

	2007	2008
December 1 total layers (1,000 head)	346,613	339,642
Annual average number of layers (1,000 head)	346,498	339,572
Eggs per layer	263	266
Total egg production (million eggs)	91,101	90,151
Number of broilers produced (1,000 head)	8,906,700	9,009,100
Number of chickens lost (1,000 head)	101,152	101,828
Number of turkeys raised (1,000 head)	266,828	273,088
Number slaughtered (1,000 head)		
Chickens—young	8,903,071	8,921,265
Chickens—mature	132,549	153,996
Chickens—total	*9,035,620*	*9,075,261*
Turkeys—young	262,748	269,145
Turkeys—old	2,178	2,100
Turkeys—total	*264,926*	*271,245*
Ducks	*27,311*	*24,149*
Value of production ($1,000)		
Broilers	21,513,536	23,112,184
Eggs	6,718,853	8,225,486
Turkeys	3,954,472	4,477,054
Chickens (value of sales)	51,498	61,845
Total	*32,238,359*	*35,876,569*

Source: USDA–NASS.

TABLE A1.9: Equine production in the United States, 1997, 1998, 2002, and 2007

	1997[1]	1998[1]	2002[2]	2007
Inventory on January 1 of following year (1,000 head)				
All equids	5,250	5,317		
On farms	[2]3,200	NA	[3]3,750	[4]4,313
On nonfarms	2,050	NA		
Number sold	540	558		
Value of sales ($1,000)	1,641,196	1,753,996		

[1] USDA-NASS (March 2, 1999).

[2] The 2002 Census of Agriculture revised the 1997 number of all equids to 3,143,328 head.

[3] The 2002 Census of Agriculture reported 3,644,278 head of horses and ponies located on 542,223 farms. In addition, there were 105,358 mules, burros, and donkeys reported. The combination rounds to 3,750,000.

[4] The 2007 Census of Agriculture reported 4,028,827 head of horses and ponies located on 575,942 farms. In addition, there were 283,806 mules, burros, and donkeys reported. The combination rounds to 4,313,000.

TABLE A1.10: Catfish and trout production in the United States, 2007 and 2008

	2007	2008
Catfish		
Number of fish on January 1 of following year (1,000)		
Foodsize	321,840	308,796
Stockers	688,844	586,069
Fingerlings	951,910	728,340
Broodfish	801	704
Number of operations on January 1 of following year	1,617	1,306
Sales ($1,000)		
Foodsize	423,736	389,290
Stockers	6,831	8,338
Fingerlings	23,073	12,076
Broodfish	953	294
Total sales	*454,593*	*409,998*
Trout		
Number of fish sold (1,000)		
≥ 12 inches	58,674	40,401
6-12 inches	5,411	4,608
1-6 inches	10,147	9,525
Sales ($1,000)		
≥ 12 inches	79,523	72,432
6-12 inches	6,522	5,777
1-6 inches	1,811	1,500
Total sales	*87,856*	*79,709*
Eggs sold		
Number of eggs (1,000)	399,414	364,982
Total value of sales ($1,000)	7,620	6,647
Total value of fish sold plus value of eggs sold ($1,000)	95,476	86,356
Number of operations selling trout	525	463
Number of operations selling or distributing trout, or both	1,124	1,018

Source: USDA–NASS.

TABLE A1.11: Honey production[1] in the United States, 2007 and 2008

	2007	2008
Honey-producing colonies (1,000)	2,443	2,301
Yield per colony (lb)	60.7	69.9
Production (1,000 lb)	148,341	160,861
Stocks on December 15 (1,000 lb)	52,635	50,445
Value of production ($1,000)	159,763	226,814

Source: USDA–NASS.

[1] For producers with five or more colonies.

TABLE A1.12: Production data on miscellaneous livestock, 2007

Commodity	Number of farms	Inventory	Number sold
Milk goats	27,481	334,754	102,775
Angora goats	7,215	204,106	50,017
Meat and other goats	123,278	2,601,669	1,234,784
All goats	144,466	3,140,529	1,387,576
Mules, burros, donkeys	99,746	283,806	32,467
Mink	290	1,507,719	2,811,470
Rabbits	27,137	616,129	979,563
Ducks	31,391	3,984,982	27,321,288
Geese	18,869	177,812	161,133
Pigeons or squab	5,369	531,489	1,294,163
Pheasants	5,313	3,773,593	10,876,586
Quail	3,983	10,611,067	39,968,045
Emus	3,621	28,443	6,540
Ostriches	714	11,188	5,697
Bison	4,499	198,234	62,890
Deer	5,654	269,537	44,210
Elk	1,917	68,251	13,049
Llamas	26,060	122,680	12,704

Source: USDA–NASS 2007 Census of Agriculture.

TABLE A1.13: Slaughter statistics, 2008

Commodity	Federally inspected plants (no.)	Slaughter in federally inspected plants (1,000 head)[1]	Slaughter in State-inspected or custom-exempt plants (1,000 head)
Cattle	630	33,805.1	559.8
Calves	251	942.0	14.5
Hogs	618	115,420.7	1,031.2
Sheep and lambs	496	2,393.5	162.1
Goats	412	670.7	195.1
Bison	133	54.8	15.3

Source: USDA–NASS Livestock Slaughter 2008 Summary, March 2009.

[1] Includes data for the calendar year.

APPENDIX 2

Diseases in the United States Reportable to the World Organization for Animal Health (OIE)

TABLE A2.1: Status of the occurrence of OIE-reportable diseases in the United States, 2008

Disease	Status	Date of last occurrence/Notes
Multiple-species diseases		
Anthrax	Present	Sporadic/limited distribution
Aujeszky's disease	Present	Sporadic (in feral or noncommercial animals)/limited distribution/national program/no detections in commercial production swine herds in 2008
Bluetongue	Present	Sporadic/limited distribution
Brucellosis *(Brucella abortus)*	Present	Sporadic/limited distribution—primarily limited to wildlife in the Greater Yellowstone National Park area/national eradication program
Brucellosis *(Brucella melitensis)*	Free	1999
Brucellosis *(Brucella suis)*	Present	Sporadic (in feral or noncommercial animals)/limited distribution/national eradication program/no detections in commercial production swine herds in 2008
Crimean Congo haemorrhagic fever	Free	Never occurred
Echinococcosis/Hydatidosis	Present	Sporadic (uncommon in all species)/one detection in sheep reported in 2008
Foot-and-mouth disease	Free	1929
Heartwater	Free	Never occurred
Japanese encephalitis	Free	Never occurred
Leptospirosis	Present	
New World screwworm	Free	1982
Old World screwworm	Free	Never occurred
Paratuberculosis (Johne's disease)	Present	National control program
Q fever	Present	Sporadic
Rabies	Present	
Rift Valley fever	Free	Never occurred
Rinderpest	Free	Never occurred

Disease	Status	Date of last occurrence/Notes
Trichinellosis	?	Sporadic (in feral, wild animals)/limited distribution/ national control program/no detections reported in 2008
Tularemia	Present	Sporadic (primarily in feral animals)/limited distribution
Vesicular stomatitis	Absent during reporting period	2006–bovine/no detections reported in 2008
West Nile fever/encephalitis	Present	
Cattle diseases		
Bovine anaplasmosis	Present	
Bovine babesiosis	Free	Limited distribution (endemic in the territories of Puerto Rico and the U.S. Virgin Islands; last occurrence on the U.S. mainland was in 1943)
Bovine genital campylobacteriosis	Present	Sporadic/limited distribution
Bovine spongiform encephalopathy	Controlled	2006/no detections reported in 2008 risk
Bovine tuberculosis	Present	Sporadic/limited distribution/national eradication program
Bovine viral diarrhea	Present	
Contagious bovine pleuropneumonia	Free	1892
Enzootic bovine leucosis	Present	
Hemorrhagic septicemia	?	Sporadic/limited distribution (bison)/no detections reported in 2008
Infectious bovine rhinotracheitis/ infectious pustular vulvovaginitis	Present	
Lumpy skin disease	Free	Never occurred
Malignant catarrhal fever (wildebeest only)	One outbreak	April 2008—one event in multifaceted cattle-producing ranch (OIE immediate followup reports—event resolved December 3, 2008)
Theileriosis	Free	Never occurred
Trichomonosis	Present	
Trypanosomosis	Free	Never occurred
Sheep and goat diseases		
Caprine arthritis/encephalitis	Present	
Contagious agalactia	Present	Sporadic (non-Mediterranean form)/limited distribution
Contagious caprine pleuropneumonia	Free	Never occurred
Enzootic abortion of ewes (ovine chlamydiosis)	Present	Sporadic/limited distribution
Maedi-visna	Present	Sporadic/limited distribution
Nairobi sheep disease	Free	Never occurred
Ovine epididymitis *(Brucella ovis)*	Present	Sporadic/limited distribution
Peste des petits ruminants	Free	Never occurred
Salmonellosis *(S. abortusovis)*	?	Sporadic/limited distribution/no detections reported in 2008
Scrapie	Present	National eradication program
Sheep pox and goat pox	Free	Never occurred

continued

Disease	Status	Date of last occurrence/Notes
Equine diseases		
African horse sickness	Free	Never occurred
Contagious equine metritis	One outbreak	One event December 2008 (OIE immediate followup reports—event is continuing)
Dourine	Free	1934
Equine encephalomyelitis (Eastern)	Present	Sporadic/limited distribution
Equine encephalomyelitis (Western)	?	Sporadic/limited distribution/no detections in 2008
Equine infectious anemia	Present	Sporadic/limited distribution/national control program
Equine influenza	Present	Sporadic/limited distribution
Equine piroplasmosis	One event	One event August 2008 (OIE immediate report followup reports—event resolved February 23, 2009)
Equine rhinopneumonitis	Present	Sporadic/limited distribution
Equine viral arteritis	Present	Sporadic/limited distribution
Glanders	Free	1942
Surra *(Trypanosoma evansi)*	Free	Never occurred
Venezuelan equine encephalomyelitis	Free	1971
Swine diseases		
African swine fever (hog cholera)	Free	Never occurred
Classical swine fever	Free	1976
Nipah virus encephalitis	Free	Never occurred
Porcine cysticercosis	Absent during reporting period	2004
Porcine reproductive and respiratory syndrome	Present	
Swine vesicular disease	Free	Never occurred
Transmissible gastroenteritis	Present	
Avian diseases		
Avian chlamydiosis	Present	Sporadic (in wild, pet, and backyard birds)/limited distribution/no detections in commercial production flock detections in 2008
Avian infectious bronchitis	Present	
Avian infectious laryngotracheitis	Present	Sporadic (primarily vaccine-related)/limited distribution
Avian mycoplasmosis *(M. gallisepticum)*	Present	Sporadic/limited distribution/All commercial poultry breeding flocks are under a surveillance program to confirm infection-free status. Commercial table-egg layers may be vaccinated.
Avian mycoplasmosis *(M. synoviae)*	Present	Sporadic/limited distribution/All commercial poultry breeding flocks are under a surveillance program to confirm infection-free status. Commercial table-egg layers may be vaccinated.
Duck viral hepatitis	Free	1998
Fowl cholera *(Pasteurella multocida)*	Present	
Fowl typhoid *(Salmonella gallinarum)*	Free	1981

Disease	Status	Date of last occurrence/Notes
Highly pathogenic avian influenza	Free	2004
Infectious bursal disease (Gumboro disease)	Present	Sporadic/limited distribution
Low pathogenic avian	Identification influenza (poultry)	Nonclinical event June 2008, H7N3, identified on routine preslaughter surveillance as part of the National Poultry Improvement Plan (NPIP) Avian Influenza Clean Program (OIE immediate followup reports—event resolved July 15, 2008) Nonclinical event September 2008, H5N8, identified in game birds that were bred and used for hunting (OIE immediate followup reports—event resolved November 4, 2008)
Marek's disease	Present	
Newcastle disease (neurotropic and viscerotropic strains)	Free	2003
Pullorum disease *(Salmonella pullorum)*	Present	One detection reported in backyard poultry in 2008/ sporadic/limited distribution (backyard poultry)/no detections in commercial production flock detections in 2008
Turkey rhinotracheitis	Present	Sporadic/limited distribution
Lagomorph diseases		
Myxomatosis	?	No detections reported in 2008
Rabbit hemorrhagic disease	Present	February 2008—one event in a noncommercial, pet-related incident (OIE immediate report)
Bee diseases		
Acarapisosis of honey bees	Present	Sporadic/limited distribution
American foulbrood of honey bees	Present	
European foulbrood of honey bees	Present	
Small hive beetle infestation *(Aethina tumida)*	Present	Sporadic/limited distribution
Tropilaelaps infestation of honey bees	Free	Never occurred
Varroosis of honey bees	Present	
Other listed disease		
Camelpox	Free	Never occurred
Leishmaniasis	?	No detections reported in 2008
Status of aquatic animal diseases in the United States		
Fish		
Epizootic hematopoietic necrosis	Free	Never occurred
Epizootic ulcerative syndrome	Free	2004 (in wild species)
Gyrodactylosis *(Gyrodactylus salaries)*	Free	Never occurred
Infectious hematopoietic necrosis	Present	Sporadic/limited distribution
Infectious salmon anemia	Free	2006
Koi herpesvirus disease	Present	
Red Sea bream iridoviral disease	Free	Never occurred

continued

Disease	Status	Date of last occurrence/Notes
Spring viremia of carp	Identification of the presence of infection/infestation	Confirmed infestation (in wild species)/no clinical disease
Viral hemorrhagic septicemia	Present	Sporadic (in wild species)/limited distribution
Molluscs		
Abalone viral mortality	Free	Never occurred
Infection with *Bonamia exitiosus*	Free	Never occurred
Infection with *Bonamia ostrae*	Free	2006
Infection with *Marteilia refringens*	Free	Never occurred
Infection with *Microcytos roughleyi*	Free	Never occurred
Infection with *Perkinsus marinus*	Present	Sporadic (in wild species)/limited distribution
Infection with *Perkinsus olseni*	Free	Never occurred (imported detection in 2008)
Infection with *Xenohaliotis californiensis*	Free	2006
Crustaceans		
Crayfish plague *(Aphanomyces astaci)*	Free	
Infectious hypodermal and haemotopoietic necrosis	Free	
Infectious myonecrosis	Free	Never occurred
Spherical baculovirosis *(Penaeus monodon*-type baculovirus)	Free	Never occurred
Taura syndrome	Absent during reporting period	
Tetrahedral baculovirosis *(Baculovirus penaei)*	Free	2006
White spot disease	Present	June 2008—one event detected in Whiteleg shrimp *(Litopenaeus vannamei)*, shrimp farm located on Kauai Island, Hawaii, (OIE immediate report)/Sporadic/limited distribution
White tail disease	Free	Never occurred
Yellowhead disease	Absent during reporting period	No detections reported in 2008

Sporadic = occurring only occasionally. Limited distribution = limited geographic distribution.

? = presence of the disease suspected but not confirmed.

Free = negative occurrence of the disease.

APPENDIX 3

Animal Health Contacts in the United States

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APPENDIX 4

Acronyms and Abbreviations

3D	Depopulation, disposal, and decontamination
AAEP	American Association of Equine Practitioners
AAVLD	American Association of Veterinary Laboratory Diagnosticians
AHE	Animal health emergency
AHSM	Animal Health and Surveillance Management
AHT	Animal health technician
AI	Avian influenza
AMS	Agricultural Marketing Service
APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
AVIC	Area Veterinarian-in-Charge
AVMA	American Veterinary Medical Association
BMST	Brucellosis milk surveillance test
BSE	Bovine spongiform encephalopathy
BSL	Biosafety level
BT	Bluetongue
BTV	Bluetongue virus
BVD	Bovine viral diarrhea
BVDV	Bovine viral diarrhea virus
CDC	Centers for Disease Control and Prevention
CDFA	California Department of Food and Agriculture
CEM	Contagious equine metritis
CFTEP	Cattle Fever Tick Eradication Program
CNS	Central nervous system
CSF	Classical swine fever
CVB	Center for Veterinary Biologics
CWD	Chronic wasting disease
EHD	Epizootic hemorrhagic disease
EHDV	Epizootic hemorrhagic disease virus
EEE/WEE	Eastern and western equine encephalitis
EHM	Equine herpesvirus myeloencephalopathy
EHV-1	Equine herpesvirus type 1
EIA	Equine infectious anemia
ELISA	Enzyme-linked immunosorbent assay
EMRS	Emergency Management Response System
END	Exotic Newcastle disease
EP	Equine piroplasmosis
FAD	Foreign animal disease

FADDL	Foreign Animal Disease Diagnostic Laboratory
FDA	Food and Drug Administration
FMD	Foot-and-mouth disease
FSIS	Food Safety and Inspection Service
FY	Fiscal year
GYA	Greater Yellowstone area
HL7	Health level 7
HPAI	Highly pathogenic avian influenza
HSPD-9	Homeland Security Presidential Directive-9
IBMP	Interagency Bison Management Plan
IBR	Infectious bovine rhinotracheitis
ICLN	Interagency Consortium of Laboratory Networks
ISA	Infectious salmon anemia
IT	Information technology
JMOC	Joint Modeling Operations Center
LBM	Live bird market
LBMS	Live bird marketing system
LPAI	Low-pathogenicity avian influenza
LPNAI	Low-pathogenicity notifiable avian influenza
MAP	*Mycobacterium avium paratuberculosis*
MCF	Malignant catarrhal fever
MCI	Market Cattle Identification
MRSA	Methicillin-resistant *Staphylococcus aureus*
NADC	National Animal Disease Center
NAHERC	National Animal Health Emergency Response Corps
NAHLN	National Animal Health Laboratory Network
NAHMS	National Animal Health Monitoring System
NAHRS	National Animal Health Reporting System
NAHSS	National Animal Health Surveillance System
NARMS	National Antimicrobial Resistance Monitoring System
NASS	National Agricultural Statistics Service
NBAF	National Bio- and Agro-Defense Facility
NCAHEM	National Center for Animal Health Emergency Management
NCC	National Chicken Council
NPIP	National Poultry Improvement Plan
NSU	National Surveillance Unit
NVAP	National Veterinary Accreditation Program
NVS	National Veterinary Stockpile
NVSL	National Veterinary Services Laboratories
OIE	World Organization for Animal Health
PCR	Polymerase chain reaction
PFGE	Pulsed-field gel electrophoresis
PI3	Parainfluenza type 3
PRRS	Porcine reproductive and respiratory syndrome

PRV	Pseudorabies virus
rRT–PCR	Real-time Reverse-transcriptase–polymerase chain reaction
RSSS	Regulatory Scrapie Slaughter Surveillance
RVF	Rift Valley fever
SCWDS	Southeastern Cooperative Wildlife Diseases Study
SFCP	Scrapie Flock Certification Program
SIV	Swine influenza virus
TAHC	Texas Animal Health Commission
TAIO	Tool for Assessment of Intervention Options
TB	Tuberculosis
UGBA	United Gamefowl Breeders Association
UM&R	Uniform methods and rules
USAHA	United States Animal Health Association
USDA	U.S. Department of Agriculture
USTCP	U.S. Trichinae Certification Program
VHS	Viral hemorrhagic septicemia
VMO	Veterinary medical officer
VS	Veterinary Services; vesicular stomatitis
VSPS	Veterinary Services process streamlining
WNV	West Nile virus
WS	Wildlife Services

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