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Feedback

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Foreword

I am pleased to introduce the 2007 United States Animal Health Report. This is the fourth annual report produced by the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) on the status of animal health in the United States.

The report includes updates on new and existing programs, conducted by APHIS' Veterinary Services (VS) staff, that seek to maintain healthy livestock, poultry, and aquaculture populations. In addition, the report presents information about emergency management efforts, highlights key epidemiological events of 2007, and provides an overview of the Nation's animal health surveillance activities.

Throughout the report, we present updates on activities and events that reflect the VS program mission, which is to protect animal health and facilitate safe agricultural trade. This year we devote Chapter 1 to a number of strategic areas specific to the VS mission, including emergency planning and preparedness; avian influenza surveillance; aquatic health; national animal identification; and comprehensive, integrated animal-health surveillance. In addition, Chapter 1 covers some of the significant animal health and epidemiological events that occurred in 2007.

Chapters 2, 3, and 4 provide comprehensive information about how VS is working to carry out the goals of the National Animal Health Surveillance System. Chapter 2 describes early detection and global risk surveillance for foreign and emerging diseases. Chapter 3 covers animal disease eradication programs as well as control and certification programs, and Chapter 4 describes monitoring and surveillance for other diseases that affect production and marketing.

A new addition this year is a chapter devoted to animal health diagnostics and veterinary biologics (Chapter 5) to describe in detail these fundamental components of the VS infrastructure and how they enhance animal health in the United States. As in previous reports, we include an overview of the U.S. livestock, poultry, and aquaculture industries (Chapter 6), as well as information on the ever-changing landscape of U.S. trade in animals and animal products (Chapter 7). Chapter 8 highlights some of the programs and efforts essential to the VS mission, including the National Veterinary Accreditation Program; VS information technology and data systems; and, important tools, methods, and models that VS has developed to improve our efficiency.

Expanding international and domestic collaborative efforts and capacity-building activities is essential to our VS mission. The changing global environment and increasing potential for disease spread have highlighted the need to look beyond our borders to protect the health of U.S. animals. Chapter 9 looks at some of these important partnerships, activities, and efforts that are underway both overseas and throughout our nation. We in VS, and APHIS employees in other units, are proud of the numerous training, education, and outreach programs in place throughout the world to protect animal and human health.

The 2007 Animal Health Report is intended to offer an in-depth look at the status of USDA programs and strategies that help ensure the health of U.S. livestock, poultry, and aquaculture. I believe you will find it a useful animal-health information guide, and I invite and welcome your comments and ideas for future reports. Information on how to provide feedback and contact details are on the inside front cover.

—John Clifford
Deputy Administrator
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CHAPTER 1

CHAPTER 1

Veterinary Services Strategic Program Highlights

As part of the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) carries out USDA's animal health safeguarding mission and facilitates safe agricultural trade. As an animal health organization, VS is engaged and vigilant across the full spectrum of animal health issues.

Through its surveillance and emergency response activities, and enhanced by an expanding network of partners, VS safeguards the Nation's animals, animal products, and veterinary biologics by preventing, controlling, and/or eliminating animal diseases, and monitoring and promoting animal health and productivity.

In addition, APHIS-VS has identified a number of specific focus areas as central to its mission. In this chapter, we will explore these areas in addition to significant animal health events that occurred in 2007. These focus areas include

- Emergency Planning and Preparedness,
- Avian Influenza Surveillance,
- The National Aquatic Animal Health Plan,
- The National Animal Identification System, and
- The National Animal Health Surveillance System.

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. USDA-APHIS is designated the lead Federal agency for prevention or mitigation of AHEs in the United States.

APHIS-VS' National Center for Animal Health Emergency Management (NCAHEM) provides leadership in ensuring rapid detection of FADs, should they occur, and responding effectively to control or eradicate them. NCAHEM develops strategies and policies for effective incident management and coordination of incident responses. During an emergency, NCAHEM is responsible for deployment of critical veterinary supplies and personal protective equipment from the National Veterinary Stockpile (NVS) to responders within 24 hours.

Four Pillars of Emergency Management

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

Pillar 1: Preparedness and Communication— Preparedness for a rapid response to disease outbreaks is increasingly important in our global environment. NCAHEM develops flexible guidance and response plans that can readily be adapted to address any animal disease or pest situation. To ensure that these plans reflect current thinking, NCAHEM builds and maintains a communications structure involving various entities and organizations—ranging from Federal and State agencies to national and regional animal health associations.

APHIS has the authority to coordinate response efforts for incidents involving animal diseases. If a disease agent threatens human health or U.S. critical infrastructure, or if the characteristics of the incident suggest agroterrorism, USDA's Office of Homeland Security will call upon the U.S. Department of Homeland Security (DHS) to assist APHIS.

Pillar 2: Surveillance and Detection—Despite all prevention efforts, agents that cause an FAD may enter the United States. Effective surveillance and rapid detection provide for the most expedient response to disease agents. NCAHEM personnel work closely with those responsible for disease surveillance, diagnostic services, and onsite investigations to facilitate information exchange and establish whether an FAD is present.

When a potential FAD is reported, foreign animal disease diagnosticians are rapidly deployed through area or State offices to conduct an investigation and procure samples, usually for next-day laboratory analysis. About 400 such investigations are performed annually, with only a small number resulting in an assessment that indicates a possible FAD. (See Chapter 2 for more information on FADs.) Awareness and reporting of suspect FADs by producers, livestock owners, and veterinarians play an important role in surveillance and the initiation of appropriate response and control actions.

To further support national emergency response planning, NCAHEM has taken a leadership role on the APHIS Emergency Management Leadership Council (EMLC). The EMLC was established to provide cross-unit coordination, direction, and priority setting for agency-wide emergency management activities. Its efforts to adapt and refine automated systems that track and ensure availability of needed personnel, equipment, and supplies will facilitate an effective and coordinated emergency response in the future.

Pillar 3: Response and Containment—When an FAD is detected in the United States, NCAHEM takes immediate action to eradicate it. Responding to quickly contain the disease agent is central to the VS mission. During an FAD incident, APHIS-VS provides leadership and coordination with field operations to contain the disease agent through the use of animal movement control, premises quarantines, biosecurity measures, vector control, depopulation, and, if warranted, vaccination.

In compliance with Federal and State guidelines, APHIS-VS implements the Incident Command System (ICS), a well-established command and control structure that serves as a management framework and provides standardized terminology, training, and qualified personnel—judged by training and experience—for emergency response. ICS is all-inclusive and allows people from various local agencies, private industry, and multiple Federal agencies to work together with a common goal and mission. In addition to coordinating incident response, NCAHEM provides guidance to all levels of government on the range of options for infection control and containment.

Pillar 4: Recovery and Continuity of Animal Agriculture Operations—After an AHE is confirmed and animal or animal-product movement control plans are developed, recovery is an ongoing priority for NCAHEM. Maintaining product movement in relatively unaffected sectors during an emergency and restoring movement to affected sectors are critical business concerns. Proposals for implementing movement control plans are being developed in collaboration with State, Federal, and industry partners.

In 2007, NCAHEM met with several industry groups to gather information and input to advance response efforts and improve existing processes on a commodity-by-commodity basis. The resulting response plans will consider the products or circumstances of each industry. For example, APHIS began working with egg producers after the exotic Newcastle disease (END) outbreak to develop movement protocols for eggs and egg products in the event of an avian influenza (AI) outbreak.

2007 Emergency Management Activities and Accomplishments

Disease outbreaks throughout the past several years have demonstrated the critical need for surge capacity personnel during an AHE. 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. In 2001, 145 NAHERC responders deployed to the foot-and-mouth disease (FMD) outbreak in the United Kingdom. In 2003, 340 NAHERC personnel assisted in the END outbreak in California, and 71 NAHERC personnel responded to a Virginia low pathogenic avian influenza (LPAI) outbreak.

Recent improvements to this growing initiative include a simplified application process through USAJobs, an Internet Web site. NCAHEM's new program coordinator and an outreach contractor further promoted NAHERC, building strategic alliances with State response teams and veterinary schools.

National Veterinary Stockpile

In February 2004, President George W. Bush issued Homeland Security Presidential Directive–9 (HSPD–9), which established the NVS. HSPD–9 reflects concerns that terrorists could simultaneously, and in multiple locations, release catastrophic animal diseases. The mission of the NVS is to deliver critical veterinary supplies nationwide within 24 hours.

In 2007, NVS staff finished projects designed to expand capacity and decrease response time. These projects included completing contracts with vendors to provide qualified personnel, equipment, and supplies when existing resources are insufficient. The NVS added the following:

- Personal protective equipment (PPE) and antiviral medications to protect 3,000 responders for 40 days;
- Satellite communication equipment to provide each team with voice and data capabilities for 10 people;
- Emergency air and ground transportation to ensure deployment within 24 hours; and,
- Portable vaccine storage containers for field use.

In April 2007, the NVS issued its first operational guide to help Federal, State, and local officials plan for NVS products and services. An exercise support package was developed to help States test their plans. In October 2007, the first full-scale physical exercise was held in Iowa.

Avian Influenza Preparedness

The outbreaks of highly pathogenic avian influenza (HPAI) subtype H5N1 in Asia, Europe, and Africa have increased attention on AI surveillance in the United States. Because of heightened animal- and public-health concerns, the poultry industry and State and Federal animal-health regulatory agencies are continuing efforts to increase biosecurity measures and conduct extensive surveillance for HPAI as well as H5/H7 LPAI in commercial poultry, live-bird markets, and poultry raised in nonconfinement operations.

For many years, APHIS has partnered with other Federal agencies, as well as States and the commercial poultry industry, to conduct surveillance efforts for notifiable avian influenza (NAI). By World Organization for Animal Health (OIE) definition, all H5/H7 subtypes and all HPAI strains are NAI. APHIS implemented strategies to strengthen existing NAI surveillance where necessary in 2006 and continued the enhanced surveillance efforts in 2007. (See Chapter 2 for more information on AI surveillance.)

In addition, in partnership with the U.S. Department of the Interior's (DOI) U.S. Geological Survey (USGS) and U.S. Fish and Wildlife Service (FWS), APHIS-Wildlife Services monitors wild birds for AI. Bird banding data are used in conjunction with U.S. Census of Agriculture data, compiled by USDA's National Agricultural Statistics Service (NASS), to rank counties with a high prevalence of domestic poultry production and relatively high numbers of migrant waterfowl. This allows APHIS to identify areas of critical concern and to determine where there are concentrations of migratory waterfowl located near commercial poultry operations.

In 2007, APHIS' NCAHEM increased its AI preparedness by refining response plans and strengthening existing core programs. The APHIS National HPAI Response Plan was a key accomplishment. The new guidelines include an updated definition of HPAI, clarified payment-for-damages information, and guidance on the use of foam to safely depopulate affected animals. The National HPAI Response Plan is available on the APHIS Internet Web site, *http://www.aphis.usda.gov/newsroom/hot_issues/avian_influenza/avian_influenza.shtml*.

APHIS' AI efforts are organized to meet the preparedness, surveillance, and response goals specified in the National Strategy for Pandemic Influenza document published by the U.S. Homeland Security Council. APHIS has streamlined its domestic activities into three functional areas: domestic bird surveillance and diagnostics, wild bird surveillance, and preparedness. NCAHEM improved its continuity of business, mitigation, and recovery planning efforts for the poultry industry to ensure an integrated, synchronized emergency response in the event of an HPAI incident or outbreak.

Through the Joint Modeling Operations Center, funded by USDA and DHS, NCAHEM helps develop epidemiologic and economic models to study the potential impact of FAD outbreaks in U.S. livestock. Additional preparedness activities are designed to help AHE responders sharpen their skills and test their readiness for an HPAI outbreak.

In 2007, NCAHEM and regional VS staff provided logistical, operational, planning, financial, and administrative assistance to seven LPAI incidents in six States. NCAHEM demonstrated the ability to deploy PPE and disinfectants from the NVS within 24 hours. NCAHEM also deployed contractors to conduct depopulation, decontamination, and disposal functions to two of the incidents.

National Animal Identification System

From its inception, the National Animal Identification System (NAIS) has been a State-Federal-industry partnership that has evolved to meet producer needs. That partnership continued to grow in 2007. The goals of this voluntary, nationwide system are to limit the spread of animal diseases, minimize animal losses and economic impact, and protect producers' livelihoods.

NAIS has three components: premises registration, animal identification, and animal tracing. Through NAIS, APHIS' ultimate, long-term goal is to be able to retrieve traceback data within 48 hours of detection of an FAD or domestic animal disease of concern.

NAIS provides the opportunity for producers that are not part of the disease program to voluntarily participate in national animal health safeguarding efforts.

Premises Registration

Registering premises, or locations where livestock are housed or kept, provides animal health officials with the key information needed to conduct disease investigations quickly and efficiently. At the close of 2007, more than 439,000 premises in U.S. States, Tribes, and territories had been registered. This total represents more than 31 percent of the estimated number of premises nationwide.

In addition, by the end of 2007, 12 States had registered more than 50 percent of their estimated number of premises: Idaho, Indiana, Massachusetts, Michigan, Nebraska, Nevada, New York, North Dakota, Pennsylvania, Utah, West Virginia, and Wisconsin. Other States have made substantial progress in numbers of premises registered. They include Alabama, California, Georgia, Illinois, Iowa, Kentucky, Missouri, North Carolina, Ohio, Oklahoma, South Carolina, Tennessee, and Texas.

Animal Identification

Additional NAIS-compliant identification devices were approved in 2007, including the first injectable transponder for use in horses, llamas, and alpacas. There are now eight approved devices from five manufacturers. USDA has purchased 1.5 million NAIS-compliant tags for use in State/Federal animal disease program work.

Animal Tracing

In 2007, the animal tracing component moved from development to the operational stage. Two animal tracking databases were approved and became operational, while several others were in the review process.

Education and Outreach

Working with partners on outreach was key to NAIS success in 2007. Cooperative agreements to promote premises registration and animal identification were signed between NAIS and a number of influential agriculture groups. In addition, NAIS staff held meetings with underrepresented groups and began expanding outreach in those communities. NAIS representatives also encourage outreach and communication through participation in a number of important industry meetings and trade shows.

For its State, Tribal, and industry partners, the NAIS program implemented some new tools, including monthly conference calls, a Web-based collaboration site, and training resources.

Business Plan

In December 2007, NAIS released "A Business Plan to Advance Animal Disease Traceability." The plan identifies seven key strategies for achieving a comprehensive traceability infrastructure:

Strategy 1: Prioritize NAIS Implementation by Species/Sectors—The establishment of priorities among species—and sectors within species—will ensure that resources are applied based on the need for traceability. Priority species include the primary commercial food animals: cattle, poultry (chickens and turkeys), swine, sheep, and goats. Sectors within each species have also been prioritized; for example, the beef and dairy sectors are the highest priorities within the cattle species. Additionally, horses that require either a Certificate of Veterinary Inspection or a test for equine infectious anemia are also included as a priority. Because of their frequent movements and potential for commingling, horses present an increased risk of disease transfer.

Strategy 2: Harmonize Animal Identification Programs—The need for unique animal identification in government and industry programs is widely recognized. As a result, producers are seeking improved and flexible identification methods and compatible processes. The harmonization of existing animal identification systems will result in more cost-effective options, benefiting producers while improving animal traceability.

Strategy 3: Standardize Data Elements of Disease Programs to Ensure Compatibility—USDA will standardize data elements in existing disease programs, including international and interstate commerce regulations. This improvement will greatly enhance animal disease tracing and

emergency response capabilities. A consistent data format will help identify premises that import and export livestock, locations that participate in official disease control programs, and origin and destination premises listed on interstate Certificates of Veterinary Inspection.

Strategy 4: Integrate Automated Data-Capture Technology with Existing Disease Programs—By using NAIS-compliant identification devices that support automated data-capture technology and handheld computers/readers to replace paper-based forms, animal health officials will be able to electronically record and submit essential data to the appropriate animal health databases. The electronic collection of data will increase volume and quality of data, minimize data errors, and speed data entry into a searchable database.

Strategy 5: Partner with States, Tribes, and Territories—State, Tribal, and territorial animal health authorities play a critical role in advancing national animal disease traceability. Working closely with these officials, USDA will continue to facilitate the development of each State's disease traceability infrastructure.

Strategy 6: Collaborate with Industry—USDA has entered into cooperative agreements with nonprofit industry organizations to promote premises registration within various species groups. Collaboration with USDA-accredited veterinarians will increase the delivery of accurate information from veterinarians to clients and encourage the adoption of NAIS at the producer level. Additional partnership efforts with industry alliances, service providers, auction markets, feedlots, harvesting facilities, and other industry sectors are a priority.

Strategy 7: Advance Identification Technologies—Continued advancements in traceability require practical, affordable technology solutions that improve the efficiency and accuracy of animal identification data collection. USDA will focus its efforts on establishing performance standards for identification devices and evaluating emerging technologies.

User Guide

In December 2007, USDA released the official version of the "NAIS User Guide." The user guide provides producers with up-to-date information on how NAIS works, how they can put it to use, and why participation benefits them and their animals.

The National Aquatic Animal Health Plan

The Joint Subcommittee on Aquaculture (JSA) is a Federal interagency group that convenes under the auspices of the Office of Science and Technology Policy of the Executive Office of the President (OSTP). The Secretary of Agriculture chairs the JSA, which serves to coordinate all Federal aquaculture-related activities.

In 2002, in response to requests by various aquaculture stakeholders, the JSA commissioned a new task force, the National Aquatic Animal Health Task Force on Aquaculture, to develop a National Aquatic Animal Health Plan (NAAHP).

The primary goals of the NAAHP are to

- Enhance the protection of U.S. wild and cultured aquatic animal resources from foreign aquatic pests, diseases, and their causative agents;
- Facilitate the safe and legal movement of aquatic animals and their products in interstate and international commerce; and,
- Ensure the availability of diagnostic and certification services equivalent to those provided to other sectors of agriculture.

From January 2003 through November 2006, 12 workshops were held to gather information for the NAAHP. Topics included aquatic diseases of concern; health issues for the salmonid industry, baitfish, ornamental and tropical fish, warm-water food fish, and cool-water food fish; diagnostic and laboratory issues related to aquatic animal health; technology and research needs in aquatic animal health; and, educational needs in aquatic animal health.

A key element of the recently completed first draft of the NAAHP is the chapter cataloging those aquatic animal pathogens that should be considered for reporting purposes or Federal programs. The list of pathogens reflects OIE-listed pathogens as well as pathogens of concern in the United States. Additionally, the NAAHP includes discussions on surveillance, education, research, and eventual implementation.

The NAAHP is not a regulation, but rather a framework for activities and programs needed to achieve a comprehensive approach to aquatic animal health in the United States. Implementation of the NAAHP by the various Federal agencies will require resources and continued input from aquaculture stakeholders. A key to implementation is establishing an advisory group to help Federal agencies prioritize aquatic animal health programs based on available resources. The advisory group will also ensure that the NAAHP continues to be relevant and responsive to stakeholders.

The NAAHP is a living document and will require periodic updating. Additionally, the task force must be flexible to implement needed programs as they arise, including programs for infectious salmon anemia, (ISA) spring viremia of carp, and viral hemorrhagic septicemia (VHS).

Comprehensive and Integrated National Animal Health Surveillance System

The National Animal Health Surveillance System (NAHSS) is a APHIS–VS initiative to (1) integrate existing animal health monitoring programs and surveillance activities into a national, comprehensive, and coordinated system and (2) develop new surveillance systems, methodology, and approaches. The system is an interdisciplinary network of partners working together to protect animal health and promote free trade through surveillance, control, and prevention of foreign, emerging, and endemic diseases.

The NAHSS strategic plan identifies four goals:

- Early detection and global risk surveillance for FADs;
- Early detection and global risk surveillance for emerging animal diseases;
- Enhanced surveillance for current program diseases; and,

- Monitoring and surveillance for diseases with a major impact on production and marketing. Chapters 2, 3, and 4 in this report provide information on specific activities and events in each of those areas.

In 2007, one specific focus of the NAHSS has been advancing comprehensive and integrated surveillance systems that cross species and diseases, rather than focusing on individual diseases. Building surveillance systems requires the coordination and standardization of methods, establishment of priorities, and implementation of objective-based surveillance plans. A central body, the National Surveillance Unit (NSU), encourages adherence to surveillance and data standards and recognition of opportunities for integration in the development and implementation of surveillance plans.

Each new national surveillance system is developed by modifying existing surveillance activities and infrastructure, where possible, and designing new components to address gaps and weaknesses that are identified. As disparate surveillance components are fused into national systems, areas of integration are identified to improve efficiency while continuing to provide accurate and scientifically defensible surveillance information. It is also important to understand the potential value that particular surveillance strategies could contribute to the overall national system. Measuring this value requires standardized, systematic methods and metrics.

APHIS has evaluated scrapie and brucellosis program surveillance and developed surveillance plans for bovine spongiform encephalopathy (BSE), VHS, and classical swine fever (CSF). In addition, APHIS has analyzed U.S. and Canadian BSE data to support the resumption of beef trade with Canada, leading to the development of the Minimal-Risk Regions Rule. As the NAHSS has developed, it has produced important surveillance information, including

- An online inventory of U.S. animal disease surveillance;
- BSE and AI surveillance summaries for the Secretary of Agriculture and APHIS managers;
- Ongoing reports to assist disease program management;
- Web site delivery of equine arboviral, vesicular stomatitis, and equine infectious anemia data; and,
- Reporting of OIE-listed diseases to trading partners through the National Animal Health Reporting System.

Enhancing the efficiency of surveillance has provided equivalent surveillance information at a lower cost per sample. For example, targeted sampling, applied to BSE and CSF surveillance, has generated analytic information that, if collected by traditional nontargeted sampling schemes, would require as many as 10 times more samples and an equivalent increase in cost. Fifty-two States and territories met the level of surveillance activity required by the cattle and swine surveillance programs. Samples were collected to test for these diseases on the farm, at livestock auction markets, and at slaughtering establishments.

Several foundational components support the NAHSS and its advancement toward a comprehensive and integrated system. These include stakeholder partnerships at multiple levels: producers; industry representatives; diagnostic laboratories; slaughter plants; wildlife biologists; State and Federal animal health officials; private veterinarians; surveillance system developers, including information technology professionals, epidemiologists, and program managers; and, stakeholders involved in implementation, decisionmaking, and policy formation.

Another foundational element of the NAHSS is the National Animal Health Laboratory Network (NAHLN), which combines Federal laboratory capacity with the facilities, professional expertise, and support of public, State, and university animal health laboratories. For more on NAHLN, see Chapter 5.

The NAHSS makes U.S. animal disease surveillance more effective and efficient. This, in turn, provides the Nation's livestock, poultry, aquaculture, and wildlife populations with greater protection from endemic, emerging, and foreign diseases.

CHAPTER 2

CHAPTER 2

Foreign and Emerging Animal Diseases

Foreign and emerging animal diseases represent an ongoing threat to U.S. animal and human health. USDA–APHIS expects foreign and emerging animal diseases to continue to be of major concern due to globalization; an increase in trade volume; and, increased movement of people, animals, and pathogens. Consequently, surveillance is critical in ensuring early detection and supporting global risk analysis for foreign and emerging animal diseases. These are two of the four primary goals established for the National Animal Health Surveillance System (NAHSS).

NAHSS objectives include enhancing domestic and global surveillance to identify elevated risks for FADs and encouraging the development and application of new technologies for early and rapid disease detection.

Foreign Animal Disease Surveillance and Investigations

An FAD is defined as a transmissible livestock or poultry disease believed to be absent from the United States and its territories that has a potential for significant U.S. health and economic impacts. APHIS works with State animal health officials and 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 specially trained Federal, State, and private accredited veterinarians. Additional detection efforts include State diagnostic laboratory surveillance, conducted by specially trained 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 routine and specific-risk samples for FADs. More detailed information on the NAHLN is provided in Chapter 5.

From 1997 through 2007, the number of FAD investigations per year ranged from a low of 254 in 1997 to a high of 1,013 in 2004 (fig. 2.1). The high number of investigations in both 2004 and 2005 reflects the occurrence of a widespread vesicular stomatitis outbreak.

In 2007, APHIS conducted 383 investigations, in 45 States and Puerto Rico, of suspected FADs or emerging disease incidents (table A2.1 in appendix 2). California and Texas reported the greatest number of investigations (31 and 30, respectively). In 28 other States, 5 or more FAD investigations were conducted in 2007. Most of the cases suspected of being FADs were first reported by private veterinary practitioners and livestock producers.

Of the 383 investigations conducted in 2007, 3 resulted in a confirmed FAD finding. One FAD investigation (of breeder fish in Hawaii) was positive for white spot syndrome virus (see Chapter 4), one was positive for Old World screwworm (in a dog originating in Singapore), and the third was positive for New World screwworm (in a dog originating in Trinidad). In all three cases, early identification and quick response minimized further spread of disease.

In 2007, vesicular conditions (painful, blisterlike lesions) of the muzzle and feet were the most common complaint investigated. There were 238 vesicular complaints: 130 in equids (horses, donkeys, and mules), 60 in cattle, 32 in goats, 11 in sheep, 2 in pigs, 2 in alpaca, and 1 in a pet bird (table A2.2 in appendix 2). In ruminants, camelids, captive cervids, and swine, concern about any vesicular lesions would include not only vesicular stomatitis, but also FMD, a highly contagious viral infection of skin or mucous membranes that primarily affects cloven-hoofed domestic and wild animals. If it were to enter the United States and spread throughout the country, FMD would have a severe economic impact. In equids, vesicular stomatitis is the only differential diagnosis of FAD concern for vesicular conditions.

Potential Foreign Animal Disease in Minnesota

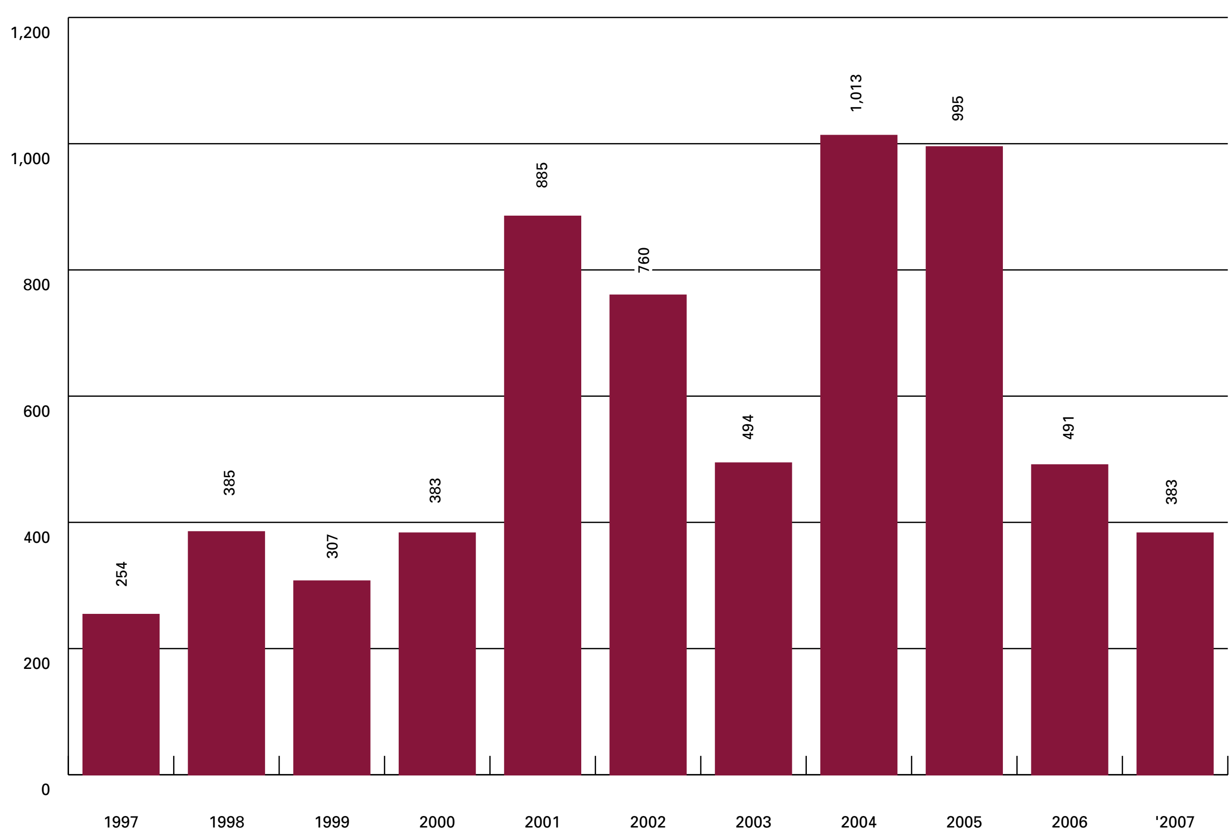
While hundreds of FAD investigations occur annually, only a small number require an active, sustained response. Often, the suspect animal(s) can easily be confined until a diagnostic laboratory test result is available. This was not the case with an investigation that occurred in June 2007. In this instance, APHIS–VS employees investigated animals with lesions suspicious of FMD in a swine slaughterhouse in Minnesota—a location with high animal concentration and movement.

The diagnostic test result was negative for FMD. This incident prompted APHIS to improve its response guidance in locations outside farms and to provide additional guidance for stakeholders. In concert with industry partners, APHIS personnel subsequently began to develop improved communications and refine existing guidelines.

Screwworm Detection in Dogs

As mentioned above, in 2007, the United States reported two incursions of screwworms. The first incident occurred in September in Mississippi. A 16-year-old small-breed dog that had been born and raised in Trinidad was imported into the United States. A few days after the dog arrived, a veterinarian detected what turned out to be New World screwworms (*Cochliomyia hominivorax*) in the ocular orbits of the animal. This type of screwworm

FIGURE 2.1: Number of investigations into possible foreign animal diseases and emerging diseases, by year, 1997–2007



commonly occurs in tropical South America. (The United States officially eradicated New World screwworm in 1966; it was subsequently eradicated from Mexico and Central America.)

In November, larvae collected from a 1-year-old Labrador retriever were identified by the National Veterinary Services Laboratories (NVSL) as Old World screwworms (*Chrysomya bezziana*). At the time of diagnosis, the dog was in Massachusetts, having arrived 4 days earlier by airplane from Singapore with a 1-day stop in the Netherlands. This species of screwworm had never been collected or introduced before in the Western Hemisphere. Its typical geographic distribution is sub-Saharan Africa, the Middle East, the Indian subcontinent, Southeast Asia and southern China, and various islands in the East Indies.

Both animals were treated with oral and topical medications, placed under quarantine, and subsequently declared free of screwworm infestation. Cleaning, disinfection, and treatment of all vehicles, transport containers, and premises were completed following State and Federal guidelines. The incidents were unrelated to each other, and each infestation occurred in the animal's country of origin before importation to the United States.

Exotic Newcastle Disease Investigations

Surveillance for END includes reliance on owners' reporting of sick birds and on vigilant scrutiny for illegally imported birds. NVSL routinely receives specimens during investigations of suspected cases of foreign poultry diseases (FPDs). During FY 2007, NVSL tested 654 specimens in 91 submissions from FPD investigations conducted in 22 States; no END was detected.

Surveillance Activities in 2007

APHIS–VS conducts surveillance for avian influenza (AI), bovine spongiform encephalopathy (BSE), classical swine fever (CSF), tropical bont tick (TBT), cattle fever ticks, and vesicular disease to improve detection of disease and to document that the United States is free from these specific diseases. Descriptions of these surveillance activities are provided below.

AI Surveillance

Surveillance in domestic poultry is conducted using four methods: passive surveillance, active observational surveillance, active serologic surveillance, and active antigen surveillance. The National Avian Influenza Surveillance Plan, developed by APHIS, addresses the following 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 plan also includes nonpoultry avian populations, including migratory waterfowl and zoo or exhibition birds. The APHIS National AI Surveillance Plan can be found online at *www.aphis.usda.gov/vs/nahss/poultry/ai/avian_influenza_surveilance_plan_062907.pdf.*

APHIS continues to implement measures to increase surveillance sensitivity and ensure rapid and efficient detection of future outbreaks of AI.

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 Avian Influenza Monitoring Plan, using 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 summary surveillance data of the NCC's monitoring effort. 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—Breeder flocks, as well as commercial meat and egg production flocks, are monitored for AI through the National Poultry Improvement Plan (NPIP)[1], administered by APHIS-VS. In 2007, more than 2.3 million birds were tested as part of the NPIP surveillance program. Low pathogenic notifiable AI (LPNAI) strains were detected and reported to the OIE in separate events involving turkey flocks in three States (West Virginia, Nebraska, and Virginia) in FY 2007 (table 2.1). The West Virginia incident occurred in April 2007 and involved a single flock of 25,600 turkeys. Pre-slaughter testing detected antibodies to the H5N2 subtype AI virus. Additional specimens collected from the flock tested positive for H5-specific RNA using real-time reverse transcriptase polymerase chain reaction (rRT-PCR), but no virus was isolated in embryonated chicken eggs. In accordance with State NPIP LPNAI response plans, the premises was depopulated. The Nebraska incident occurred in June 2007 and involved a multi-age turkey operation of 145,000 birds. Antibodies to H7N9 subtype AI virus were initially detected in serum samples collected at slaughter. Subsequent testing of younger birds on the premises using rRT-PCR in swab specimens showed presence of AI-specific RNA; the H7N9 subtype avian influenza virus was also isolated and characterized as LPAI. The flock was disposed of by controlled marketing. The Virginia incident occurred in July 2007, in a flock of 54,000 turkeys. Initially, H5N1-specific antibodies were detected in pre-slaughter serum samples. Subsequent rRT-PCR testing showed H5 RNA in clinical specimens, but no H5N1 virus was isolated. However, H5N1 virus was isolated from additional specimens collected at depopulation and characterized as LPAI.

Live-Bird Marketing System—The domestic LPAI program provides surveillance to detect H5 and H7 LPAI in the LBMS. Surveillance for NAI in the LBMS remained a high priority in FY 2007. APHIS has initiated cooperative agreements with 33 States and 1 territory to conduct LBMS surveillance (fig. 2.2).

From July 2006 to June 2007, a total of 103,130 birds were tested by agar gel immunodiffusion (AGID) assay for the presence of AI antibodies. In addition, 91,046 birds were tested by virus isolation, and 19,591 environmental samples were tested by virus isolation. Further, 171,582 tracheal/oral pharyngeal swab samples were submitted for rRT-PCR testing. All specimens that tested positive by any of these screening methods were submitted to APHIS' NVSL for confirmation.

TABLE 2.1: LPAI in commercial turkey flocks, 2007

Month	State	Flock Size	Subtype
April	WV	25,600	H5N2
June	NE	145,000	H7N9
July	VA	54,000	H5N1

Footnote

1. Through participation in the voluntary NPIP, all commercial breeding operations producing primary and multiplier egg-type and meat-type chickens and turkeys are monitored for pullorum disease and fowl typhoid. Nearly all primary poultry-breeding operations and many multiplier-poultry breeding operations are monitored for the organisms that cause other egg-transmitted and hatchery-disseminated diseases such as *Salmonella enterica* serotype *enteritidis*, *Mycoplasma gallisepticum*, *M. synoviae*, and *M. meleagridis* (turkeys only). Flocks primarily producing meat-type chickens for breeding are monitored for all serotypes of *Salmonella*.

Low pathogenic H5 AI virus was isolated from 39 specimens in 35 submissions. The H5N2 subtype AI virus was isolated from 36 specimens from New York and 1 each from New Jersey and Pennsylvania. In addition, an H5N9 subtype was isolated from a single specimen from Pennsylvania. The H5 viruses were shown to be low pathogenic by the chicken pathogenicity test and deduced amino acid profile at the hemagglutinin cleavage site. FY 2007 marked the successful eradication of the LPAI H7N2 virus that had been circulating in the LBMS in the Northeast United States since 1994. The H7N2 virus has not been detected in poultry in the United States since March 2006.

AI Surveillance in Wild Waterfowl—In 2007, funding was appropriated for HPAI surveillance in waterfowl in Alaska and the continental 48 States. This collaborative interagency effort for early detection of HPAI involves APHIS Wildlife Services (WS) and VS, DOI, the Department of Health and Human Services (HHS), State and local wildlife and natural resource agencies, and nongovernmental wildlife organizations. Using rRT-PCR for AI virus-specific RNA, specimens collected from wild-caught and hunter-killed waterfowl and from feces were screened at the APHIS–WS' National Wildlife Research Center (NWRC), at veterinary diagnostic laboratories in the NAHLN, and at the USGS' National Wildlife Health Center. Presumptive H5 and H7 positives were submitted to NVSL for confirmation and virus isolation. In addition, specimens from wild bird mortality events (more than 500 birds) were submitted directly to the NVSL for testing and to the NWRC for full necropsy examination. Between October 2006 and September 2007, more than 1,500 presumptive positive specimens underwent confirmatory testing.

FIGURE 2.2: States awarded cooperative agreements to conduct live-bird marketing system surveillance in FY 2007

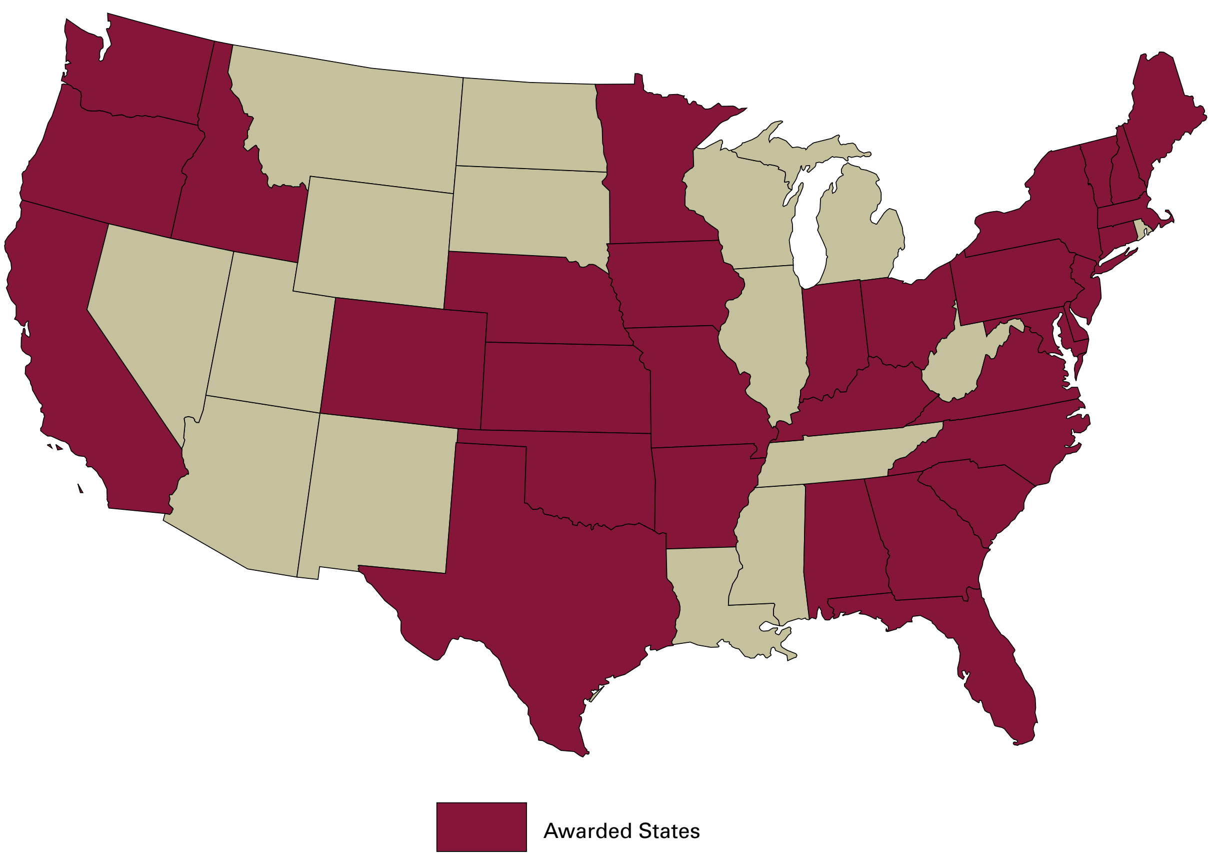


TABLE 2.2 CSF testing for FY 2007

Month	Laboratory	Slaughter	Feral Swine	Total
October 2006	462	193	4	659
November 2006	383	224	6	613
December 2006	418	295	1,254	1,967
January 2007	492	128	32	652
Febraury 2007	319	35	103	457
March 2007	359	52	141	552
April 2007	269	113	68	450
May 2007	236	71	89	396
June 2007	337	79	96	512
July 2007	252	74	106	432
August 2007	277	84	368	729
September 2007	191	192	295	678
Total	3,995	1,540	2,562	8,097

The predominant subtype isolated was H5N2 with 46 isolations from 23 States. No HPAI was detected. However, LPAI H5N1 was detected in specimens submitted from five States (Delaware, Illinois, New Jersey, Maryland, and Michigan). All H5 and H7 AI viruses were characterized as LPAI viruses of North American lineage.

BSE Surveillance

When veterinarians examine cattle and find central nervous system (CNS) signs, such as changes in temperament, abnormal posture, and ataxia, BSE is one of the differential diagnoses of concern. APHIS has conducted surveillance for BSE since 1990, including an enhanced surveillance effort from June 2004 through August 2006. The surveillance was designed to estimate the level of BSE present in the national herd and provide input for developing a long-term surveillance plan. The analysis of data from the enhanced surveillance concluded that BSE might occur in this country, but if it does, it would occur at extremely low levels—at less than one case per million in the U.S. adult cattle population.

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 OIE.

In the initial year of ongoing BSE surveillance, more than 40,000 cattle were sampled with no disease detected. The emphasis of surveillance efforts has been on those cattle populations where the disease is most likely to be found. The targeted subpopulations for ongoing surveillance are cattle exhibiting signs of CNS disorders or any other signs that may be associated with BSE, including emaciation or injury. Dead cattle, as well as nonambulatory cattle, were also targeted. Healthy slaughter cattle were not included in the sampling because the likelihood of detecting BSE in this population has been shown to be extremely low.

The samples collected annually under the ongoing surveillance program yielded enough information to exceed OIE surveillance sampling guidelines supporting "controlled BSE risk" status for the United States. Further, this level of sampling on an annual basis provides assurance that BSE surveillance in the United States is capable of detecting one infected animal per million U.S.

TABLE 2.3: CSF surveillance, 2006-07

Year	Laboratory	Slaughter	Feral Swine	Total
FY 2006	8,533	2,126	3,146	13,805
FY 2007	3,995	1,540	2,562	8,097

adult cattle. Ongoing surveillance will allow 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.

CSF Surveillance

The United States has been free of CSF since 1978. CSF is still endemic in many other countries in the Western Hemisphere, including Mexico, Cuba, Haiti, and the Dominican Republic. CSF surveillance is aimed at rapidly detecting any incursion of CSF into the United States 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.

Implementation of a comprehensive CSF surveillance plan began in early 2006. Training was conducted via Web casts and distribution of the CSF surveillance manual. The plan is available on the NAHSS Web site, *www.aphis.usda.gov/vs/nahss/swine/csf/index.htm*.

In 2007, VS continued several surveillance measures designed to rapidly detect the introduction of CSF virus into the United States. One of these is a reporting system through which private practitioners, producers, diagnosticians, and slaughter inspectors report animals displaying clinical signs compatible with CSF. In 2007, there were six swine cases reported and investigated, of which four occurred in CSF high-risk States. High-risk areas for CSF include those with food-waste feeding operations, backyard swine operations, hunting clubs, military bases, international air or sea ports, farming operations utilizing an international labor force, and corporations engaging in the international movement of swine. High risk is also a function of the number of swine in each State and the number of swine imports in each State. A list of States identified as high risk can be found on the NAHSS Web site.

A cooperative agreement established with industry associations and Iowa State University helped fund educational materials for a CSF awareness campaign—with the ultimate goal of increased reporting of suspicious cases. These materials include a 3-D video training tool for CSF awareness, unveiled at the American Association of Swine Practitioners annual meeting, and publications highlighting CSF surveillance activities.

In 2007, CSF surveillance testing using rRT-PCR antigen-based assays of tonsil specimens from case-compatible swine samples submitted to the NAHLN was continued. Domestic specimens were collected at 14 participating veterinary diagnostic laboratories and 11 slaughter plants; other specimens were collected from feral pigs by 18 WS biologists. In all, 8,097 specimens were collected and tested in NAHLN (rRT-PCR) and the Foreign Animal Disease Diagnostic Laboratory (serology): 3,995 from labs, 1,540 from slaughter plants, and 2,562[2] from feral swine (tables 2.2 and 2.3). All specimens tested were negative for CSF. (See Chapter 4 for information on the National Animal Health Monitoring System's most recent swine studies.)

Tropical Bont Tick Surveillance

The Territory of U.S. Virgin Islands (USVI) Amblyomma Project cooperative agreement was established and an eradication plan for *Amblyomma variegatum* (TBT) in St. Croix was implemented on October 1, 2004. The plan initially focused on eight epidemiologically-linked TBT locations; four more locations were discovered in 2006.

The objective of the project is to eradicate TBT from St. Croix, the only U.S.-flagged region with recent history of active TBT infestation. St. Croix is a geographic neighbor of 12 Eastern Caribbean island nations that have had TBT eradication and surveillance programs in place since the mid-1990s.

TBT is the principal vector of *Ehrlichia* (formerly *Cowdria*) *ruminantium*, a rickettsia that causes a disease known as heartwater in ruminant species. Three islands 200 to 260 miles east of St. Croix—Guadeloupe, Marie Gallante, and Antigua—are recognized to have TBT populations infected with *E. ruminantium*. To date, clinical disease attributed to *E. ruminantium* has not been observed on St. Croix.

Three surveillance zones have been established on St. Croix, an 84-square-mile island: a high-risk quarantine zone at the west end, a central surveillance zone, and a low-risk TBT-free zone covering the eastern third of the island. Activities performed in these zones include individual animal inspection, animal identification, and acaricide treatment. All livestock and horses in the high-risk quarantine zone are inspected and treated with acaricide at 2-week intervals.

VS activities in 2007 included 1,511 surveillance visits to farms (including visits to 37 new farms); 983 farm visits to treat animals with acaracide; and "scratch" inspections of 3,485 cattle, 7,682 sheep, 6,257 goats, 2,419 horses, and 55 donkeys. A total of 572 field surveillance samples of ticks (total of 2,506 ticks) were collected from all zones. The ticks were submitted to NVSL for identification and documentation.

All livestock and horses of the Territory of USVI are required by TBT project protocol and USVI Code to be registered and uniquely identified.

TABLE 2.4: Screwworm submissions tested by NVSL

Year	Number of Submissions	Number of Positives
2001	161	0
2002	102	0
2003	74	0
2004	74	0
2005	49	1
2006	44	0
2007	41	2

Screwworm Surveillance

Cochliomyia hominivorax (Coquerel), the New World cattle screwworm, historically was an important pest of U.S. livestock. After creation of a permanent sterile-fly prevention barrier at the Darien Gap between Panama and Colombia, the goal of eradicating screwworm from the United States, Mexico, and Central America was realized. No case of screwworm has been found in Panama since August 2005. Dispersal of sterile screwworm flies is an ongoing preventive measure.

Footnote

2. Of these 2,562 samples, 1,260 are serum and 48 are blood samples that were sent to the Foreign Animal Disease Diagnostic Laboratory at Plum Island, New York, for antibody tests (more information on FADDL is included in Chapter 5).

NVSL personnel perform identifications for suspected screwworm infestations in the United States. Table 2.4 lists the number of submissions NVSL received from myiases and suspected screwworms from 2001 through 2007. The two positive submissions are discussed in more detail earlier in this chapter.

Cattle Tick Surveillance

The Cattle Fever Tick Eradication Program began in 1906 with the objective of eradicating populations of fever ticks (*Boophilus microplus* and *B. annulatus*) that had become endemic in the southern United States. Fever ticks can carry and transmit bovine babesiosis (*Babesia bigemina* and *B. bovis*), which causes illness and high mortality in immunologically naïve cattle. By 1943, the eradication campaign had been declared complete, and all that remained was a permanent quarantine zone along the Rio Grande in south Texas. That permanent quarantine zone is a nearly 500-mile-long swath of land from Del Rio to Brownsville, Texas, ranging in width from several hundred yards to about 10 miles.

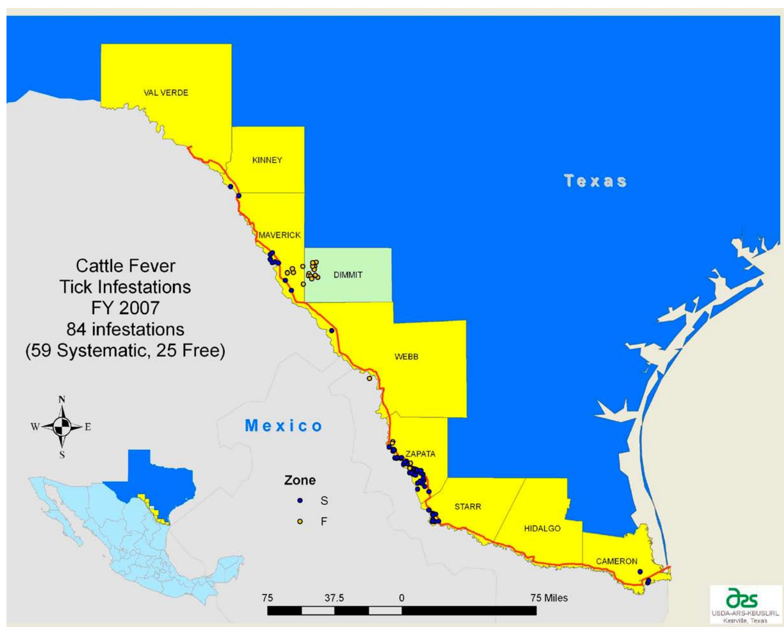
Sixty-one mounted inspectors patrol the Rio Grande along the Mexican border, conducting range inspections of premises within the quarantine zone and apprehending stray and smuggled livestock from Mexico. Program personnel also inspect and treat livestock on premises found to be infested with fever ticks, regularly inspect premises that have been quarantined for infestations or exposures, and perform the required inspection and treatment of all cattle and horses moving out of the quarantine zone.

In FY 2007, eradication personnel apprehended 71 stray and smuggled animals (29 cattle and 42 horses) from Mexico, 14 of which were infested with fever ticks. Also, 84 premises were found to be infested with fever ticks, with 59 premises located inside the quarantine zone ("systematic") and 25 premises located outside it ("free") (fig. 2.3). In comparison, 65 total infestations were detected in 2006, with 50 premises located inside the quarantine zone and 15 premises located outside it (table 2.5).

TABLE 2.5: Cattle fever tick surveillance

	FY 2004	FY 2005	FY 2006	FY 2007
Premises infested within the quarantine zone (systemic)	74	78	50	59
Premises infested outside quarantine zone (free)	20	39	15	25
Total number of infestations	94	117	65	84
Animals apprehended	60	35	97	71
Animals infested with ticks	21	9	28	14

FIGURE 2.3: Cattle fever tick infestations in FY 2007



Because infestations were discovered outside the permanent quarantine zone, three temporary preventive quarantine areas were established. These areas included parts of 5 counties and involved a total of 714,452 acres. The steps being taken to eradicate the ticks from these areas include intensive surveillance and systematic treatment of cattle in infested pastures, movement restrictions, treatment of livestock from noninfested pastures prior to movement, and treatment of wildlife.

Although fever-tick infestation rates tend to spike cyclically over a period of several years, infestation rates within the quarantine zone in both 2004 and 2005 were higher than ever recorded. There is an apparent increase in the maintenance of ticks on wildlife—most notably on white-tailed deer and exotic ungulates.

Vesicular Disease Surveillance

In 2007, the U.S. national surveillance plan for vesicular diseases was revised. The goals of vesicular disease surveillance in the United States are to maintain international market confidence, to provide economic protection of the U.S. livestock industry, and to protect the health and well-being of the Nation's meat and milk herds and flocks. These goals are to be achieved through rapid detection of vesicular disease, along with analysis and documentation to demonstrate national disease status.

Vesicular disease surveillance has five general components:

- Observational surveillance, including both passive and active observation and reporting;
- Laboratory-based surveillance, targeting laboratory testing based on a trigger of pre-vesicular clinical signs and case history;
- High-risk swine sero-surveillance, conducted in populations at increased risk for vesicular disease as identified by pathways assessments;
- Market-based syndromic surveillance, using the network of animal health officials in the Nation's livestock markets who play a crucial role in identifying disease early and preventing its spread; and,
- Risk-based intelligence surveillance, drawing on data from a variety of information-gathering sources to identify locations or populations at elevated risk that warrant enhanced, targeted surveillance.

The components of vesicular disease surveillance are designed to integrate with existing surveillance systems and other VS efforts toward the goal of building a comprehensive national surveillance system. (See "Foreign Animal Disease Surveillance and Investigations" earlier in this chapter for vesicular disease surveillance results.)

Emerging Diseases and Issues

Within APHIS–VS' Centers for Epidemiology and Animal Health (CEAH), the Center for Emerging Issues (CEI) assesses global intelligence about emerging and foreign animal diseases and issues. CEI uses a multifaceted approach to gather information for analysis to provide actionable intelligence to APHIS decisionmakers and to inform others in agriculture.

Identification and Tracking of Emerging Animal Health Issues

CEI uses electronic scanning of open-source media and text mining to identify emerging animal diseases and issues, as well as FAD outbreaks. This process helps provide early warning of animal health events and creates an awareness of the global animal health situation. The information is analyzed and stored in a central system, the Emerging Veterinary Events database.

CEI analysts evaluate animal health events using a text-based algorithm, developed in 2007, to identify and prioritize items of potential interest.

Analysts focus on animal health issues that are important, or in some way unusual, with respect to morbidity, mortality, clinical signs, location, or other epidemiological characteristics. Analysts use the algorithm to determine the level of potential threat by assigning a priority of high, medium, or low to each event. For high- and medium-priority events, alerts are generated immediately to decisionmakers. These events are monitored and verified through a network of domestic and international collaborators and are summarized in periodic reports. Additionally, CEI analysts develop in-depth assessments on select high- and medium-priority events. High-priority events are monitored for further developments, which are reported to VS management.

International animal disease events of interest identified by CEI are also entered into an APHIS database called the Offshore Pest Information System (OPIS). OPIS is designed to improve risk management of foreign pests and diseases by communicating timely information about offshore outbreaks of plant and animal diseases and changes in pest or disease distribution patterns. CEI coordinates the review and analyzes the animal event information entered into OPIS.

Assessment and Analysis of Emerging Animal Diseases—After identifying a potential emerging animal disease, CEI analysts verify the authenticity and accuracy of the reported event and then determine the type of report to prepare. Examples of reports include information sheets about specific outbreaks, emerging disease notices, quarterly summaries of selected international and domestic disease events, and special reports. Emerging disease and FAD outbreak reports prepared by CEI are available at the CEI Web site, *www.aphis.usda.gov/vs/ceah/cei*.

In 2007, CEI issued emerging disease notices on equine herpesvirus myeloencephalopathy (EHM), porcine reproductive and respiratory syndrome in Vietnam and China, and methicillin-resistant *Staphylococcus aureus*.

Selected Domestic Emerging Issues in 2007

Highlighted domestic emerging health issues monitored in 2007 by CEI included hemorrhagic diseases in cattle, progressive inflammatory neuropathy in swine slaughter-plant workers, swine influenza in both swine and humans, and EHM. In addition, APHIS worked with other agencies to monitor and respond to the discovery that imported ingredients for animal feed were adulterated with melamine.

Epizootic Hemorrhagic Disease (EHD) in White-Tailed Deer and Cattle—Summer and fall 2007 were especially severe for hemorrhagic diseases—bluetongue and EHD—in the United States. An extensive outbreak of EHD among white-tailed deer was reported in late July in the Mid-Atlantic States, spreading in the fall to deer populations in parts of the Midwest, Southeast, and Northeast. The impact on deer in Northern States was unprecedented; in some areas, the disease killed thousands of animals. By September and October, there was evidence that EHD had spread to cattle, with reported detections among herds in Indiana, Kentucky, Ohio, Pennsylvania, Tennessee, and West Virginia. Clinical signs in cattle included fever, foot and oral lesions, gait stiffness, anorexia, nasal discharge, and diarrhea. Serology and virus isolation (in the absence of bluetongue virus in some animals) strongly suggested EHD virus-2 (EHDV-2) as the cause. Although suspected EHD infections in cattle are rarely fatal, there were some reported deaths in 2007.

EHD and bluetongue viruses are transmitted to ungulate hosts by biting midges. While EHD is generally not recognized as a clinical disease of cattle in the United States, EHDV-2 has been isolated from U.S. cattle herds concurrent with outbreaks in white-tailed deer. However, EHDV-2 has not been demonstrated to cause disease in cattle, even in experimental challenge studies. The population dynamics of the midge vector, *Culicoides sonorensis*, may be the most important factor in the timing and severity of these epizootics.

not identified any foodborne risk to the general population. Confirmed cases of the neurologic illness have since been found in association with the Indiana and Nebraska plants. Further assessments of these patients, and additional measures to identify any other workers with illness, are being conducted.

Swine Influenza Virus (SIV) Infection of Swine and People—In August 2007, pigs being shown at an Ohio county fair were observed with influenza-like illness, including anorexia, lethargy, fever, and cough. Approximately 235 pigs were present at the fair; of these, more than two-thirds were affected. Approximately two dozen people at the fair simultaneously developed influenza-like illness and sought medical care. The affected people had direct contact with pigs or had family members who were in direct contact with pigs. Virus was isolated from seven of eight swine nasal swabs using either continuous cell lines or embryonated chicken eggs. The isolated viruses were all determined to be H1N1 SIV based on serologic subtyping and molecular analysis. Sequencing of the eight segments showed the viruses were triple reassortants containing genes originating from swine, avian, and human influenza viruses. The viruses were determined to be typical SIVs currently circulating in the U.S. swine population. Virus was detected in two human samples by a rapid influenza A test. The samples represented a parent and child who were involved with the swine show and developed a febrile upper respiratory illness. Sequencing of all eight gene segments of the human virus isolates revealed H1N1 triple reassortant SIV. The sequence analysis of both the human and swine viruses revealed 100 percent homology, indicating that the virus was shared between pigs and people at the fair.

Progressive Inflammatory Neuropathy in Swine Slaughter-Plant Workers—In December, the Minnesota Department of Health announced an investigation of a neurological illness that occurred in a cluster of workers at a pork processing plant in Austin, Minnesota. The cases occurred between December 2006 and July 2007. Symptoms ranged from acute paralysis to gradually progressive symmetric weakness over periods ranging from 8 to 213 days. The affected individuals worked in an area where either swine heads or organs were processed with compressed air. The HHS' Centers for Disease Control and Prevention is assisting with further investigation. Two additional slaughter plants, one in Indiana and one in Nebraska, were identified in the investigation as using a similar compressed-air technique. All three slaughter plants have discontinued the use of the suspect processing technique. Pigs slaughtered at the three plants have passed inspection by the USDA Food Safety and Inspection Service (FSIS), and the investigation has

Neurologic Cases of Equine Herpesvirus Type 1 (EHV-1)—EHV-1 is primarily a respiratory pathogen associated with a variety of clinical manifestations in horses. In addition to being a significant cause of respiratory illness and abortion in horses, EHV-1 is responsible for a neurological disease referred to as EHM.

In January 2007, CEI issued an emerging disease information factsheet suggesting that EHM met the criteria for an emerging infectious disease based on (1) the occurrence of a more virulent strain of EHV-1 than previously seen in the United States and (2) increased recognition of disease outbreaks at equine events with associated high case fatality rate. This document is available online at *www.aphis.usda.gov/vs/ceah/cei/taf/emergingdiseasenotice_files/ehv.pdf.*

Outbreaks of neurological EHV-1 occurred at various equine facilities in the United States in 2007, including racetracks, horse show grounds, veterinary clinics, and boarding stables. Outbreaks were reported in California, Connecticut, Illinois, Kentucky, Maryland, Maine, Minnesota, New York, Virginia, and Wisconsin.

The general ecology of EHV-1, and more specifically EHM, is not fully understood. More information about the virus and the disease could potentially help prevent or mitigate future outbreaks.

Melamine Animal-Feed Adulteration Issue—In April 2007, the U.S. Food and Drug Administration (FDA) determined that wheat gluten and rice protein imported from China were contaminated with melamine and melamine-related compounds, including cyanuric acid, raising concern for human and animal health. These contaminated products were used in the production of pet food, and a byproduct was used in animal feed.

Because of the adulterated feed, 8 States placed a total of 15 swine premises, involving approximately 40,000 swine, on voluntary hold or State quarantine for weeks. Another State had approximately 69,000 poultry on hold. During the investigation, NCAHEM staff collaborated with their counterparts at FDA, FSIS, and USDA's Agricultural Marketing Service (AMS).

CHAPTER 3

CHAPTER 3

Animal Disease Eradication Programs and Control and Certification Programs

This chapter describes VS 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 to meet the third goal of the NAHSS strategic plan (described on page 7).

Eradication Programs

Diseases targeted in VS eradication programs include scrapie in sheep and goats, tuberculosis in cattle and cervids, pseudorabies and brucellosis in swine, and brucellosis in cattle and bison.

Scrapie in Sheep and Goats

Since 1952, VS 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, VS initiated an accelerated scrapie eradication program.

Current Program—The primary components of the scrapie eradication program are animal identification; surveillance; tracing of positive and exposed animals; testing of sheep and goats in exposed, infected, and source flocks; cleanup of infected and source flocks; and, certification of flocks.

Animal Identification—Identification of breeding sheep and culled breeding sheep is mandatory when ownership changes. The only sheep that do not have to be identified are those less than 18 months old moving in slaughter channels. Since 2004, the number of sheep and/or goat premises recorded in the scrapie national database, and the number of these premises that have requested official ear tags, have risen to 134,595 and 99,903, respectively, as of October 10, 2007 (table 3.1).

Surveillance—The Regulatory Scrapie Slaughter Surveillance (RSSS) program, initiated on April 1, 2003, is the primary surveillance method for scrapie in the United States. RSSS identifies scrapie-infected flocks through targeted slaughter surveillance of those sheep and goat populations recognized as having higher-than-average scrapie prevalence. These targeted higher-prevalence populations are defined as 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,

TABLE 3.1: Scrapie national database—sheep and/or goat premises counts*

	9/30 2004	9/30 2005	9/30 2006	9/30 2007
Total	90,322	103,580	118,668	134,595
Requested official tags	64,040	73,807	96,755	99,903

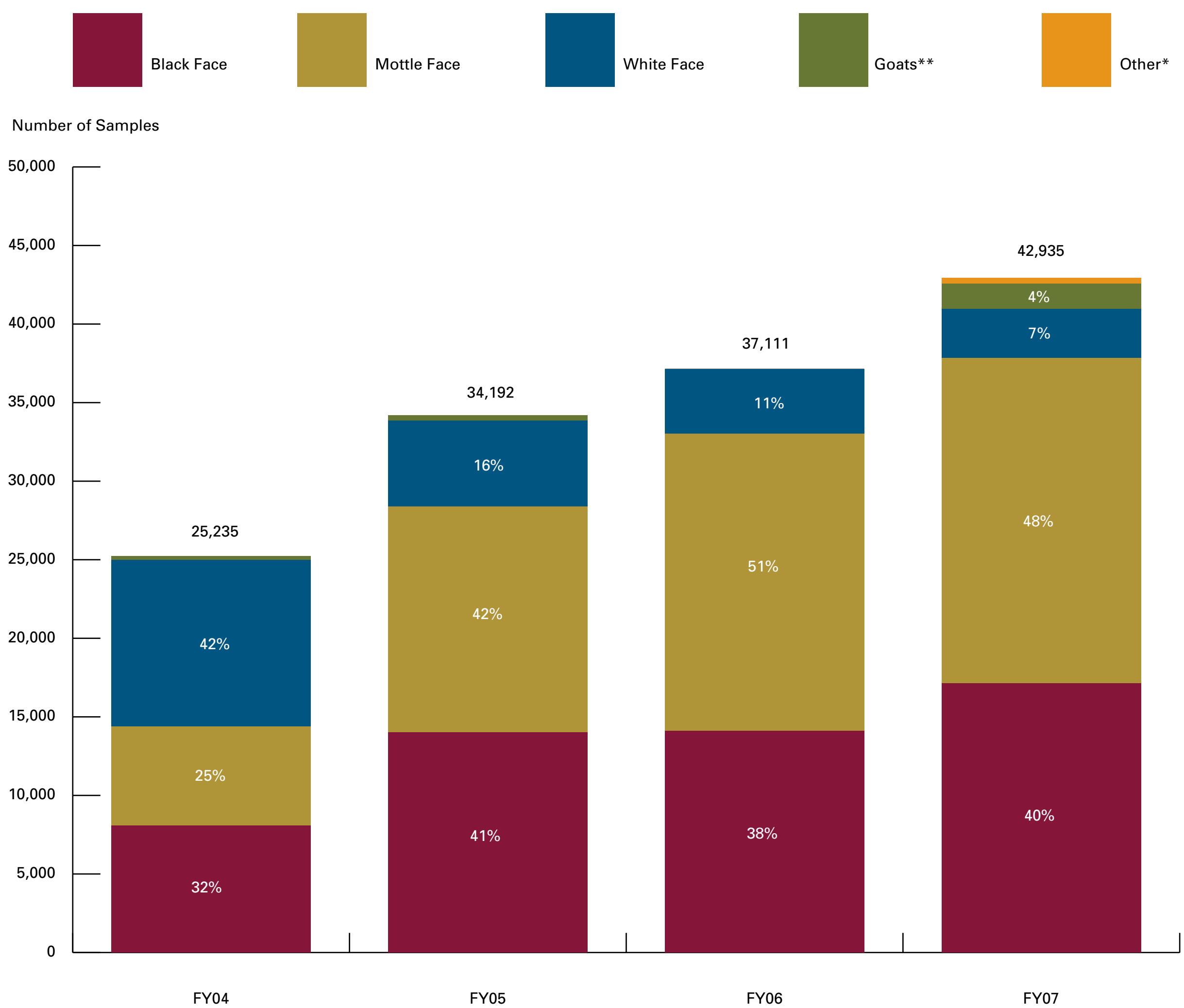
* In this database, a premises that contains both sheep and goats may be listed twice, once for each species.

wool loss, or gait abnormalities. Other than the targeted black-faced sheep and suspect animals, the RSSS program samples only animals with some form of identification. This includes USDA-approved eartags, electronic identification, backtags, and tattoos or lot identification. Identification allows for tracing scrapie-positive animals back to the farm of origin.

During FY 2007, as part of the RSSS program, 41,420 sheep and goat samples, collected from 80 slaughter plants in 22 States, were tested for scrapie using immunohistochemistry on brain and/or lymph node (table 3.2). Of the 42,935 sheep and goats sampled through RSSS and the Caprine Slaughter Prevalence Study (CSPS) described below, 48 percent were mottle-faced, 40 percent were black-faced, 7 percent were white-faced, 4 percent were goats, and 1 percent were unknown (fig. 3.1). Of the 59 sheep diagnosed as positive for scrapie, 46 were black-faced, 11 were mottle-faced, 1 was white-faced, and 1 was unknown. Of the 118 goats sampled and tested as part of the RSSS program in FY 2007, all were diagnosed as negative for scrapie.

In addition to RSSS, the CSPS was initiated in FY 2007 to determine whether the prevalence of scrapie in adult slaughter goats is less than 0.1 percent. In FY 2007, 1,515 goats were tested as part of this study; no positive animals have been found to date. The study will conclude in FY 2008 after a total of 3,000 adult goats have been tested.

FIGURE 3.1: Scrapie samples collected at slaughter FY 2004-07



*Includes sheep of unknown face color and goats for FY04-06 and sheep of unknown face color in FY07. Separation of goats in RSS starting in FY07.
**Includes goats collected through RSSS and CSPS.

Tracing of positive and exposed animals—Under the scrapie eradication program, any animal confirmed to be positive for scrapie by USDA's NVSL is traced back to its flock of origin and, if different, flock of birth and any other flock in which it might have lambed. The flocks 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. Any high-risk animals moved from these flocks before movement was restricted are also traced and tested.

Testing of sheep and goats in exposed, infected, and source flocks (regulatory field cases)—In response to disease investigations, APHIS and State field Veterinary Medical Officers collect samples from flocks for scrapie testing. In FY 2007, 4,938 additional tests were conducted for scrapie, either on third-eyelid samples or on necropsy specimens. Rectal biopsy testing was also conducted on a portion of these animals to evaluate the suitability of the test for program use; this evaluation will be completed in FY 2008.

Cleanup of infected and source flocks—In FY 2007, 76 previously undetected infected and/or source flocks were identified and 331 scrapie cases (330 sheep, 1 goat) were confirmed and reported by NVSL (tables 3.3 and 3.4). A scrapie case is defined as an animal diagnosed with scrapie by NVSL using a USDA-approved test (typically immunohistochemistry on the obex or a peripheral lymph node).

TABLE 3.2: Regulatory scrapie slaughter surveillance, by fiscal year

	FY 2004	FY 2005	FY 2006	FY 2007
Number of plants	34	78	72	80
Number of States	16	24	22	22
Number of samples tested	25,190	34,192*	37,111	41,420

* Number corrected from 2006 Animal Health Report.

In FY 2007, two field cases, one validation study case, and two RSSS cases were consistent with a variant of the disease known as Nor98 scrapie.[1] These five cases originated from flocks in California, Minnesota, Colorado, Wyoming, and Indiana, respectively.

TABLE 3.3: Flocks newly infected with scrapie

2004	2005	2006	2007
100	165	116	76

Footnote

1. Scrapie cases consistent with Nor98 have been identified in many countries since 1998, when the first case was described in Norway. Few flocks affected by Nor98 or Nor98-like scrapie yield additional positive sheep when flockmates are culled and tested. In contrast, depopulation and testing of genetically susceptible animals in flocks infected by classical scrapie commonly identifies 10 percent or more of the genetically susceptible animals as positive. Testing in the European Union has demonstrated that sheep of all commonly occurring genotypes can be infected with Nor98 or Nor98-like scrapie, including those that have historically proven resistant to the classical form of scrapie.

Scrapie susceptibility in sheep in the United States has been associated with two codons that encode for amino acids in the PrP protein. These codons are at positions 136 and 171, the latter of which is thought to be the major determinant of scrapie susceptibility in the United States. For all the scrapie-positive field cases with known genotypes in FY 2007, 100 percent were QQ at codon 171. Of these, 94.7 percent were AA at codon 136 and 5.3 percent were AV at codon 136. No cases were AVQR at codons 136 and 171 or VV at codon 136. The case from the validation study that was consistent with Nor98 was AARR at codons 136 and 171.

Certification of flocks—The Scrapie Flock Certification Program (SFCP) is a cooperative effort among producers, State and Federal animal health agencies, and industry representatives. Through the SFCP, an enrolled flock is certified if, during a 5-year monitoring period, no sheep in the flock are diagnosed with scrapie, no clinical evidence of scrapie is found in the flock, and no female animals from flocks of lower status are added to the flock. A separate category, known as "Selective Monitored" flocks, was designed for producers of slaughter lambs to allow scrapie surveillance in large production flocks. As part of the requirements for this category, an accredited veterinarian must inspect all cull ewes for clinical signs of scrapie before slaughter, and producers must submit for scrapie diagnosis a portion of the mature animals that are culled or die; the number of animals to submit is based on the flock size. A new category was added in 2007, the "Export Monitored" flock category. This category requires 7 years of monitoring, with a greater number of animals to be submitted for scrapie testing, to achieve the goal of meeting export certification requirements. Further details of the SFCP are available on the APHIS Web site at *www.aphis.usda.gov/animal_health/animal_diseases/scrapie/downloads/sfcp.pdf.*

Enrollment in the SFCP has increased since 2002 (table 3.5). At the end of FY 2007, 2,047 flocks were participating in the SFCP, including 5 flocks that had begun monitoring for the new Export Monitored flock category.

For the Future—Since the start of regulatory slaughter surveillance in FY 2003, the percentage of sheep found positive at slaughter has declined each fiscal year. Since FY 2005, the number of newly discovered infected and source flocks has also decreased each fiscal year, despite increased surveillance. To further these trends, continued efforts will be made to enhance the traceability of sheep and goats presented for sampling and to expand surveillance into underrepresented areas.

TABLE 3.4: Scrapie cases, FY 2003-07

Test or examination	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
	(Number of cases)				
	315	374	461	243	253
	32	20	31	37	13
	[1]23	86	106	70	59
	370	480	598	350	[2]331

[1] Includes only part of the FY 2003 (April 1–September 30, 2003).
[2] Includes six additional cases found as part of the third-eyelid validation study.

TABLE 3.5: Scrapie Flock Certification Program participation, 2002–07

Fiscal year, as of 9/30	Total Partici-pating Flocks	Status: Enrolled	Certified	Selective Monitored
2002	1,539	1,452	78	9
2003	1,776	1,663	105	8
2004	1,868	1,726	135	7
2005	1,961	1,770	188	3
2006	2,027	1,727	297	3
2007	2,047*	1,611	427	4

* Includes five additional flocks from the Export Monitored category.

Tuberculosis in Cattle and Cervids

In the 1800s and early 1900s, bovine tuberculosis (TB) presented a significant health risk to people and caused considerable losses in the cattle industry. Initially implemented in 1917, the Cooperative State-Federal Tuberculosis Eradication Program reduced TB prevalence to very low levels by the 1990s, but eradication has proven difficult.

Current Program—In the current eradication program, States, zones, or regions are classified into five categories based on prevalence of TB in cattle and bison herds (table 3.6), as specified in 9 CFR 77. The publication "Bovine Tuberculosis Eradication: Uniform Methods and Rules" gives the minimum standards adopted and approved by the VS Deputy Administrator on January 20, 2005. It can be accessed at *www.aphis.usda.gov/vs/nahps/tb/tb-umr.pdf*. To retain or improve their status, States, zones, or regions must comply with reporting requirements (annually for Accredited Free and Modified Accredited Advanced, semiannually for Modified Accredited and Accredited Preparatory).

In addition, surveillance is conducted through testing of suspicious granulomas collected at slaughter establishments and tuberculin skin testing of live cattle.

2006–07 Program Status—In FY 2007, the number of cattle herds found to be TB affected decreased relative to the previous year. In FY 2007, seven affected herds, including one affected cervid herd, were found, a decrease from nine affected herds in FY 2006. Two of these seven herds were located in Michigan; one was detected through annual testing; and, a captive cervid herd was detected through inspection of a hunter-killed deer. Two herds were located in Minnesota; one herd was detected through area testing; and, the other through retesting of a high-risk herd. Oklahoma, Colorado, and New Mexico each had one affected herd; these three herds were detected through slaughter surveillance.

One TB-affected herd was detected in California in FY 2008 (December 2007); although this situation is described briefly below, the herd is not included in the report above for FY 2007, and California's status has not changed.

At the end of 2007, 49 U.S. States (including Michigan's Upper Peninsula and part of New Mexico), Puerto Rico, and the U.S. Virgin Islands were considered Accredited TB Free (table 3.6). Minnesota, part of Michigan's Lower Peninsula, and part of New Mexico were classified as Modified Accredited Advanced, and 11 counties plus portions of 2 other counties in northern lower Michigan were Modified Accredited. Specific information for 2007 for affected States follows.

TABLE 3.6: Tuberculosis accreditation categories and State status—2007

Category	Prevalence of TB	States (numbers as of 12/31/07)
Accredited Free	Zero for cattle and bison	49 U.S. States, Michigan's Upper Peninsula, most of New Mexico, all of Puerto Rico, and the U.S. Virgin Islands
Modified Accredited Advanced	Less than 0.01 percent of total cattle and bison herds for each of recent years	Minnesota, part of Michigan's Lower Peninsula, and part of two counties in eastern New Mexico
Modified Accredited (Regionalized)	Less than 0.1 percent of the cattle and bison herds	11 counties in northern Lower Michigan and parts of 2 other counties
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	—

Colorado**—**For the first time since 1974, a TB case was detected in a Colorado cattle herd. The infected herd produced beef and rodeo event cattle. The index case, a rodeo bull undergoing routine slaughter inspection, had last resided in the infected herd about 2 years prior to going to slaughter. Traceback investigations detected another infected rodeo bull on that premises, and the herd was depopulated. No other infected cattle were found in the index bull's most recent herd of residence, and this herd was declared to be not infected. Epidemiological tracing led to the quarantine and testing of 5 Colorado herds, totaling nearly 700 cattle. In all, there were 96 tracebacks of exposed cattle in 24 States. All quarantines have now been lifted without evidence of TB spread to other herds in Colorado or other involved States. Colorado's TB-free status was not affected because the infected herd was depopulated, and no further evidence of infection was detected.

Michigan**—**Two new affected herds were detected in FY 2007; of these, one was a beef herd, and one was a captive wild cervid herd. Both herds were depopulated. Annual herd testing is ongoing in the Modified Accredited Zone. The prevalence of TB in wild deer in the Modified Accredited Zone was 2.3 percent in 2006.

Two dairy herds, classed as "carryover herds" from FY 2004, are under test-and-removal herd plans. Both of these herds were detected through area (annual surveillance) testing.

Minnesota**—**In FY 2007, two TB-positive beef herds were detected and depopulated in Minnesota; these were found through area testing and retesting of a designated high-risk herd. In January 2006, Minnesota's status had been reduced to Modified Accredited Advanced from Accredited Free.

As part of its TB management plan, Minnesota completed enhanced statewide surveillance of 1,500 cattle herds and wild white-tailed deer in 2007. No infected cattle or deer were found outside the high-risk area in northwestern Minnesota. In 2007, 11 positive wild white-tailed deer were identified from the high-risk area in northwestern Minnesota.

New Mexico**—**An affected dairy herd in the Accredited Free portion of New Mexico was detected through slaughter surveillance in 2007. This herd, which consisted of more than 12,000 cattle on 2 premises, has been depopulated. The herd had tested negative for TB in 2004, so cattle purchased after 2004 were the most likely source of the infection. Epidemiological investigation led to a total of 907 tracebacks, involving more than 5,981 exposed animals. TB testing was performed on 22 exposed beef and dairy herds in New Mexico, consisting of 35,821 animals. To date, no other infected herds have been found.

New Mexico's TB status did not change. New Mexico is divided into two zones; portions of two counties in eastern New Mexico are classified as Modified Accredited Advanced status, and the remainder of the State continues to be TB Accredited Free.

Oklahoma**—**One TB-infected beef herd was detected through slaughter surveillance in Oklahoma in 2007. Two additional infected animals were subsequently detected from this herd (one adult and one feedlot steer), and the herd was depopulated. Twelve herds adjacent to the infected herd were tested for TB, and no infected animals were found. Epidemiological investigation revealed a total of 43 potentially exposed herds, consisting of 893 animals in 4 States. The investigation for potential sources of the infection involved 896 animals in 6 States. To date, no other infected herds have been identified.

Before this, bovine TB was last reported in Oklahoma in 1982, and the State has been classified by USDA as TB-Accredited Free since 1996. Oklahoma's TB-Free status was not affected because the infected herd was depopulated, and no further evidence of infection was disclosed.

California**—**In December 2007, a case of bovine TB detected at a slaughter plant in California led to identification of an infected California dairy herd. The herd is being depopulated. As of April 1, 2008, 66 dairy herds in California and other States had been identified as receiving exposed cattle from the index, infected herd, and all were in the process of being investigated for evidence of disease spread. At that time, 35 additional dairies in California were being tested to evaluate whether they could have been the initial source for the infection.

Slaughter Surveillance—In FY 2007, 24 cases of *Mycobacterium bovis* were found at slaughter, a decrease from 28 cases the year before (table 3.7). Six cases occurred in adult cattle, and the remaining 18 cases occurred in feedlot cattle. The national granuloma submission rate for adult cattle for FY 2007 was 16.6 submissions per 10,000 adult cattle killed, exceeding the target rate of 5 submissions per 10,000 adult cattle killed.

Of the six cases occurring in adult cattle, three led to the detection of one affected herd per State in Oklahoma, Colorado, and New Mexico (described above). Two adult-cattle cases were traced back to South Dakota beef herds, and one case was traced to a New Mexico dairy, but no additional infection was found.

Of the 18 *M. bovis* cases identified in feedlot steers by slaughter surveillance, 17 (94 percent) involved Mexican steers. One case in a feedlot steer traced back to the affected Oklahoma herd.

TABLE 3.7: Slaughter surveillance

		Granuloma submissions	
FY	*M. bovis* cases	Total submissions[1]	Number per 10,000 adult cattle slaughtered
2004	35	6,367	9.3
2005	40	9,439	16.2
2006	28	[2]9,565	[2]16.4
2007	24	10,286	16.6

[1] Primarily from adult cattle.
[2] Numbers changed from 2006 Animal Health Report to reflect updated data.

Cervids—One TB-infected captive wild-cervid herd was found in 2007. This herd, in Michigan, was detected through inspection of hunter-killed deer from the premises, and the herd was depopulated. During 2004, a working group of State and Federal personnel developed a surveillance plan for captive cervids that was presented to, and conditionally approved by, cervid industry leadership. This input was incorporated into a draft of the Uniform Methods & Rules (UM&R) document specifically for captive Cervidae, the first such document for captive cervids. This document has been under revision, and a final UM&R is expected to be published after 2008.

For the Future—In a collaboration critical to the successful eradication of TB in both the United States and Mexico, VS officials continue to work with their Mexican counterparts to help them move the Mexican TB eradication program forward. The goal is to significantly reduce the risk of importing TB-infected and -exposed Mexican animals into the United States. In 2007, a 5-year plan, "Strategic Plan for Reducing the Risk of Importing Tuberculosis Infected Cattle from Mexico 2008-2012," was developed and presented to Mexican representatives; discussions are proceeding. The plan requires that the Mexican TB Eradication Program achieve equivalency with the U.S. program by the end of 2012. VS and APHIS International Services cooperate to conduct program reviews in Mexican states in order for USDA to recognize their status for the purposes of importation. During FY 2007, USDA conducted reviews in seven states or zones. Currently, 20 Mexican states and zones have TB programs that are equivalent to the U.S. TB program, and therefore only these regions are allowed to export cattle to the United States.

In 2008, a 5-year research project titled "Controlling Wildlife Vectors of Bovine Tuberculosis," nears completion. This collaborative project between Wildlife Services (WS) and VS, conducted primarily by WS' National Wildlife Research Center, addresses activities that are required to achieve TB eradication. These include defining species susceptibility, transmission routes, and interactions among wildlife and between wildlife and cattle; developing effective and economical barriers to reduce interaction between wildlife and cattle; and, developing vaccines and delivery systems for deer and possibly other wildlife.

Pseudorabies in Swine

In the 1970s, a virulent strain of pseudorabies virus (PRV) caused concentrated outbreaks in the Midwest. Consequently, the Livestock Conservation Institute (now the National Institute for Animal Agriculture) set up a task force in the 1980s that defined two State stages, relative to disease status, and established the National Pseudorabies Control Board to oversee the stages and determine the status of each State. In 1989, APHIS published program standards for a plan to eradicate pseudorabies from commercial swine production by 2000. By 1999, the U.S. infection rate was down to less than 1 percent of all swine herds (about 1,000 herds), and the Accelerated Pseudorabies Eradication Program was established. The goal of the program was to remove the last infected domestic commercial herds, through depopulation, by the end of 2004.

Current Program—The National Pseudorabies Eradication Program, conducted in cooperation with State governments and swine producers, had eliminated pseudorabies from domestic commercial herds in all States, Puerto Rico, and the U.S. Virgin Islands by the end of 2004. As documented in the Pseudorabies Program Standards, which can be viewed at *www.aphis.usda.gov/animal_health/animal_diseases/pseudorabies/downloads/pseuumr.pdf*, program measures are based on prevention, vaccination (now largely discontinued), disease surveillance, and eradication. Primary program activities include surveillance, herd certification, and herd cleanup. These are minimum standards developed by VS and endorsed by swine health practitioners and State animal health officials in cooperation with USAHA. Active surveillance components include testing market and cull swine, breeding animals being moved between States, imported breeding swine, and feral and transitional swine being moved. Transitional swine are defined as captive feral swine or domestic swine in contact (or potentially in contact) with feral swine. The program also has passive and outbreak surveillance components. If an infected swine herd is identified, pseudorabies is eliminated through complete depopulation.

There are five stages in the eradication program, beginning with a preparatory phase and culminating in the pseudorabies-free stage V. Since 2004, each State is required to file a Feral–Transitional Swine Management Plan that outlines its plans for dealing with PRV threats from feral swine.

Program Status—In FY 2007, 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 by the PRV-control board as part of the status renewal process. These filings were analyzed to ensure that testing of the breeding herd population was adequate and that the Feral-Transitional Swine Management Plan was complete, as required by pseudorabies program standards.

As of December 31, 2007, there were no known domestic production swine herds infected with PRV in the United States. Nationally, 14 transitional herds were disclosed through surveillance as infected with PRV during FY 2007. All herds were depopulated promptly. Complete epidemiological investigations of all cases disclosed no evidence that infection had spread from the infected transitional herds to any contact herds. Exclusion plans are part of good biosecurity protocol on most commercial production farms, and extensive surveillance activities over the past 3 years suggest that no commercial production farms have been infected.

Pseudorabies Surveillance Plan—Although pseudorabies has been eradicated from commercial production swine, it is still endemic in feral swine and can be found occasionally in transitional swine herds. The distribution of feral swine continues to expand, with an estimated 3 million to 4 million feral swine now located in at least 35 States. Reintroduction of PRV into commercial swine herds would most likely occur via either direct exposure to free-roaming feral hogs, indirect exposure to wild boars at hunting clubs, or exposure to transitional swine infected by feral swine.

In 2007, a comprehensive surveillance plan for PRV, specifically for rapidly detecting PRV introduction into commercial swine, was completed. The plan is based on several surveillance activities. First is a passive surveillance system for reporting suspicious cases. Second is surveillance at veterinary diagnostic laboratories of submissions that feature high mortality in pigs, central nervous system symptoms in suckling pigs, abortions, and other signs of reproductive failure. In addition, serum samples submitted to five targeted swine diagnostic laboratories will be selected from respiratory disease cases or from serum routinely submitted for sero-profiling.

Herds shipping swine interstate from counties with feral swine will be identified and periodically sampled based on risk of exposure to feral swine. On-farm PRV testing will be conducted in response to reported direct exposure of domestic swine herds to feral swine. Direct exposure is defined as physical contact (feral swine that have gained access to the swine facilities or pens) or fenceline contact (feral swine spotted along the fence).

Other objectives of PRV surveillance include monitoring the distribution of the feral swine populations relative to domestic swine populations at risk of exposure (i.e., outdoor production sites). Also, data mining of electronic information sources will help to rapidly identify and analyze information related to PRV outbreaks in other countries.

For the Future—Efforts are underway to update the pseudorabies program standards to align with the revised surveillance standards. Furthermore, PRV surveillance activities are being integrated with existing swine surveillance activities, such as those for CSF. For example, as part of an APHIS collaborative effort to monitor feral swine for CSF (described on page 17), APHIS-WS also will continue to monitor feral swine populations for PRV.

Brucellosis in Swine

In the United States, porcine brucellosis, caused by *Brucella suis*, led to considerable economic loss from the 1920s to the 1950s. Since then, changes in management combined with regulatory programs to eradicate the disease have gradually eliminated brucellosis as a major disease problem from large areas of the country.

Current Program—Current brucellosis eradication program activities in the United States are a joint State, Federal, and livestock industry effort. The program is administered, supervised, and funded by cooperative efforts between State and Federal animal health regulatory agencies. Livestock industries are represented on advisory committees that ultimately advise changes in the UM&R for brucellosis eradication, the working guidelines for conducting the program. For details, see *www.aphis.usda.gov/animal_health/animal_dis_spec/swine/downloads/sbruumr.pdf*

Establishment and maintenance of validated brucellosis-free herds, especially herds selling breeding stock, are integral to the swine brucellosis eradication program. Surveillance programs, such as identification and testing of market sows and boars, have located large numbers of infected herds and led to their elimination.

When a herd is classified as infected with *B. suis*, one of three alternative plans is recommended, depending on the circumstances. Plan 1 entails depopulating the entire herd, which is the most successful and economical approach. Plan 2 is designed to salvage irreplaceable bloodlines and basically consists of marketing the adult pigs for slaughter and retaining weanling pigs for breeding stock; this plan is not always successful and necessitates considerable isolation and retesting. Plan 3, rarely successful, involves removing only serologic reactors and retesting the herd as many times as necessary. This is the approach of choice for a herd with few reactors, in which there is reasonable doubt that brucellosis exists in the herd.

The swine brucellosis eradication program now recognizes that *B. suis* infection will continue to exist indefinitely in feral swine and associated transitional swine populations. As described previously, transitional swine are defined as captive feral swine or domestic swine in contact (or potentially in contact) with feral swine. Efforts are now concentrated on effective separation of commercial production swine from transitional and feral swine, with adequate surveillance and testing of at-risk populations to ensure compliance. As part of the Feral–Transitional Swine Management Plan that each State must file for the Pseudorabies Eradication Program (described previously in this chapter), each State will also address swine brucellosis infection threats from feral swine populations.

Program Status—As of December 31, 2007, all States and U.S. territories, except Texas, remained in stage III (free) status of the Swine Brucellosis Control and Eradication Program, and there were no known commercial production swine herds infected with swine brucellosis in the United States. For several years, all outbreaks of infection in transitional herds, including those in Texas, have been attributed to feral swine exposure. Texas will likely achieve free status in 2008.

During FY 2007, 11 swine brucellosis infections were identified in transitional herds; one of these was a mixed PRV and swine brucellosis infection. Animal health officials traced animal movements in all cases, failing to detect any evidence of spread from the infected herds to contact transitional or commercial swine herds. Exclusion plans remain vital in preventing or minimizing contact between domestic and feral swine.

For the Future—Swine brucellosis will be included in comprehensive swine surveillance. As with PRV, the biggest challenge to eliminating swine brucellosis continues to be the sporadic appearance of infection in feral pigs and transitional herds that are exposed to feral swine. Vigorous surveillance is integral to protecting the commercial swine population. As part of the APHIS collaborative surveillance effort for feral swine (described on page 114), WS will continue to monitor feral swine populations for *B. suis*.

Brucellosis in Cattle and Bison

The brucellosis program initially began in 1934 with the goal of controlling brucellosis in domestic livestock herds in the United States. In 1954, this goal shifted to eradication when Congress formally appropriated funds for a national eradication program, launching the Cooperative

TABLE 3.8: Brucellosis certification categories and State status—as of Dec 31, 2007

Designation	Infection rate	No. 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 herd per 1,000)	1 (Texas)*
Class B	Herd infection rate between 0.10 percent and 1.0 percent	0

*Class Free application for Texas is pending final approval.
Note: States or Areas not having at least Class B status are considered "No Status."

State-Federal Brucellosis Eradication Program. A cooperative effort among Federal and State animal health officials and livestock producers, the program is designed to eliminate brucellosis from the U.S. domestic livestock population. The primary motivation for brucellosis eradication is the economic benefit, including increased trade opportunities, to the cattle industry and consumers of its products. Another important reason for eradication is to eliminate the public health threat posed by brucellosis, a zoonotic disease. (Zoonotic diseases are transmissible from animals to humans.)

Current Program—The brucellosis eradication program is based on active surveillance by each State of domestic cattle and bison herds. The program's UM&R document sets forth minimum standards for States to achieve eradication and conduct continued surveillance. For details, see *www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/downloads/umr_brucellosis.pdf*.

States are designated as Class Free status—that is, free of brucellosis—when no domestic cattle or bison herds in the State are found to be infected during a period of 12 consecutive months while under an active surveillance program. Restrictions on moving cattle interstate become less stringent as a State approaches or achieves Class Free status. Maintaining brucellosis State status focuses on continual surveillance activities. Surveillance for bovine brucellosis is conducted primarily through the Market Cattle Identification (MCI) program and the Brucellosis Milk Surveillance Test (BMST). Each State is required to maintain surveillance at certain levels to maintain its brucellosis State status (table 3.8).

The program does allow a Class Free status State to maintain status if a brucellosis-affected herd is disclosed, provided certain provisions are met. Program regulations stipulate that, if a single affected herd is found in a Class Free State, the State may retain its Class Free status if it satisfies two conditions within 60 days of the identification of the affected animal. First, the affected herd must be immediately quarantined, tested for brucellosis, and depopulated as soon as practicable. Second, an epidemiological investigation must be performed, and the investigation must confirm that brucellosis has not spread from the affected herd. All adjacent herds, source herds, and contact herds must be epidemiologically investigated, and each of those herds must receive a complete herd test with negative results.

TABLE 3.9: Number of cattle tested for brucellosis (million head)—2004-07

			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

Program Status—As of December 31, 2007, 49 States, Puerto Rico, and the U.S. Virgin Islands were officially declared free of brucellosis (table 3.8). Texas was the last remaining Class A status State at the end of 2007; it had achieved Class A State status in August 1994. By mid-2007, Texas demonstrated it met all requirements to advance in status and formally applied for reclassification as a Class Free State. Idaho, formally downgraded from Class Free status to Class A status in January 2006 after the disclosure of two brucellosis-affected cattle herds within a consecutive 12-month period, formally regained Class Free State status in July 2007. Specific 2007 information for affected States follows.

Montana**—**In May 2007, one brucellosis-affected cattle herd was disclosed in the State of Montana, detected by a test of animals intended for interstate movement. (Previously, Montana had been classified as Brucellosis Class Free since June 1985.) One animal with elevated titer for brucellosis was identified, and samples were sent to NVSL for culture. Bacteriologic culture results from the initial reactor animal revealed *Brucella abortus* Biovar 1.

Upon the initial identification of the reactor cow, her herd of origin was identified and tested, disclosing six additional reactor animals. The affected herd was held under quarantine and depopulated with indemnity in mid-July 2007. In addition, all adjacent herds, potential source herds, contact herds, and area herds were tested and placed on herd plans within the required 60-day period. Approximately 3,200 head of cattle in about 25 herds were tested as part of the epidemiological investigation. No additional brucellosis-affected herds were disclosed.

The affected herd had been in existence for less than 3 years. The herd's main source of cattle, including the index animal, was a ranch located close to Yellowstone National Park with numerous elk (a wildlife reservoir species in this area) overwintering on it each year. The index cow aborted about a month after arriving at the new premises, which is farther from Yellowstone. Also, very few elk had been seen on the new premises.

Montana successfully completed the required affected-herd depopulation and epidemiological investigation, including all required testing, within 60 days, thereby meeting all requirements to maintain Class Free State classification.

Texas—No new brucellosis-affected cattle herds were disclosed in Texas during 2007. Throughout 2007, Texas diligently maintained brucellosis surveillance activities while conducting an in-house review of previous brucellosis-affected herd investigations and high-risk areas. First-point testing was a key component of brucellosis surveillance in Texas. Upon completing its self-assessment, Texas formally applied to advance to Class Free State status in June 2007. A pre-Class Free review conducted in Texas during summer 2007 evaluated the State's brucellosis program to confirm that all requirements to advance to Class Free State status had been met. At the end of 2007, regulatory activities to advance Texas to Class Free State status were in progress.

Idaho—After successfully completing all program regulatory requirements, Idaho successfully regained Class Free State status on July 23, 2007. Idaho had initially attained Class Free State status in February 1991; however, after two brucellosis-affected herds were disclosed in November 2005, Idaho's status was downgraded to Class A State status in January 2006.

Maintaining brucellosis State status focuses on continual surveillance activities. As previously noted, the two primary surveillance activities conducted for bovine brucellosis are MCI testing and BMST. During FY 2007, APHIS tested approximately 7.995 million head of cattle under the MCI surveillance program. Brucellosis program standards require testing a minimum of 95 percent of all test-eligible slaughter cattle. In FY 2007, 96.4 percent of all test-eligible slaughter cattle were tested. First-point testing at livestock markets is required in Brucellosis Class A States. Several Brucellosis Class Free States continue to conduct first-point testing at markets to facilitate interstate movement of cattle and enhance surveillance activities. 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. In FY 2007, about 97.9 percent of all MCI reactors were successfully traced and investigated, resulting in successful case closures. About 835,200 additional head of cattle were tested on farms or

TABLE 3.10: Brucellosis Milk Surveillance Test (BMST) results 2004-07

FY	Number of tests	Number suspicious on screening	Number of positive
2004	184,000	200	0
2005	171,000	200	0
2006	164,000	186	0
2007	142,000	126	0

*Estimates based on the number of dairy herds in 2003-04 and State's success in meeting brucellosis ring test sampling requirements.

ranches during FY 2007, bringing the total cattle tested for brucellosis in FY 2007 to 8.8 million head (table 3.9).

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 detailed in individual State annual reports, there were about 62,500 dairy operations in the United States in FY 2007. Approximately 142,700 BMSTs were conducted in FY 2007, and about 126 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 2007 were confirmed negative by subsequent epidemiological investigations and additional herd testing (table 3.10).

Approximately 4.212 million calves were vaccinated for brucellosis in FY 2007. 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 vaccination policy also recommends elimination of mandatory vaccination in all States.

Bovine Brucellosis Surveillance—A Brucellosis Surveillance Planning Working Group, composed of 4 State veterinarians and 14 other members, was convened in FY 2007 to modify the brucellosis surveillance plan. The revised plan is based on the findings and recommendations of the National Surveillance Unit's FY 2006 evaluation of current bovine brucellosis program surveillance activities. The draft plan is designed 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, and eliminating Federal funding for first-point testing in lower-risk States where it is not required. The working group held discussions with key industry partners and members of the National Assembly of State Animal Health Officials to better understand impacts and concerns relative to changes in brucellosis surveillance activities.

A Brucellosis Laboratory Consolidation/Regionalization Planning Workgroup, consisting of State and Federal animal health officials and laboratory personnel, was convened in FY 2007. This committee was tasked with drafting a proposal for a regional brucellosis laboratory concept for brucellosis surveillance testing. The objectives are to increase the cost efficiencies of brucellosis surveillance testing while maintaining testing effectiveness and timely reporting of test results. The proposal includes developing and implementing plans to consolidate the current 44 brucellosis laboratories into 14 regional laboratories. The Brucellosis Laboratory Consolidation/Regionalization Planning Workgroup continues to collaborate with States to refine appropriate laboratory selection and funding criteria. Standardization of brucellosis diagnostic testing methodology is another part of the consolidation effort.

Brucellosis Activities Related to the Greater Yellowstone Area—The only known remaining reservoir of *Brucella abortus* infection in the Nation is in wild bison and elk in the Greater Yellowstone Area (GYA). APHIS continues to cooperate with State and Federal agencies— the U.S. Department of the Interior, and the States of Idaho, Montana, and Wyoming—on an Interagency Bison Management Plan (IBMP) for Yellowstone National Park bison. The goal of the IBMP is to maintain wild, free-ranging bison and elk herds while controlling brucellosis in the GYA and minimizing the risk of transmitting the disease from the Park's bison to domestic cattle on public and private lands in Montana, adjacent to Yellowstone National Park.

The cooperating agencies made several adaptive management changes for 2007. These include strategic hazing on some public lands, increased tolerance of bison bulls in some areas during certain times of the year, bison hunting in some areas, and

a clarification that the 3,000 bison or elk population number is a trigger for management decisions rather than a Yellowstone National Park population objective or target. Adaptive management changes for operations in the IBMP can be made with the concurrence of all of the IBMP cooperating agencies.

When requested by the States, APHIS is cooperating with, and assisting the GYA States in, the development and implementation of herd plans for individual livestock herds in the GYA. These plans will address concerns about brucellosis transmission from wild bison and elk to domestic livestock and provide suggested mitigation measures to prevent transmission. Also at State request, APHIS is consulting and cooperating with State wildlife agencies in their development of herd-unit management plans for wild elk and bison.

Idaho completed and implemented herd plans in 2006. Montana has completed its survey of livestock herds in the GYA and is performing a risk analysis of the individual livestock herds to determine management actions for inclusion in the individual livestock herd plans. Montana is also reviewing its elk herd unit plans. Wyoming has a larger number of livestock herds and elk units in the area of concern but is currently surveying livestock herd owners and developing individual livestock herd plans. Wyoming has completed individual elk herd plans for the nine involved elk herd units and is continuing statewide elk herd brucellosis surveillance based on hunter-collected blood samples.

Additionally, APHIS has assisted Wyoming with funding to vaccinate elk on elk feeding grounds in an effort to reduce the prevalence of brucellosis. APHIS has also provided funds for habitat improvement to keep elk dispersed and away from cattle and feeding grounds. Efforts are continuing to develop new, safe, and more effective brucellosis vaccines as well as vaccine delivery systems for bison and elk.

For the Future—Controlling brucellosis in the free-ranging elk and bison populations in the GYA is integral to protect the national livestock population against outbreaks of the disease. Some of the ongoing projects to mitigate the threat of brucellosis from free-ranging bison and elk in the GYA to livestock in surrounding States are described below.

- Wyoming is continuing a 5-year pilot project focused on test and removal of brucellosis-seropositive elk at the Muddy Creek feedground. Initiated in 2006, this project will provide data to help evaluate whether test and removal will significantly reduce brucellosis seroprevalence in those elk herds.

- The multiagency Bison Quarantine Feasibility Study (BQFS) is continuing efforts to evaluate quarantine procedures and determine whether it is possible to certify individuals or groups of bison as free from brucellosis, including latent infection. Bison that remained test negative after the first phase of the BQFS advanced into the second phase. During this phase, the animals enter quarantine protocols and are bred to determine whether and how latent brucellosis infection is expressed during the stress of pregnancy. If latent infection does not become evident at parturition, some cows and their calves should be eligible for release into fenced pasture for continued surveillance at the site of intended future full release.

Control and Certification Programs

VS control and certification programs include chronic wasting disease (CWD) in cervids, Johne's disease in cattle, trichinae in swine, and the Swine Health Protection Inspection Program.

Chronic Wasting Disease in Cervids

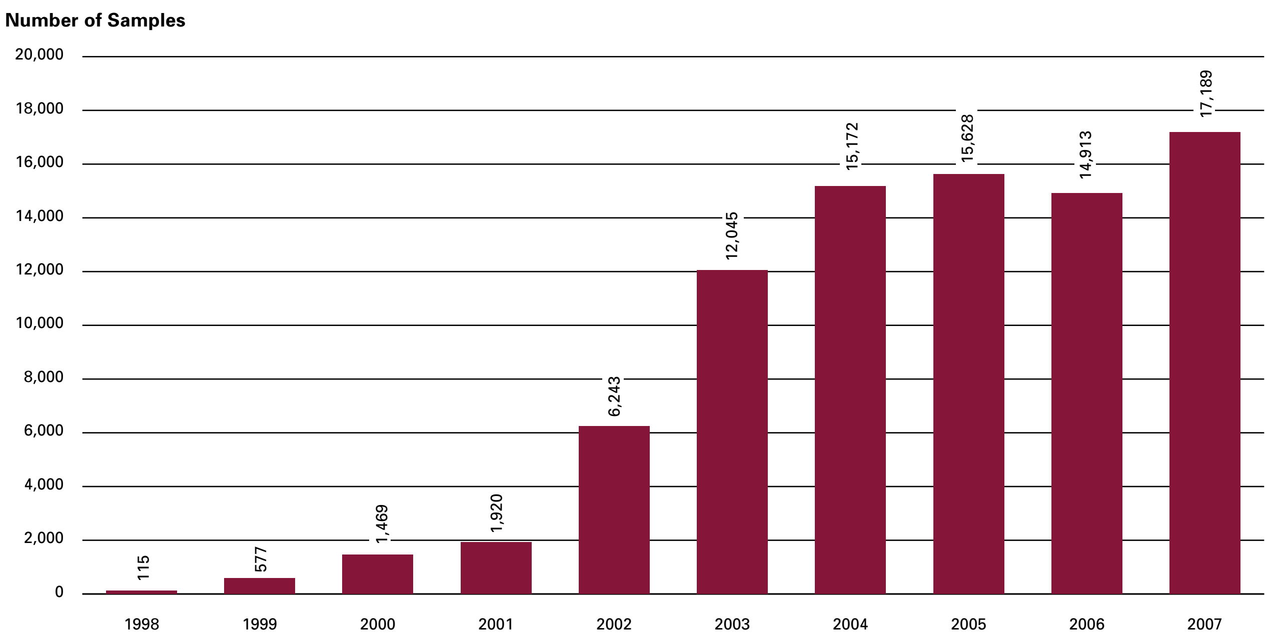
First recognized in 1967 as a clinical "wasting" syndrome in mule deer at a wildlife research facility in northern Colorado, CWD was identified as a TSE in 1978. There is no known causal link between CWD, which occurs in cervids, and any other TSE of animals or humans.

Current Program—APHIS–VS and State CWD surveillance in farmed animals began in late 1997. VS pays laboratory costs for all surveillance testing of farmed cervids. Responses to on-farm CWD-positive cases include depopulation with indemnity or quarantine. When requested by VS, APHIS–WS assists with depopulation of affected farmed cervid herds. Additionally, VS conducts traceforward and traceback epidemiologic investigations.

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 proposed program would certify herds that satisfactorily meet program requirements for a minimum of 5 years with no evidence of CWD. The proposed requirements include fencing, identification, inventory, surveillance, and restriction of interstate movement of farmed cervids to those herds enrolled in the herd-certification program. The program is intended to be a cooperative State-Federal-industry program, and State programs that meet or exceed Federal standards will be recognized by the Federal program as approved State programs.

APHIS–VS began supporting CWD surveillance in wildlife in 1997. APHIS first received line-item funding for CWD in FY 2003 and has since provided assistance to State wildlife agencies and Tribes through cooperative agreements to address the disease in free-ranging deer, elk, and moose. Funding for State wildlife agencies is distributed through a tiered system based on presence of CWD and risk of disease introduction, developed in consultation with the Association of Fish and Wildlife Agencies. In some States, WS wildlife disease biologists assist in the

FIGURE 3.2: Number of farmed cervids tested for chronic wasting disease, FY 1998-2007



collection of CWD test samples from hunter-killed wild deer and elk. In addition to assisting individual Tribes, an agreement with the Native American Fish and Wildlife Society funds five regional CWD Tribal biologists to assist Tribes with CWD activities.

APHIS–WS' NWRC is assessing the potential for CWD transmission at the interface between wild and domestic cervids and devloping methods to reduce transmission and spread. As part of this work, the NWRC is assessing the role of scavengers in CWD epidemiology and developing improved containment and removal techniques for cervids. WS and VS are collaborating to implement and validate a rectal biopsy live animal test for CWD in elk and to determine the time to infection relative to transmission route. NWRC is also making progress in developing methods to inactivate prions.

TABLE 3.11: Number of farmed cervid herds with animals positive for chronic wasting disease, by State, 1997–2007

State	1997–2004	2005	2006	2007	Total (1997–2007)
Colorado	12	2	—	—	14
Kansas	1	—	—	—	1
Minnesota	2	—	1	—	3
Montana	1	—	—	—	1
Nebraska	4	1	—	—	5
New York	—	2	—	—	2
Oklahoma	1	—	—	—	1
South Dakota	7	—	—	—	7
Wisconsin	6	1	—	—	7
Total	34	6	1	0	41

Program Status—Since FY 2004, more than 14,900 farmed cervids have been tested for CWD each year (fig. 3.2). From 1997 through 2006, CWD had been identified in 32 farmed elk herds and 9 farmed white-tailed deer herds in 9 States (table 3.11). No new farmed cervid herds were found to have animals positive for CWD in 2007.

Of the 41 positive herds identified as of December 31, 2007, 5 (4 in Colorado and 1 in Wisconsin) remained under State quarantine, and 35 had been depopulated. The quarantine was lifted from one herd that underwent rigorous surveillance for more than 5 years with no further evidence of disease.

FIGURE 3.3: Surveillance testing of hunter-killed and targeted animals for chronic wasting disease

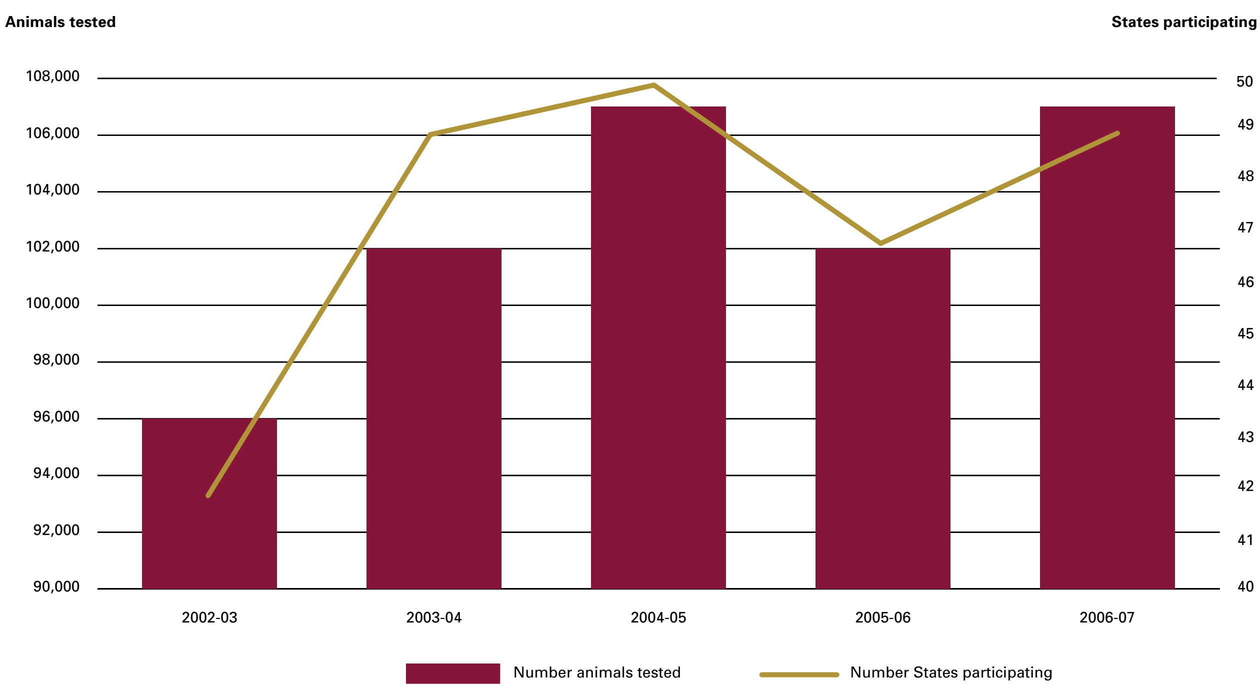


TABLE 3.12: Johne's disease control program statistics, 2000–07

	2000	2001	2002	2003	2004	2005	2006	2007
States in full compliance with the Voluntary Bovine Johne's Disease Control Program	NA	NA	22	35	43	47	49	50
Herds in Johne's control programs	1,952	1,925	3,248	3,268	6,189	6,448	8,738	8,650
Johne's test-negative herds	390	514	631	543	972	1,632	1,792	1,672
ELISA tests performed in cattle	359,601	342,045	592,350	480,586	673,299	697,264	784,978	400,445
Cultures performed in cattle	44,961	43,218	98,094	96,222	101,786	105,685	125,336	63,392

Since 2002, most States have been participating in CWD surveillance in free-ranging deer, elk, and more recently, moose. Each year, more than 90,000 hunter-killed and targeted animals have been tested (fig. 3.3).

For the Future—State agencies raised several concerns in response to the 2006 publication of the final rule establishing the Federal CWD herd certification program and interstate movement restrictions. As a result, VS has delayed implementation of the rule and is addressing those concerns, with plans to publish a new proposed rule in 2008 and a new final rule in 2009.

Johne's Disease in Cattle

Bovine paratuberculosis (Johne's disease) is caused by the bacterium *Mycobacterium avium* subspecies *paratuberculosis* (MAP). In addition to cattle and other ruminants, many species of domestic and wild animals worldwide have been diagnosed with MAP infection. Clinical signs of Johne's disease include weight loss, diarrhea, and decreased milk production.

Current Program—The Voluntary Bovine Johne's Disease Control Program (VBJDCP) 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 MAP to noninfected herds and decreasing disease prevalence in infected herds. For more details, see *www.aphis.usda.gov/animal_health/animal_diseases/johnes/downloads/johnes-umr.pdf*. The program has three basic elements:

1. Education—Informing producers about Johne's disease and providing guidance about management strategies that prevent, control, or eliminate it.
2. Management—Completing risk assessments and management plans to help producers identify high-risk areas or practices, and then working with the producers to prioritize changes in management practices to reduce the risk of transmission on their operations.
3. Testing—Testing herds to identify and classify them as test-positive or test-negative (low-risk) herds. Herd classification is based on the number of MAP tests and years of MAP testing in the herd.

Program Status—All 50 States participate fully in the VBJDCP, and 8,650 herds have enrolled in the Johne's disease control program (table 3.12). There are 1,672 herds enrolled in the test-negative component of the program.

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; 81 laboratories are approved for Johne's disease serology testing, 52 are approved for MAP fecal culture, and 13 are approved for polymerase chain reaction/DNA testing. In 2007, these laboratories conducted 400,445 enzyme-linked immunosorbent assays (ELISAs) and 63,392 fecal cultures, in addition to 1,740 pooled fecal samples (5 bovine per pool) and 300 environmental samples. Fewer serum ELISAs and fecal cultures were performed in 2007 mainly because of a decline in Federal funding and an increase in the number of milk ELISAs.

Trichinae in Swine

Disease and Program History—In the United States, the prevalence of *T. spiralis* in pigs has dropped sharply because of changes in swine production practices. The National Animal Health Monitoring System's 1990 National Swine Survey and Swine '95 and Swine 2000 studies reported *T. spiralis* infection rates in the United States of 0.16 percent, 0.013 percent, and 0.007 percent, respectively. In the Swine 2006 study, no samples were positive for trichinae. Because modern pork-production systems have all but eliminated trichinae as a food-safety risk, alternatives to individual carcass testing to demonstrate that pork is free of *T. spiralis* were explored via trichinae pilot programs.

Current Program—The U.S. Trichinae Certification Program (USTCP), initiated as a pilot program in 1997, is based on scientific knowledge of *T. spiralis* epidemiology and numerous studies demonstrating how 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, FSIS, and 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. 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.

Uniform program standards detailing the requirements of this certification program have been developed, along with additional Federal regulations in support of the program. The completion of the pilot phase described here will lead to implementation of a federally-regulated program throughout the United States.

Program Status—Based on risk factors related to swine exposure to *T. spiralis*, an objective audit that could be applied to pork production sites was developed for on-farm production practices. USDA regulates the audits to ensure that program standards are met and certifies that specified good production practices are in place and maintained at the audited pork-production sites. The on-farm audit includes aspects of farm management, biosecurity, feed and feed storage, rodent control programs, and general hygiene.

In the pilot study, objective measures of these good production practices were obtained through review of production records and an inspection of production sites. Production site audits were performed by veterinarians trained in auditing procedures, *Trichinella* risk-factor identification, and *Trichinella* good production practices. From 2000 to 2007, more than 500 audits were completed on farms, and a great majority of these have 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.

Program sites will be audited on a regular status-determined schedule as established by official standards of the pilot 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 program 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-free 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.

For the Future—USDA has published in the *Federal Register* draft regulations to establish trichinae certification as an official USDA voluntary program for on-farm risk-mitigation certification in the U.S. pork industry, and has received comments on these regulations. It is expected that the regulations will be finalized during 2008, and the program then will become an official USDA program.

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. Raw meat is one of the primary media through which numerous infectious or communicable diseases of swine can be transmitted—especially exotic animal diseases such as FMD, African swine fever (ASF), CSF, and swine vesicular disease.

Current Program—In accordance with Federal regulations, food waste may be fed to swine only if it has been treated to kill disease organisms. Treatments must be made at facilities possessing valid permits issued by VS or by the chief agricultural or animal health official of the State (if the State permits feeding of food waste to swine). Licensed operations must follow regulations regarding the handling and treatment of garbage, facility standards (rodent control, equipment disinfection), cooking standards, and recordkeeping. In addition, licensed operations are required to allow Federal and State inspections.

Program Status—In FY 2007, 29 States and Puerto Rico allowed the feeding of food waste to swine and issued permits to operate garbage treatment facilities. There were 1,951 licensed food-waste cooking and feeding premises (table 3.13), and 9,562 routine inspections were made on these licensed premises during the year.

TABLE 3.13: Statistics on licensing of facilities feeding food waste to swine, 2005-07

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

*Puerto Rico also allowed food-waste feeding.

Because of increased awareness and threats of potential FAD incursions, most States increased efforts to ensure that all food-waste feeders were properly licensed. To this end, field personnel conducted 39,107 searches for nonlicensed food-waste feeders. Through these efforts, 87 nonlicensed feeders were found; most of these were then licensed and now are subject to routine inspections.

CHAPTER 4

CHAPTER 4

Monitoring and Surveillance for Diseases That Affect Production and Marketing

The fourth goal of the NAHSS strategic plan is monitoring and surveillance for diseases with a major impact on animal production and marketing. Objectives within this goal include monitoring animal health and production trends; contributing to animal disease awareness education for producers and veterinarians; facilitating the use of new technologies for early and rapid disease detection and data analysis; and, capturing, analyzing, interpreting, and disseminating data using standardized methods.

This chapter describes the national studies coordinated by the National Animal Health Monitoring System (NAHMS) program unit, focusing on dairy, beef, small-enterprise swine, and small-enterprise chicken operations. In addition, Chapter 4 explains the disease status, monitoring, and surveillance activities underway for White Spot Syndrome Virus in Louisiana crawfish, ISA virus, and VHS. The chapter also outlines the National Animal Health Reporting System (NAHRS) and summarizes its current status.

NAHMS Studies

The Animal Industry Act of 1884 directed USDA–APHIS predecessor, the Bureau of Animal Industry, to "collect such information as shall be valuable to the agricultural and commercial interests of the country." In the mid 1970s, the National Academy of Sciences prompted APHIS to reassess its responsibility to fulfill agricultural information needs. Producers, veterinarians, academics, educators, and government policymakers needed scientifically sound and statistically valid information that is national in scope. NAHMS was formed to test the theories and methods of data collection necessary for a national animal health monitoring program. State pilot projects in the 1980s were successful and, by 1990, NAHMS began its first efforts to describe health and production related to a national animal population.

Study designers recognized that, to obtain high-quality data, producer participation must be voluntary and that the data from individual operations must be kept confidential. Because reliance on a convenience sample of voluntary producers would not ensure statistically valid results, the designers sought the help of the USDA's National Agricultural Statistics Service (NASS). NASS conducts hundreds of surveys each year and prepares reports and lists covering virtually every aspect of U.S. agriculture from which NAHMS can select a probability-based, random sample of producers as potential study participants.

NAHMS studies generally focus on food animals and on equids. Livestock and poultry commodities are studied about every 5 years or longer 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. Then a study is 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.

NAHMS studies typically proceed in two data collection phases. In the first phase, about 300 to 500 NASS data collectors conduct personal interviews with producers. Questions typically focus on herd or flock management, operation and production issues, and animal health. At the conclusion of the interview, producers can sign consent forms to continue participating in the study.

In the second phase, a study coordinator in each State trains data collectors and oversees data collection, which is completed by roughly 100 to 200 veterinary professionals. Usually the data collectors conduct two more interviews with each producer and collect biological samples (i.e., blood, feces, feed, and water) at the operation. Biologic samples are evaluated in cooperation with NVSL, other laboratories, and USDA's Agricultural Research Service (ARS). Producers generally receive the results from the biological sampling.

After data collection, NAHMS veterinarians and statisticians analyze and summarize the data, taking into account sampling design and nonresponse. The NAHMS analysts interpret results and develop population inferences in the context of the study design and other available information, with input from study collaborators. All published information is subject to outside review by subject matter specialists prior to release.

Primary products from the studies include descriptive reports and information sheets. Descriptive reports contain tables, graphs, and minimal interpretation of study results and average about 100 pages. Information sheets address very specific topics such as vaccination or biosecurity practices.

NAHMS has conducted 23 national studies to date:

- 4 Dairy
- 3 Beef cow-calf
- 2 Beef feedlot
- 5 Swine (including Swine 2007 Small-Enterprise Study)
- 3 Poultry (including Chicken 2007 Small-Enterprise Study)
- 2 Catfish
- 2 Sheep
- 2 Equine

Highlights of recent and current studies follow.

Dairy 2007

The NAHMS Dairy 2007 study was the fourth study of the Nation's dairy herd. In 1991, NAHMS conducted the National Dairy Heifer Evaluation Project (NDHEP). The NDHEP provided baseline information on heifer health and management practices, as well as prevalence estimates for *Cryptosporidium*, *Escherichia coli* O157:H7, and *Salmonella*. Objectives of the Dairy '96 study included acquiring national prevalence estimates of *Mycobacterium paratuberculosis* (Johne's disease) and bovine leukosis virus and fecal shedding of *E. coli* O157 and *Salmonella* in adult dairy cows. Major goals of the Dairy 2002 study were to describe management strategies that prevent and reduce Johne's disease and to determine management factors associated with *Mycoplasma* and *Listeria* in bulk tank milk. Dairy 2007 objectives focused on cow comfort, unweaned calf health, bovine viral diarrhea (BVD), contagious mastitis pathogens, and herd-level prevalence of *Mycobacterium paratuberculosis*.

A total of 17 States (California, Idaho, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Hampshire, New Mexico, New York, Ohio, Pennsylvania, Texas, Virginia, Washington, and Wisconsin) participated in Dairy 2007 and accounted for 82.5 percent of U.S. milk cows and 79.5 percent of U.S. operations.

The following results provide a small example of data collected.

The three most prevalent diseases that producers reported in their dairy cows for the previous year (2006) were clinical mastitis, lameness, and infertility problems (16.5, 14.0, and 12.9 percent of cows, respectively).

During 2006, approximately one in four cows (23.6 percent) (excluding cows that died) was permanently removed from operations. Of permanently removed cows, 26.3 percent were removed for reproductive problems and 23 percent for udder or mastitis problems. Other factors that led to the removal of cows were poor production not related to reproductive problems, mastitis, or lameness (16.1 percent), and lameness or injury (16 percent) (fig. 4.1).

The highest percentage of deaths occurred in unweaned heifers (7.8 percent), while 5.7 percent of cows and 1.8 percent of weaned heifers died. More than half of unweaned heifer calf deaths (56.5 percent) were due to scours/diarrhea or other digestive problems, while 22.5 percent of deaths resulted from respiratory problems. Respiratory problems accounted for 46.5 percent of deaths in weaned heifers. The single largest cause of cow deaths was lameness or injury (20.0 percent), followed by mastitis (16.5 percent), calving problems (15.2 percent), and unknown reasons (15.0 percent) (fig. 4.2).

FIGURE 4.1: Percent cow removals by reason

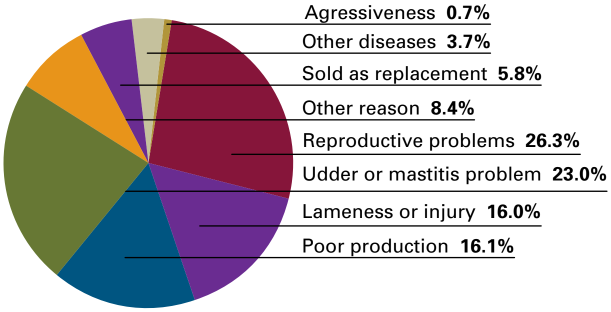
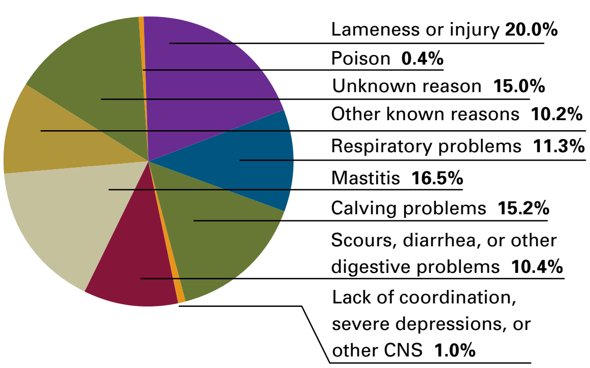
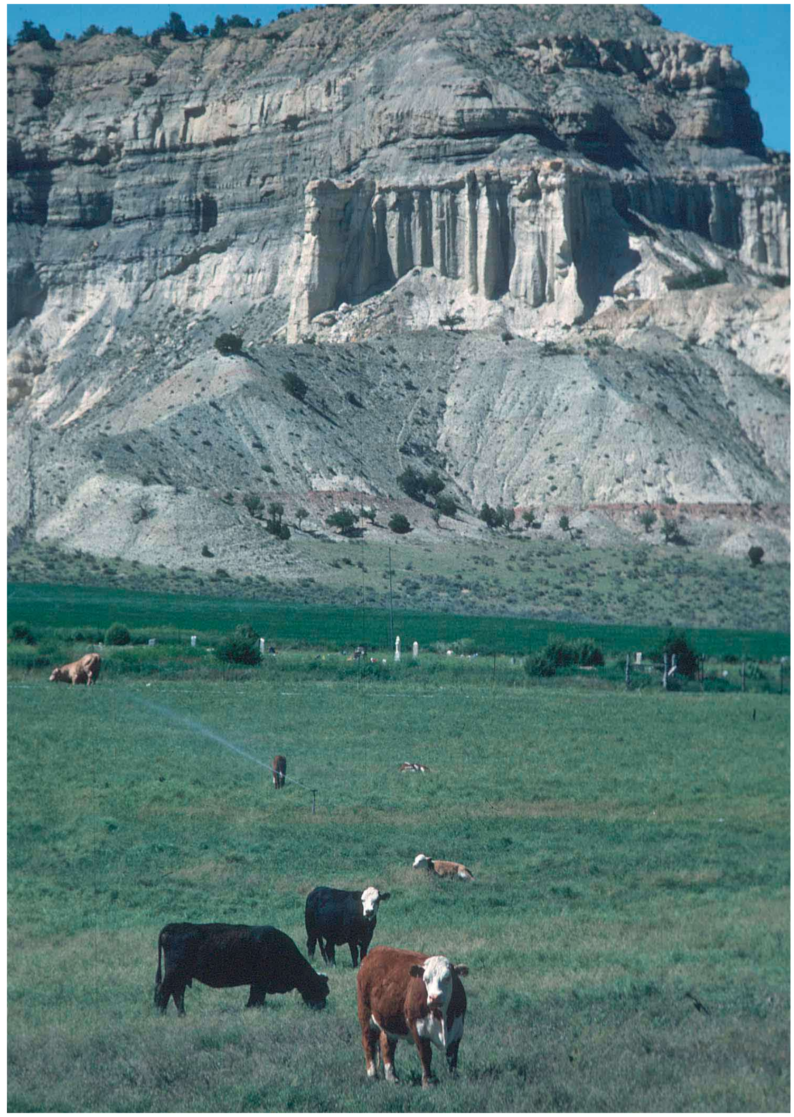


FIGURE 4.2: Cow mortality by reason





Beef 2007-2008

In 1993, NAHMS conducted the Cow/Calf Health and Productivity Audit (CHAPA). CHAPA provided baseline information on U.S. beef cattle inventories, health and management practices, forage nutrient content, and the animal selenium status. Beef '97 study objectives included describing health issue trends that affect the U.S. beef herd and acquiring national prevalence estimates of exposure to *Mycobacterium paratuberculosis* (Johne's disease) and bovine leukosis virus infections.

The NAHMS Beef 2007-08 study (currently underway) is the third study addressing the cow-calf segment of the beef industry.

The study will address the priority issues of the U.S. beef cattle industry and other stakeholders. Information needs were solicited from industry organizations and those that provide services to producers. Themes with broadest support among stakeholders and that best fit the mission of VS were used to define the objectives of the study. Twenty-four States participated in Beef 2007-08 (fig. 4.3). These States represent 79.4 percent of U.S. beef herds and 87.8 percent of U.S. beef cows.

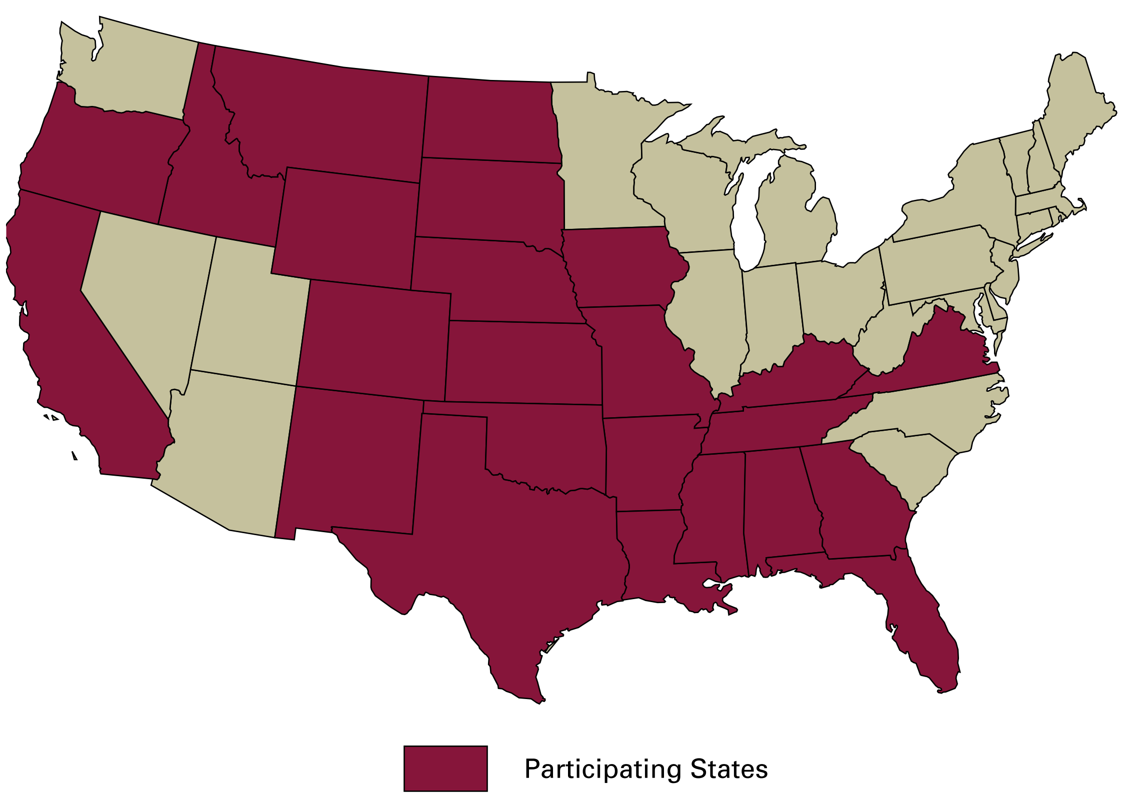
The Beef 2007-08 study will:

- Describe trends in beef cow-calf health and management practices;
- Evaluate management factors related to beef quality assurance;
- Describe record-keeping practices of cow-calf operations;
- Determine producer awareness of BVD virus (BVDV) and management practices used for BVD control;
- Describe current biosecurity practices, as well as producer motivation for implementing or not implementing biosecurity practices; and,
- Determine the prevalence and antimicrobial resistance patterns of potential food-safety pathogens.

The Beef 2007-08 study has three primary biological sampling components:

- Testing ear notch samples to estimate the percentage of calves persistently infected with BVDV. The study will also help to identify factors associated with herds that have persistently infected calves;
- Estimating the prevalence of specific food-safety pathogens such as *Salmonella* and *E. coli* O157 via testing of fecal samples; and,
- Evaluating the internal parasite burden of weaned calves (6 to 18 months old) and the efficacy of deworming programs.

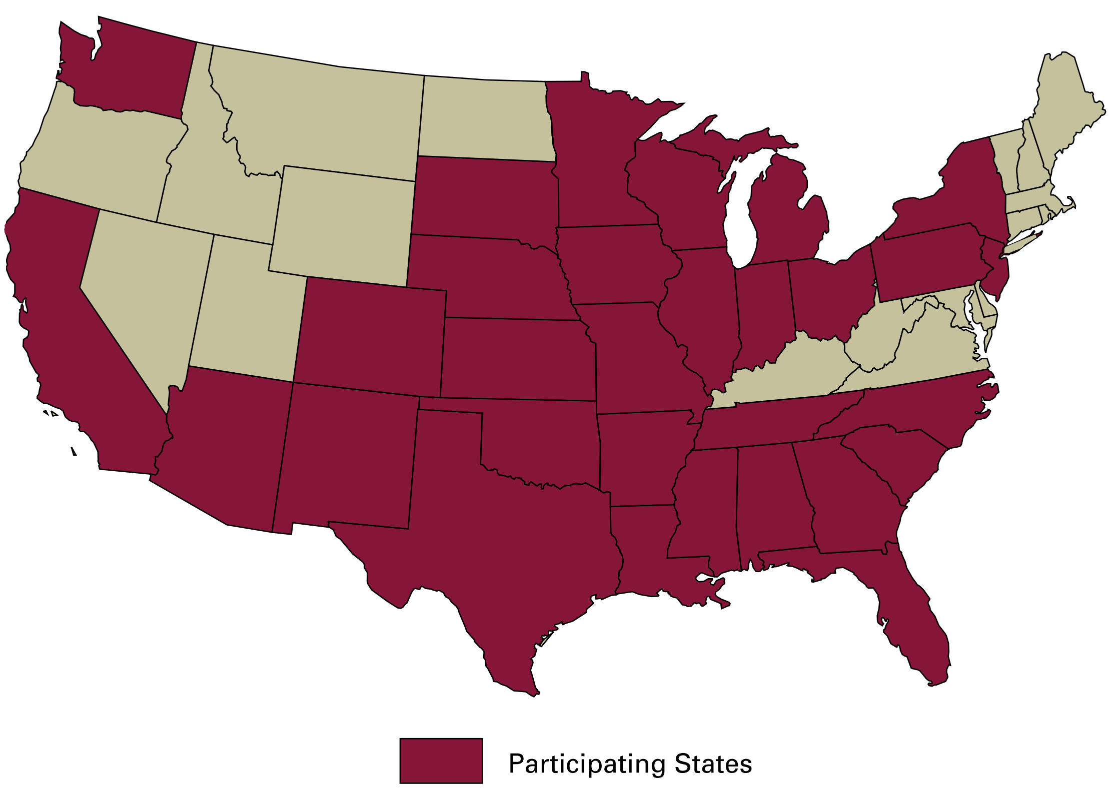
FIGURE 4.3: NAHMS Beef 2007-08 participating States



Swine 2007 Small-Enterprise Study

The Swine 2007 Small-Enterprise study was conducted jointly by NASS, NAHMS, and the National Surveillance Unit (NSU). Both NAHMS and NSU are part of the Centers for Epidemiology and Animal Health in Fort Collins, Colorado. Previous NAHMS swine studies conducted in 1995, 2000, and 2006 examined a wide variety of husbandry practices and biosecurity measures used on swine operations throughout the country. These studies focused on swine operations with 100 or more pigs, resulting in an information void with regard to health and management practices of smaller-operation swine producers. In addition, to satisfy its mission, NSU needed information to evaluate the potential for pseudorabies and classical swine fever (CSF or hog cholera) to be transmitted to or reintroduced into the national herd. The study focused on those States considered at risk for exposure to feral swine and for transmission of CSF and pseudorabies. Although the United States was declared free of CSF in 1978, the disease remains a threat to the U.S. pork industry and is currently present in neighboring countries, such as Cuba, Haiti, the Dominican Republic, and Mexico. The study included 31 States (fig. 4.4). These States accounted for 84.4 percent of swine operations nationally with fewer than 100 pigs.

FIGURE 4.4: Small-Enterprise Swine participating States



During 2007, NASS collected data for the Swine 2007 Small-Enterprise study in two phases. The following results are based on the data obtained. Overall, 79.9 percent of the sample provided usable responses.

The study found that during the period from July 1, 2006, through June 20, 2007, 8.8 piglets per litter were born; of these, 8 were born alive and 7.3 were weaned. In contrast, the Swine 2006 study of large operations (operations with 100 or more pigs) found that, from June through November 2006, 11.9 piglets were born per litter; of these, 10.9 were born alive, and 9.5 were weaned.

Nearly 7 of 10 operations (69.5 percent) brought at least 1 pig onto the operation (temporarily or permanently) during the previous 12 months. Nearly 9 of 10 pigs (89.1 percent) brought onto the operation were weaner pigs or feeder pigs (table 4.1).

On operations that had sows and gilts and housed them separately from weaned market hogs, 18.4 percent of operations housed them in total confinement or in an open-sided building with no outside access. In contrast, the NAHMS Swine 2006 study of large operations found that 67.7 percent of sites with a farrowing phase housed sows and gilts in total confinement, and 34.6 percent of sites with a gestation phase housed sows and gilts in total confinement.

Nearly one in four operations (23.9 percent) were located in counties where producers indicated feral pigs (including wild boars on hunting clubs or captive on farms) were present. This percentage is over two times higher than the estimate found in the NAHMS Swine 2006 study (10 percent of sites). Among small-enterprise producers, where feral swine were present in the county, nearly one out of two operations (49 percent) reported no concern that feral pigs would transmit disease to the operation's pigs. More than 6 of 10 operations (60.9 percent) indicated no concern that feral pigs would transmit zoonotic disease to the operator or the operator's family.

TABLE 4.1: Description of pigs brought onto the operation in the last year

	Percent Pigs	
Pig Type	**Percent**	**Std. error**
Gilts for breeding	4.4	(0.6)
Sows for breeding	2.6	(1.1)
Boars for breeding	1.9	(0.3)
Weaner pigs or feeder pigs	89.1	(1.7)
Other	2.0	(0.8)
Total	100.0	

Small-Enterprise Chicken Study 2007

The Small-Enterprise Chicken Study 2007 is NAHMS' third study of the poultry industry. This study focused on biosecurity practices and bird movement from October 2006 through September 2007 on operations with 1,000 to 19,999 chickens. NASS selected 2,511 producers from a list primarily based on the 2002 Census of Agriculture. A total of 1,789 operations responded to the survey, of which 1,191 had chickens present during the previous year.

Nearly all operations with 10,000 to 19,999 chickens and more than one-half of operations with fewer than 10,000 chickens operated under contract with a poultry company (95.8 and 54.1 percent, respectively). More than one-half of operations were contract farms with breeding chickens (55.2 percent), and 27.4 percent of operations were contract farms without breeding chickens. Independent (noncontract) operations accounted for 17.4 percent of operations.

More than two-thirds (68.6 percent) of independent (noncontract) operations held chickens for table-egg production, compared with less than 10 percent of contract operations (fig. 4.5). Two-thirds of contract operations held breeding chickens (66.9 percent), compared with only 18.3 percent of independent operations.

Nearly one-half (46.5 percent) of independent (noncontract) operations had multiple types of birds on the premises, while nearly all contract operations (97 percent) were limited to a single bird type.

Roughly one-half of independent (noncontract) operations allowed birds to have outside access, while very few contract operations did so.

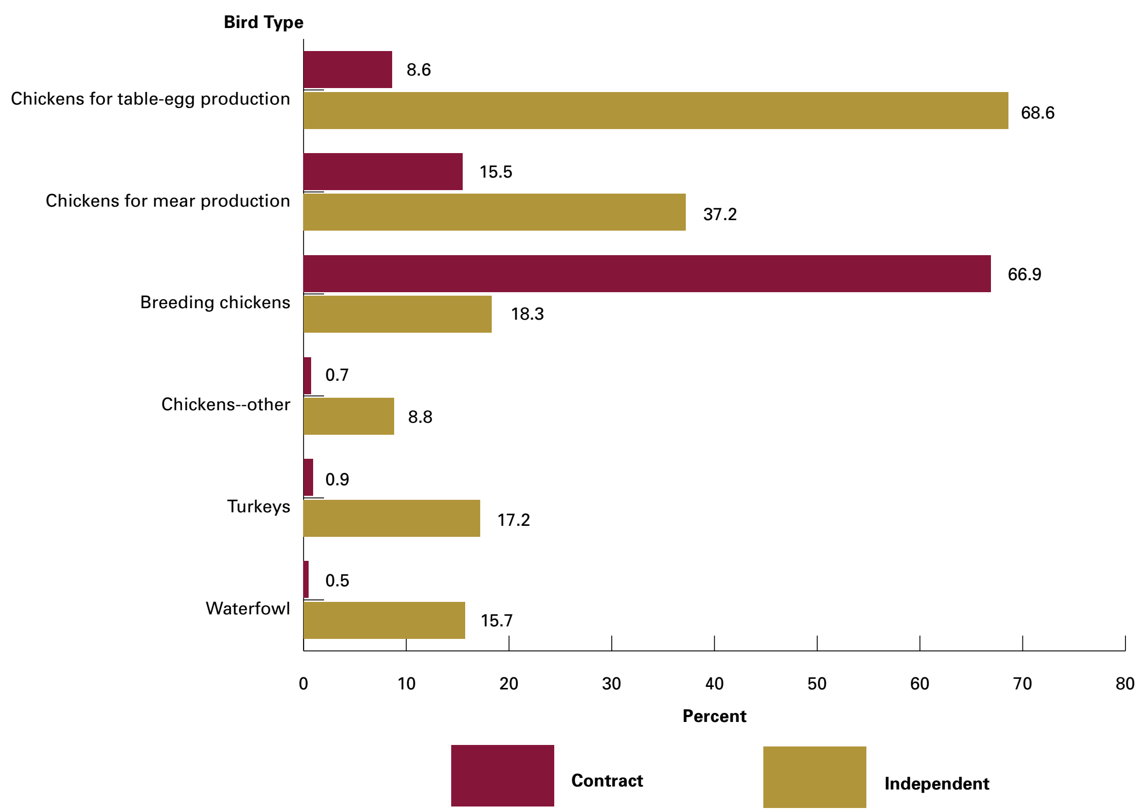
Only 1 percent of operations took poultry to a location where birds were present and then returned the poultry to the operation.

Fewer than 4 percent of operations had personnel who worked on another operation that handled birds, and fewer than 2 percent of operations had employees with pet birds or poultry at home.

The most common types of visitors were feed delivery personnel (83.7 percent), service persons employed by the poultry company (79.8 percent), and catch crew (77.3 percent). These types of visitors were more common on large operations than on small operations.

For more information on the dairy, beef, swine, poultry, and other NAHMS studies, see *http://nahms.aphis.usda.gov*.

FIGURE 4.5: Percentage of operations with the following types of birds on the premises on the day the questionnaire was completed, by contract status



White Spot Syndrome Virus in Louisiana Crawfish

White spot syndrome virus (WSSV) is a member of the Nimaviridae family and the *Whispovirus* genus of known viruses. The virus affects only certain crustaceans, particularly decapods—shrimp, crabs, lobsters, and crawfish (also known as crayfish) and poses no risk to human health. The virus invades many tissues and organ systems in the body of the infected host. As the infection progresses, multiple organ systems shut down, resulting in mortality. One of the clinical signs is shell spotting from abnormal deposits of calcium salts (hence the name "white spot"). Other clinical signs observed in shrimp are decreased food consumption, erratic swimming behavior, lethargy, weak and moribund shrimp aggregating on the pond surface and along the edge of the pond, and, ultimately, a high mortality rate.

WSSV has caused significant losses on shrimp farms in the Far East. The disease was first reported on shrimp farms in Taiwan and China in 1992-93, and it spread rapidly to surrounding countries in Asia and to Japan. In 1995, WSSV was detected on shrimp farms located in south Texas. Since then, the disease has been reported on shrimp farms in northern South America, Central America, and Mexico; along the U.S. Gulf Coast; and most recently, Hawaii.

Until 2007, the disease had never been reported in North American crawfish. The initial suspicious case occurred in an 11-acre crawfish pond in St. Martin Parish, Louisiana. During the 2006 harvesting season, the producer had experienced poor crawfish production, which worsened in 2007. In February 2007, the producer called a Louisiana State University aquaculture extension specialist for assistance.

To investigate the cause of the poor production, the producer's pond was tested for dissolved oxygen and for pesticides and other pathogens. Crawfish specimens were collected and delivered to the Louisiana Animal Disease Diagnostic Laboratory (LADDL) in Baton Rouge for a comprehensive histologic and electron microscopic diagnostic assessment. On histology and electron microscopy, the aquaculture disease diagnostician observed viral inclusion bodies characteristic of WSSV in the epithelial cells of the crawfish. Specimens were then sent to the Texas Veterinary Medical Diagnostic Laboratory (TVMDL) in College Station for WSSV polymerase chain reaction (PCR) testing. The preliminary results were positive for WSSV. Additional specimens were collected from the affected pond and forwarded to NVSL, where tests confirmed WSSV.

Louisiana has more than 1,100 crawfish farms comprising approximately 110,000 acres of shallow-water ponds. Many of these ponds are integrated with rice production. Depending on the year, approximately 95 percent of the crawfish production in the United States occurs in Louisiana, yielding 40 to 60 million pounds of crawfish per year, so the occurrence of WSSV in this population loomed as a potentially devastating prospect for the industry.

Common cultured species in Louisiana include the red swamp (*Procambarus clarkii*) and the white river (*Procambarus zonangulus*) crawfish. Both species appear to be equally affected by WSSV.

To define the extent of the infection among crawfish farms in Louisiana, a surveillance testing protocol was developed. NVSL certified a real-time PCR procedure at LADDL to accelerate diagnosis for the surveillance testing program. Specimens were collected from ponds and farms adjacent to those that reported increased crawfish mortality. Crawfish processing plants, randomly selected ponds on volunteer operations located in southern Louisiana, and the wild swampland habitat (the Atchafalaya Basin) also were selected for testing. The sampling strategy for laboratory purposes was 60 crawfish per commercial pond and 120 crawfish from each Atchafalaya Basin site.

Samples were collected from 111 crawfish ponds in 18 parishes and from 69 other locations (processors, research facilities, and the Atchafalaya Basin). Two-thirds of all ponds tested (66.7 percent) were positive for WSSV, while slightly over one-half (53.6 percent) of the other sites were positive. Overall, 61.7 percent of sites were positive for WSSV. Out of 18 parishes contributing samples, 13 parishes had at least some positive samples (fig. 4.6).

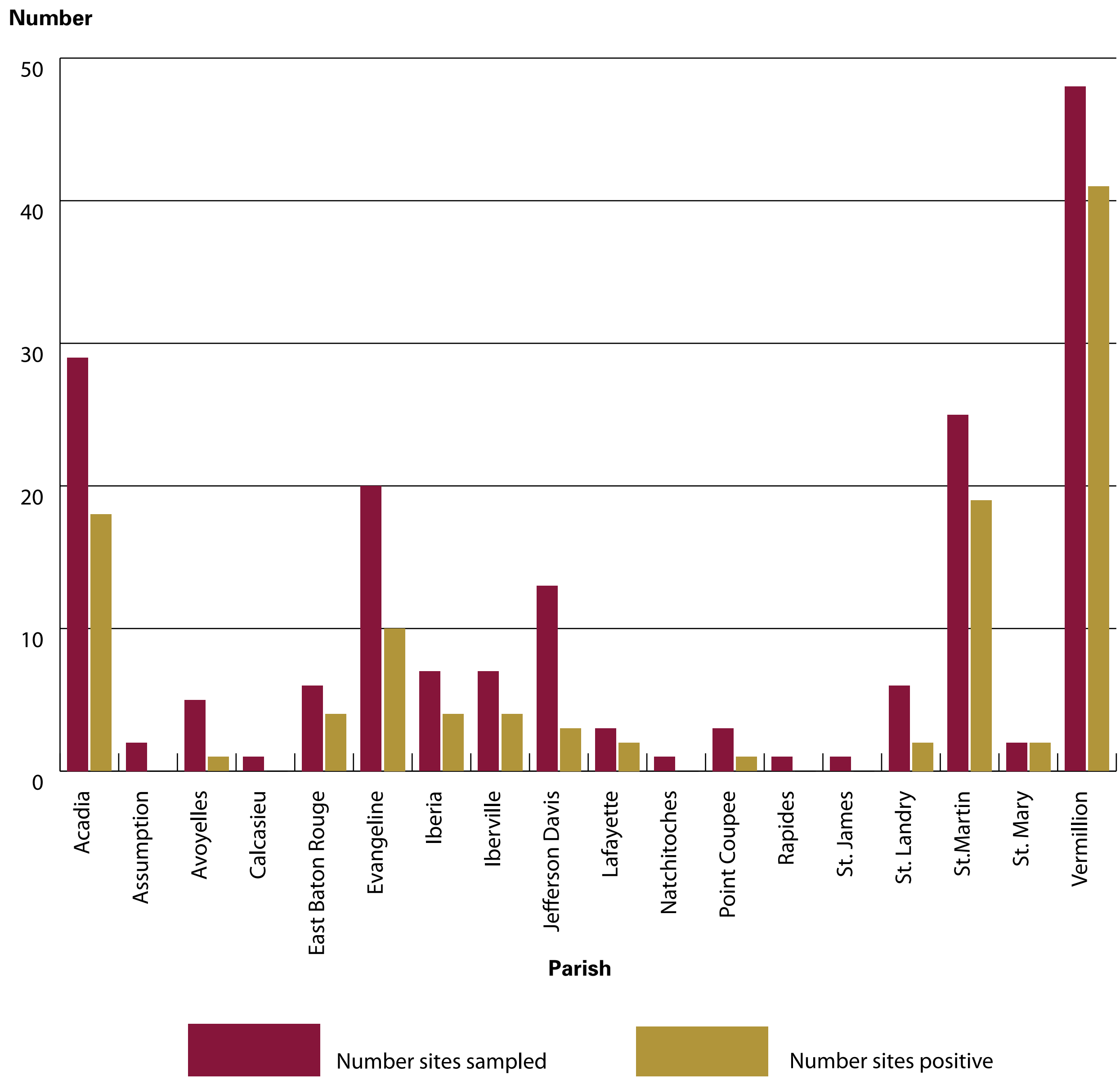
The initial source of the infection has not been determined. Two prominent hypotheses are being considered:

- Storm (hurricane) surges transported wild infected decapods, probably shrimp, ashore into freshwater habitats. Many crawfish producers trap their broodstock in the Atchafayala Basin.
- WSSV-contaminated shrimp products were used as bait in crawfish traps.

Shore birds may have contributed to the spread of the infection by carrying contaminated crawfish parts from one locale to another.

Of those ponds testing positive, only 10 reported any clinical signs in crawfish, and only 5 displayed significant mortality, which may indicate that the host has had time to adapt to the parasite. However, in archived tissue samples stored at LADDL, viral inclusion bodies similar to those left by WSSV were not observed in samples collected prior to 2005. Surveillance studies have indicated a high prevalence of WSSV in Louisiana crawfish over

FIGURE 4.6: White spot syndrome virus infection rate in crawfish



a broad geographic area. Therefore, for the Louisiana crawfish industry, the disease is now a management problem rather than a regulatory challenge. The Louisiana State Veterinarian has declared the disease to be endemic in Louisiana, and the OIE has ratified that claim.

Infectious Salmon Anemia Virus

In 2001, ISA virus infection was detected at salmon 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 as well as epidemiological and surveillance assistance to Maine's salmon industry.

The ISA program, initiated in early January 2002 in partnership with the Maine Department of Marine Resources (DMR), continued through 2007. Surveillance is mandatory at all Maine aquaculture sites where salmon are raised and is performed by the site veterinarian at a frequency dictated by the site's ISA status, at least monthly. These inspections include a visual overview of the site, a review of mortality records, the collection and submission of at least 10 moribund or freshly expired salmon, and a completed submission form that is sent with the salmon 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 by apparent relative risk.

In 2007, over 2 million smolts were stocked on 4 sites in the Machias Bay, Maine, area. Harvest of over 3 million record-sized market fish in the Eastport area was initiated in October 2007. During 2007, 900 surveillance samples were collected during 95 veterinary inspections at 11 cage sites in Maine (table 4.2). These samples bring the total number collected to 12,243 during 1,313 veterinary inspections throughout the program. In 2007, 16 site audits were conducted, for a total of 95 audits conducted during the program.

In 2007, no ISA was detected in Maine waters. A new bay management strategy, initially implemented in 2006 and based on geographic boundaries determined by hydrographic exchange during a single complete tidal cycle, continued in 2007 with stocking in the Machias Bay area.

New scientific work performed during the year, supported by USDA-APHIS and its ISA program partner, the Maine DMR, included two measures to increase the effectiveness of surveillance activities. Viral tissue culture cell lines were collected from seven participating ISA-diagnostic laboratories in eastern North America and in the United Kingdom

TABLE 4.2: ISA inspections

	2002	2003	2004	2005	2006	2007	Total
Samples	1,963	3,187	3,933	1,453	807	900	12,243
Inspections	189	369	387	178	95	95	1,313
Site audits	22	21	13	11	12	16	95
Vessel audits	8	11	0	2	0	0	21
Cages confirmed positive	0	5	17	19	1	0	42
Confirmed cages removed	0	5	17	19	1	0	42
Newly confirmed sites	1	2	6	0	1	0	11
Previously confirmed sites	0	0	1	5	0	0	NA
Sites in water	20	23	21	12	13	12	NA

and assessed for maximum ISA virus sensitivity and optimal culture conditions. Best-performing cell lines and optimal culture protocols were then distributed to participating labs. In addition, diagnosticians found a technique to optimize viral cell culture testing that greatly enhances surveillance efforts, shortens virus detection intervals, and reduces costs.

Viral Hemorrhagic Septicemia

VHS is an OIE-reportable disease that affects fish worldwide. VHS has long been considered a serious disease of rainbow trout and a few other cultured freshwater fish species in Europe, where it is known as Egtved virus. VHS virus (VHSV) causes high mortality and can have severe economic consequences, but poses no human health risks.

Four genogroups of VHSV have been identified. Genogroups I, II, and III are found mainly in Europe and Japan, while isolates of genogroup IV have been recovered only from fish in North America, Japan, and Korea. VHSV, genogroup IV, was first reported in the United States in 1988 in spawning salmon in the Pacific Northwest. Further classified as VHSV IVa, this subgroup is now considered endemic among Pacific herring and Pacific cod populations off the coast of Alaska, Canada, and Washington. In the Atlantic Ocean, this same subgroup (IVa) has been isolated from Atlantic herring and Greenland halibut.

However, VHSV has expanded in geographic range and species susceptibility in North America in recent years. Since 2005, a number of large die-offs have occurred in wild fish in the Great Lakes and associated watersheds, and many have been associated with a new, presumably mutated VHSV type IV strain, referred to as VHSV IVb. VHSV IVb has now been detected in samples collected from a variety of fish species in lakes St. Clair, Erie, Michigan, Ontario, and Huron; in the St. Lawrence River; and, inland waters in New York, Wisconsin, and Michigan. A similar, but distinct, genotype has also been isolated from fish collected as early as 2001 from tidal rivers in New Brunswick, Canada.

VHSV IVb affects multiple genera of fish. As of November 2007, 28 freshwater species, including a number of ecologically and recreationally important species, are known to be susceptible to the virus. It is not known how VHSV was transferred to the Great Lakes or how long it has been in the ecosystem. One possible scenario suggests the virus may have mutated from a marine form and become pathogenic to naïve freshwater fish species. Factors affecting its spread within and between freshwater systems may include natural and anthropogenic movements of fish, fomites, and/or water between affected and susceptible watersheds.

On October 24, 2006, the APHIS Administrator issued a Federal Order prohibiting movement of 37 species of live fish into the United States from Ontario and Quebec, Canada, the Provinces that reported VHS outbreaks. This order also prohibits the interstate movement of the same fish species from eight States (New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Minnesota, and Wisconsin) that have reported occurrences of VHS or are at immediate risk of acquiring the disease. Following stakeholder feedback, the Federal Order was amended on November 14, 2006, to allow for restricted movements, under certain conditions, out of the States affected by the original Federal Order. The basis for limiting the Federal Order to these States is that no cases of VHS IVb have been diagnosed or reported outside of the Great Lakes watershed or in any cultured populations of known susceptible species. More details on the Federal Order are available online at *www.aphis.usda.gov/vs/aqua/pdf/vhs-fed-order_ogc-changes.pdf*

However, questions about current disease distribution prompted APHIS, the Canadian Food Inspection Agency (CFIA), and DOI's FWS to develop a VHSV IVb surveillance plan for bilateral use in freshwater systems in Canada and the United States. The bilateral VHS surveillance plan was completed in May 2007. VHS surveillance methods combine standard diagnostic test data with alternative knowledge sources (e.g., expert opinion and historical data) to more efficiently predict the distribution of VHS occurrence in U.S. and Canadian freshwater fish populations. An international panel of 30 fish health experts identified 9 factors that can be used to estimate the likelihood of VHSV IVb in any particular freshwater watershed. Among these identified risk factors are hydrologic connectivity, geographic proximity, and/or a history of untested fish transfers from the affected Great Lakes and associated watersheds. The results of the panel effort will help prioritize regions with the greatest need for surveillance and provide baseline assurance of disease absence in regions without substantive risk.

At the end of FY 2007, APHIS Administrator contingency funds ($616,000 over eight States) were provided to begin implementation of VHS IVb surveillance in the Great Lakes States and States immediately adjacent. In FY 2008, Congress appropriated $5.6 million for VHS activities. APHIS will use $1.5 million of the appropriated funds to offer cooperative agreements with State agencies and Tribal groups to conduct surveillance of those farmed and wild populations at greatest risk of acquiring the disease. In addition, APHIS will continue an outreach campaign to educate the public about potential pathogen vectors, such as activities related to recreational fishing, not easily controlled through regulatory actions.

NAHRS Summary and Update

The National Animal Health Reporting System (NAHRS) is a joint effort of the United States Animal Health Association (USAHA), the American Association of Veterinary Laboratory Diagnosticians (AAVLD), and USDA-APHIS. NAHRS, which is coordinated by NSU, was designed to gather data from State animal health officials on the presence in the United States of confirmed OIE-reportable diseases in specific commercial livestock, poultry, and aquaculture species. NAHRS functions 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. The U.S. status of the occurrence of OIE-reportable diseases is listed in table A2.3 in appendix 2.

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

2007 Developments—In 2007, 46 States reported disease information to NAHRS (fig. 4.7). All four of the nonparticipating States are exploring participation in NAHRS.

Enhanced aquaculture reporting–During 2007, NAHRS staff began efforts to enhance the NAHRS reporting of OIE-reportable aquaculture diseases.

Online NAHRS reporting—A new version of the NAHRS online reporting application was released in 2007. 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.

More information is available at the NAHRS Web site, *http://www.aphis.usda.gov/vs/ceah/ncahs/nahrs/*.

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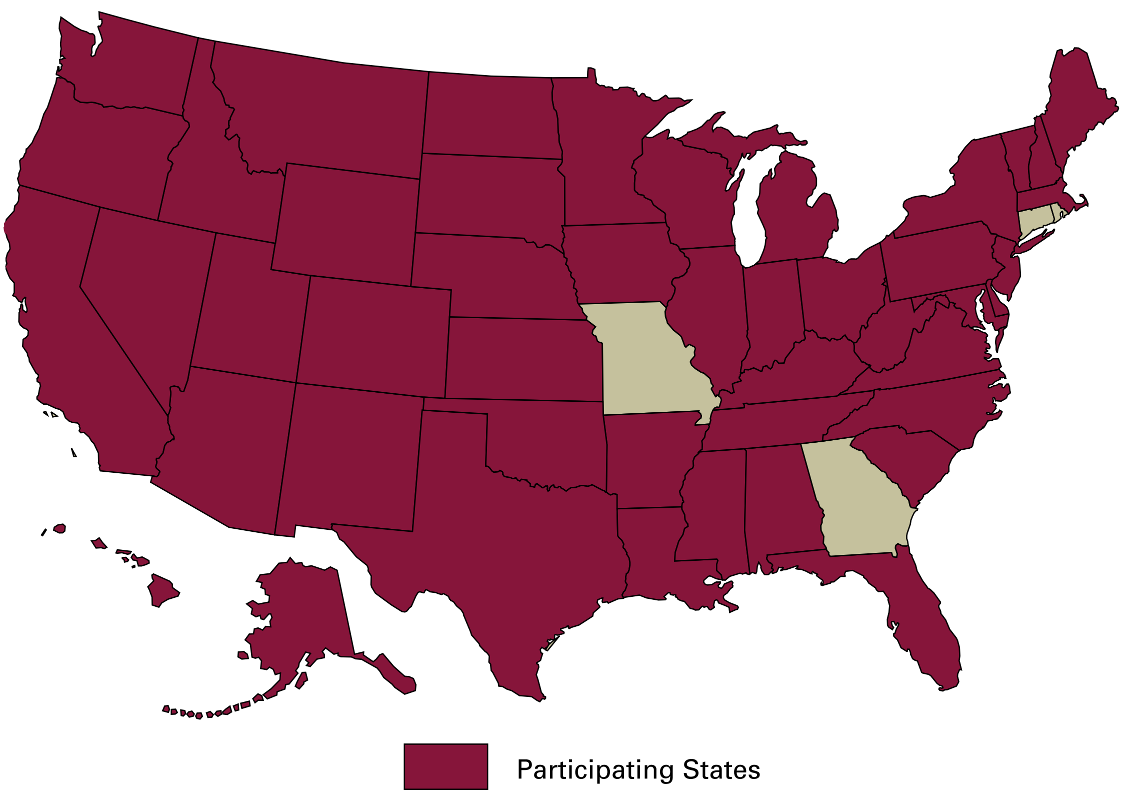
FIGURE 4.7 : States participating in NAHRS in 2007



CHAPTER 5

CHAPTER 5

Animal Health Diagnostics and Veterinary Biologics

Laboratory and diagnostic services and veterinary biologics are essential components of the U.S. animal health infrastructure. This chapter describes the missions, functions, and key 2007 accomplishments of the USDA's NVSL, the Center for Veterinary Biologics (CVB), and the National Animal Health Laboratory Network (NAHLN).

NVSL provides laboratory services for USDA–APHIS. The NVSL includes four laboratories: the Diagnostic Bacteriology Laboratory (DBL), the Pathobiology Laboratory (PL), and the Diagnostic Virology Laboratory (DVL), all located in Ames, Iowa; and the Foreign Animal Disease Diagnostic Laboratory (FADDL), located on Plum Island, New York.

CVB is also headquartered in Ames, with some staff located in Riverdale, Maryland. CVB's Veterinary Biologics Program implements the provisions of the Virus-Serum-Toxin Act (VSTA) to assure that pure, safe, potent, and effective veterinary biologics are available for the diagnosis, prevention, and treatment of animal diseases.

NAHLN represents a nationwide strategy to coordinate the activities of organizations providing critical animal disease surveillance and testing. It is a cooperative effort between two USDA agencies—APHIS and the Cooperative State Research, Education, and Extension Service (CSREES)—and the American Association of Veterinary Laboratory Diagnosticians. NAHLN is comprised of Federal agencies and State and university veterinary diagnostic laboratories.

National Veterinary Services Laboratories

NVSL's mission is to safeguard animal and public health by providing quality services and resources that meet customer needs. It does this as a diagnostic laboratory and a NAHLN support organization. NVSL serves as the NAHLN reference laboratory and as the national and international reference laboratory for an increasing number of animal diseases.

More than 300 staff members work in or support the work of the four NVSL laboratories. The NVSL also works closely with the OIE to provide consultation, reagents, and training for foreign governments.

In December 2006, NVSL and an onsite Calibration Laboratory received accreditation to the International Organization for Standardization (ISO)/International Electrotechnical Commission 17025 Standard: General Requirements for the Competence of Testing and Calibration Laboratories. The ISO is the world's largest standards development organization. Accreditation recognizes the competency of the NVSL and Calibration Laboratory to perform specified tests and calibrations. In 2007, NVSL added tests and calibrations to the scope of accreditation as part of its commitment to enhancing the NVSL Quality Management System.

Diagnostic Bacteriology Laboratory

The DBL provides diagnostic assistance for bacterial and protozoal diseases by

- Conducting serologic testing for the presence of antibodies to pathogens;
- Isolating, identifying, and genotyping bacteria;
- Producing reagents needed for diagnostic testing;
- Administering proficiency tests for selected diseases; and,
- Conducting training.

The DBL is an OIE reference laboratory for leptospirosis, contagious equine metritis, and anthrax. The major functions of the laboratory include import testing of horses for equine piroplasmosis, dourine, and glanders; *Salmonella* serotyping; bovine tuberculosis and brucellosis culturing; brucellosis reagent production; Johne's disease serology and culturing; and, leptospirosis serology. The laboratory also maintains the brucellosis, bovine tuberculosis, Johne's disease, and NAHMS serum banks and the Johne's disease culture bank. The disease-specific serum banks serve as sources of well-defined sera for validating new tests as they are developed. The NAHMS serum banks are species specific and serve as a statistically valid source of sera for prevalence studies and for the validation of new tests.

Pathobiology Laboratory

PL offers a wide range of testing services. The laboratory provides training, proficiency testing, and lab oversight for those network laboratories conducting TSE testing. PL also screens blood samples of animals being transported out of the United States to detect fraudulent blood submissions.

PL testing supports APHIS–VS disease programs, such as those for bovine TB, BSE in cattle, scrapie in sheep, and CWD in deer and elk. PL supports tick surveillance by identifying ticks found on imported animals and also assists with screwworm surveillance by identifying suspected screwworm fly larvae.

The laboratory evaluates pesticides used in cattle to ensure that effective concentrations are utilized. Formaldehyde levels in veterinary biological products are also evaluated.

Diagnostic Virology Laboratory

The DVL performs diagnostic testing for numerous domestic and foreign animal viruses such as West Nile virus, vesicular stomatitis virus (VSV), HPAI virus, END virus, equine encephalomyelitis viruses (western, eastern, and Venezuelan), equine infectious anemia (EIA) virus, bluetongue virus, swine influenza virus (SIV), and PRV.

The DVL is an OIE reference laboratory for equine encephalomyelitis, EIA, HPAI, END, PRV, West Nile virus, and bluetongue virus. The lab also performs import/export testing, produces reagents/reference materials, and administers proficiency testing and laboratory certification approvals for selected diseases, including AI and END real-time reverse transcriptase polymerase chain reaction (rRT-PCR) testing in NAHLN laboratories.

Foreign Animal Disease Diagnostic Laboratory

FADDL, located at the Plum Island Animal Disease Center, is the U.S. laboratory devoted to diagnosing and researching FADs, including highly contagious FADs of livestock such as FMD.

FADDL scientists can diagnose more than 30 exotic animal diseases and perform thousands of diagnostic tests each year looking for the presence of FAD agents. Tissue and blood samples come to FADDL from veterinarians who suspect an exotic disease in domestic livestock or from animal import centers testing quarantined animals for foreign diseases. Animal health professionals in other countries also submit samples to FADDL when they need help with diagnoses or confirmation.

Additionally, FADDL is the custodian of the North American FMD Vaccine Bank. The bank, jointly owned by Canada, Mexico, and the United States, stores concentrated FMD antigen that can be formulated into vaccines should an FMD introduction occur. FADDL personnel are responsible for testing new lots of antigen and periodic testing of stored antigen for safety and potency.

FADDL also supports NAHLN with assay development and validation, training, proficiency testing, and confirmation testing for various FADs.

National Animal Health Laboratory Network

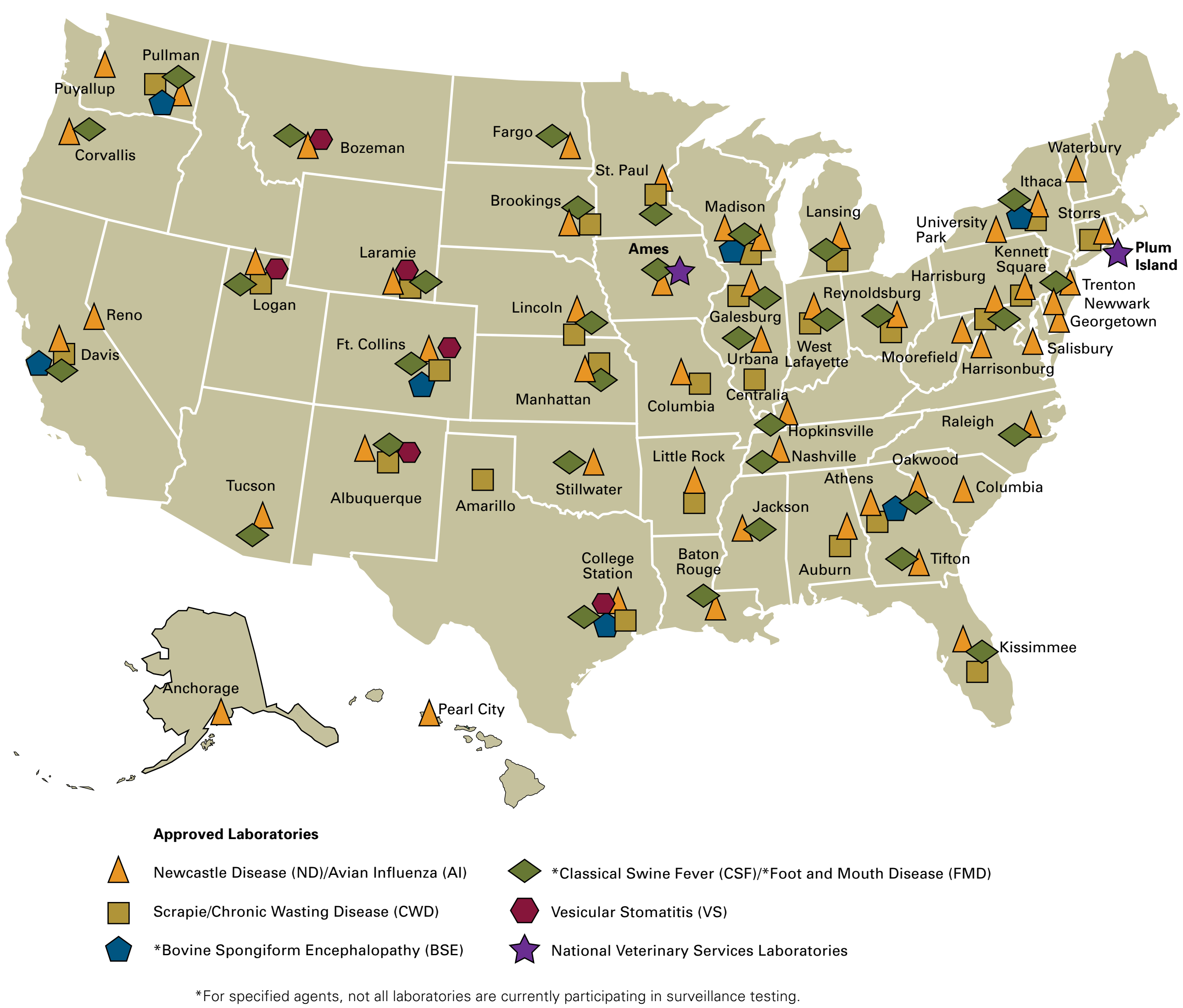
The USDA Homeland Security Office established the NAHLN as part of a national strategy to coordinate and link the testing capacities of the Federal veterinary diagnostic laboratories with the extensive infrastructure (facilities, professional expertise, and support) of State and university veterinary 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.

In 2002, APHIS and CSREES launched the NAHLN by entering into cooperative agreements with 12 State and university veterinary diagnostic laboratories. These were funded by the USDA. APHIS now contracts with 54 State and university diagnostic laboratories to assist with testing and surveillance; the number of NAHLN facilities totals 58 laboratories in 45 States, which includes those 54 laboratories plus NVSL, FADDL, the DOI laboratory in Madison, Wisconsin, and the FSIS laboratory in Athens, Georgia (fig. 5.1).

NVSL provides training and proficiency testing for the NAHLN member laboratories, either annually or semiannually. Tests include standardized screening methods for NAHLN's currently targeted diseases: AI, END, FMD,CSF, BSE, CWD, vesicular stomatitis (VS), and scrapie.

NAHLN laboratories perform screening assays and forward any suspect or positive samples to the appropriate section of NVSL for confirmatory testing.

FIGURE 5.1: NAHLN network



2007 Highlights in Diagnostics and Laboratory Activities

Testing Support

Brucellosis testing—The DBL modified the *Brucella ovis* test to screen rams for epididymitis to make the test more sensitive and specific. The PCR test, used to differentiate *Brucella abortus*, *B. melitensis*, *B. ovis*, and *B.suis*, was also modified to increase its ability to differentiate *B. suis* from *B. canis*. The DBL added the Western blot assay as a supplemental test to differentiate *Brucella abortus* infections from infections with *Yersinia* and other bacteria that can cross-react with *Brucella*. The DBL increased the testing available to genotype brucellosis and mycobacteria cultures to assist in the epidemiological investigation of outbreaks.

NAHMS study—The DBL provided testing support for the NAHMS Swine 2006 study, which concluded in March 2007, and the Dairy 2007 study. Testing for the Swine 2006 study included detection of porcine reproductive and respiratory syndrome antibodies and swine influenza antibody and serotyping of *Salmonella* isolates. Testing for the Dairy 2007 study included immunoglobulin and total protein determinations in calves, Johne's disease culturing, and *Salmonella* serotyping.

Salmonella serotyping—The number of *Salmonella* isolates serotyped in 2007 increased 9 percent compared to the number serotyped in 2006. The DBL staff serotyped 18,246 *Salmonella* cultures, continuing a steady increase over the last 5 years. This increase is predicted to continue due to the increased emphasis on food safety by FSIS and the Food Safety Consortium.

Pathobiology Support

Exotic parasites—PL entomologists identified several unusual exotic parasites that were submitted to the lab in 2007.

In June, 33 *Amblyomma compressum* ticks were recovered from 10 African tree pangolins from Cameroon that arrived at the San Diego, California, zoo. This tick occurs only in West and Central Africa and is found primarily on various pangolins. This is only the second documented collection of this species in the United States.

In September, entomologists identified hundreds of mites collected in Florida from a pet giant African millipede as belonging to two species, *Julolaelaps luctator* and *J. pararotundatus*. These African mites live on millipedes and become problematic only on animals in captivity.

In November, mites from lung tissues of a recently deceased African rock hyrax at the Kansas City, Missouri, zoo were identified as *Pneumonyssus procavians*. This host-specific mite is commonly present in African host animals, but there are no previous records of its occurrence in the United States.

In December, entomologists found a single male tick on an African aardvark that arrived at Busch Gardens in Florida; it was identified as *Rhipicephalus praetextatus*. This tick occurs only in eastern Africa, where it parasitizes a wide variety of domestic and wild animals and may cause tick paralysis or be a minor vector for a few disease agents. This may be its first collection in the United States.

Scrapie eradication program—The PL played a key role in validating rectal biopsy as a new diagnostic procedure for the scrapie eradication program. This live-animal test will expedite identification of scrapie-infected animals and flocks and the implementation of control/eradication measures.

Virology Support

Bluetongue virus (BTV) isolates—As an OIE international reference laboratory, DVL applies new diagnostic tools as they are available to characterize previously untypeable agents. For example, NVSL recently identified several BTV isolates.

Since 1999, certain BTV isolates have been obtained or isolated that could not be identified as any of the five serotypes considered endemic to the United States (BTV-2, BTV-10, BTV-11, BTV-13, and

BTV-17). All of the isolates originated in sheep, cattle, or deer samples from Florida. Virus neutralization tests using type-specific reagents directed to serotypes identified in the Caribbean and Central American regions suggested the presence of serotypes not previously identified in the United States; however, the tests were inconclusive. Sequencing of PCR products based on newly developed primers enabled the lab to confirm the identity of the Florida isolates. NVSL also submitted several of the isolates to another OIE bluetongue reference laboratory, the Institute for Animal Health at Pirbright in the United Kingdom, for identification and/or confirmation of the NVSL results. BTV serotypes identified with these new genetic tools were BTV-3, BTV-5, BTV-6, BTV-14, BTV-19, and BTV-22.

SIV investigation**—**NVSL cooperates with public health agencies to investigate situations where illness in animals and people may be related. One example was an occurrence of SIV in 2007. SIV is a common cause of respiratory infection in swine. Previous sporadic human infections with SIV illustrate the zoonotic potential of the virus. Pigs can be infected with swine, human, and AI viruses and thus potentiate cross-species influenza transmission and formation of novel influenza viruses.

During 2007, pigs at an Ohio county fair developed an influenza-like illness; some individuals attending the fair developed influenza-like illness simultaneously and sought medical care. State public health officials and laboratories, the CDC, and NVSL worked together to investigate the relationship between the illnesses. Genetic sequencing and other techniques demonstrated that the virus was shared between pigs and humans at the fair.

AI wild bird surveillance**—**In 2007, 52 approved State/university laboratories and 1 DOI NAHLN laboratory conducted enhanced AI surveillance efforts for APHIS' VS and WS programs. These laboratories evaluate whether the AI virus is present in samples and, if so, determine whether it is an H5 or H7 subtype. Because of the potential for H5 or H7 subtypes to mutate into highly pathogenic strains, laboratory personnel forward presumptive positive samples to NVSL for confirmatory testing. NVSL then conducts additional screening and confirmatory tests with assistance from USDA's Southeast Poultry Research Laboratory to confirm genetic identification of isolated strains of the virus. Approximately 148,000 wild birds were tested in 2006 and approximately 80,000 birds were tested in 2007; samples came from all 50 States. No HPAI (H5N1) was detected.

CSF surveillance**—**NAHLN laboratories assist with sample collection, processing, and testing as part of USDA's surveillance plan for CSF in Puerto Rico and those States at high risk for introduction of CSF. The number of State/university NAHLN laboratories participating in surveillance testing increased to 36 in 2007.

FADDL performs confirmatory testing for CSF. During 2007, FADDL scientists developed and validated a new rRT-PCR assay with increased sensitivity and specificity, compared to current CSF assays. This new assay enhances the Nation's capability to detect a CSF outbreak rapidly.

Vesicular diseases**—**As of the end of 2007, personnel in 35 State/university laboratories and 1 DOI laboratory have been trained and successfully completed proficiency testing for FMD. A surveillance plan for vesicular diseases was recently developed and will be implemented in 2010.

TSEs**—**Personnel in eight NAHLN laboratories conduct testing for BSE and submit any inconclusive tests to NVSL for confirmation. Twenty-seven NAHLN laboratory personnel perform tests for CWD and scrapie.

VSV**—**After NVSL confirms an index case of VSV, personnel from approved laboratories conduct a complement-fixation test for VSV on equid samples. Personnel from six NAHLN laboratories have been trained and proficiency-tested to conduct this test.

These laboratories are located in the region where VSV typically occurs in the United States.

Training and Preparedness

APHIS developed and implemented a "Train the Trainer" program for AI, END, FMD, and CSF rapid assays. The number of State/university and Federal laboratories approved to conduct FMD assays increased from 14 to 38 laboratories, and the number of approved laboratories conducting AI testing increased from 44 to 54. The training programs also increased the number of laboratory personnel prepared to respond to a national animal health emergency and the number of trainers available to teach others. During 2007, a training program for high-throughput testing was developed for use in two NAHLN laboratories. The program will be delivered to the remainder of NAHLN laboratories in 2008.

In September 2007, NAHLN established a working group to develop exercises and drills. The group includes representatives from large and small laboratories.

To prepare responders for the challenges likely to be encountered during an HPAI outbreak, NAHLN developed an AI tabletop exercise, which was reviewed by the NAHLN exercises and drills working group. Participants learn about laboratory issues likely to arise during an outbreak and have the opportunity to assess response and activation plans. During 2008, NAHLN laboratory personnel and other animal health professionals will participate in this exercise during facilitated sessions throughout the United States.

International Activities

APHIS has a long history of working on international efforts for animal disease identification and eradication. APHIS is working with Canadian and Mexican animal health laboratory network personnel to standardize tests used in North America for the diagnosis of AI, TB, and vesicular diseases. Under the Security and Prosperity Partnership of North America, harmonization of diagnostics has been identified as a key objective. The international partnership aims to create a safer and more reliable food supply while facilitating agricultural trade by pursuing common approaches to enhanced food safety, enhanced laboratory coordination, and information sharing.

NVSL, as part of its role as an OIE avian reference laboratory, provided training in various AI diagnostic techniques to 47 scientists from 27 countries. In addition, NVSL scientists traveled to Brazil, Kazakhstan, Tanzania, and Mexico to provide in-country training for AI diagnostics. APHIS developed and implemented similar training programs in seven countries for FMD and brucellosis.

Center for Veterinary Biologics

CVB regulates veterinary biologics (vaccines, bacterins, antisera, diagnostic kits, and other products of biological origin) to ensure that the veterinary biologics available for the diagnosis, prevention, and treatment of animal diseases are pure, safe, potent, and effective.

CVB's responsibilities include

- Reviewing biologics product license applications and associated studies,
- Issuing biologics product licenses and permits,
- Testing biologics products for purity and potency,
- Inspecting biologics product manufacturing facilities,
- Regulating the release of biologics products to the marketplace,
- Conducting postmarketing surveillance of biologics products, and
- Certifying vaccines and diagnostics for export.

CVB is comprised of two functional units—the Policy, Evaluation and Licensing (PEL) unit and the Inspection and Compliance (IC) unit. The licensing staff within CVB-PEL reviews license applications for production facilities and biological products; reviews permit applications for importation of products; establishes licensing, testing, and permit requirements and procedures; and, reviews production methods, labels, and supporting data involved in the licensing and permit process. The IC unit is responsible for developing and implementing programs to ensure veterinary biologics are prepared and distributed in compliance with the VSTA and its subsequent regulations. Compliance with the VSTA is assured by facilities inspections, product inspections, adverse event reporting, and investigations.

As part of its mission, CVB plays a key role in many other VS activities. For example, CVB is active in soliciting bids and evaluating technical proposals for the NVS vaccine banks. Without relaxing its rigorous licensing standards, CVB expedites the evaluation of vaccines and diagnostics for national disease-eradication or disease-control programs.

2007 Biologics Highlights

Licensing activities—In 2007, CVB issued a wide variety of product licenses and permits; some were for new products critical to facilitating trade and enhancing agricultural economic activities. Responding to swine industry concerns over the emergence of porcine circovirus, CVB expedited both the licensing of new vaccines for this chronic wasting syndrome in pigs and the rapid release of vaccine into the marketplace to meet swine producers' needs.

CVB also licensed several innovative products, including the first animal cancer vaccine (a DNA vaccine for canine melanoma) and a classical swine fever diagnostic test kit for use in national surveillance. In addition, CVB implemented new policies that allow manufacturers to quickly license products as more virulent strains of influenza emerge. These policies improved CVB's ability to respond to emerging strains of influenza in horses and pigs.

Inspection activities—CVB released more than 16,000 veterinary biological serials, comprising upwards of 80 billion doses, into the marketplace. In addition, CVB conducted more than 110 inspections of both domestic and international production facilities. Although most of these were in-depth inspections of

licensed facilities, some were select agent inspections, observations of product efficacy studies, and antigen-bank inspections. CVB also issued more than 2,600 licensing and inspection certificates and more than 850 certificates for the export of veterinary biologics.

ISO certification—CVB successfully achieved ISO 9001 standards certification in 2007. This certification provides external recognition that CVB's business practices meet international standards for quality products, customer satisfaction, individual accountability, and process improvement. Operation manuals and memoranda of understanding with service providers were revised to meet current standards. CVB certification is specific for business processes involved with

- Reviewing prelicensing data,
- Issuing establishment and product permits and licenses,
- Inspecting facilities,
- Producing testing aids,
- Evaluating products,
- Writing standards and procedures for product release, and
- Overseeing compliance of firms that produce or distribute veterinary biologics in the United States.

Strategic diagnostics and vaccines support**—**CVB provided expertise on vaccine and diagnostic kits for a variety of pathogens, including Rift Valley fever, AI, and FMD, at international conferences and working group meetings. As a result, new diagnostic and vaccination strategies to aid in early detection of FAD incursions have been developed and implemented. For example, CVB provided expertise for the inspection and risk analysis of biocontainment manufacturing facilities in the Czech Republic. This activity was part of a program to prepare the United States to respond to the need for wild-type H5N1 avian and human influenza vaccine in the United States. CVB's continued involvement in the North American FMD Vaccine Bank and the NVS has resulted in multiple contracts for a variety of products and has expanded the emergency supply of AI vaccine. CVB ensures that more than 600 million doses remain potent, effective, and available for use in the event of an AI outbreak.

International activities**—**CVB's involvement in the International Cooperation on Harmonization of Technical Requirements for Registration of Veterinary Medicinal Products (VICH) led to the development of several new technical guidelines relating to animal safety and post-licensing monitoring of product performance. Once implemented, these will serve as new international standards and allow for increased trade with Japan and the European Union. In September 2007, as part of its participation in VICH, CVB hosted the Pharmacovigilance Expert Working Group meetings in Washington, D.C. The meetings were attended by representatives from the veterinary medicinal products industry and regulatory agency representatives from Japan, the European Union, Australia/New Zealand, Canada, and the United States.

CVB provided expertise for audits conducted by Brazilian regulatory officials at several U.S. vaccine manufacturers. This collaboration provided Brazil with confidence in CVB's regulatory system and helped promote the export of U.S. products. CVB hosted a Japanese veterinary biologics regulatory official in an extended training program. CVB also provided expertise and training at a joint CVB/Institute for International Cooperation in Animal Biologics program, aimed at educating foreign officials on U.S. regulatory processes. More than 135 delegates from 21 countries participated.

CVB was represented at the Global Animal Health Conference held at the European Medicines Evaluation Agency in London. The primary objective of the conference was to promote a dialogue among key stakeholders in global animal health in the field of veterinary medicines. Approximately 140 representatives and officials from more than 20 countries attended. The attendees represented regulatory agencies, industry, international organizations, academia, and the research community.

Ames Modernization Project

NVSL, CVB, and the USDA's ARS National Animal Disease Center are modernizing their facilities and consolidating operational support in Ames, Iowa. The result will be USDA's largest animal health center, providing world-class animal health research, diagnosis, and product evaluation. This new center is known as the National Centers for Animal Health.

The Ames modernization project has four main components:

- Phase 1 of the consolidated laboratory facility was completed in September 2004. This facility includes bio-safety level 2 and 3 laboratories for pathobiology and diagnostic bacteriology work.
- Phase 2 is the consolidated laboratory facility, which will include additional bio-safety level 2 and 3 laboratories, caged animal facilities, and space for administrative, office, conference, and support services. Construction is scheduled for completion in early 2009.
- The high-containment large-animal housing and training facility, dedicated in July 2007, includes 22 rooms for animals such as bison, cattle, horses, and swine. It also includes two necropsy areas, one with training space.

- The low-containment large-animal housing facility, where diagnosticians, scientists, and ARS researchers work on livestock diseases, is scheduled to be completed in 2008.

The finished complex will include almost 1 million square feet of safe, energy-efficient, modern facilities with state-of-the-art capabilities for research, diagnosis, and biological product evaluation.

CHAPTER 6

CHAPTER 6

Overview of U.S. Livestock, Poultry, and Aquaculture Production in 2007

Available Statistics

Official statistics for U.S. livestock, poultry, and aquaculture populations are published by USDA's NASS. These statistics are based on the Census of Agriculture conducted every 5 years (e.g., 1997 and 2002) and on surveys conducted monthly, quarterly, or annually as determined by the particular commodity. Frequency of surveys and sample sizes by commodity are shown in appendix 1 (table A1.1).

The Census of Agriculture, which is a complete enumeration of the entire agricultural segment of the economy, is the only source of detailed, county-level data for all farms and ranches in all 50 States that sell or intend to sell agricultural products worth $1,000 or more in a year. The most recent Census data was collected for 2002 and published in spring 2004. The U.S. maps presented in this chapter are based on the 2002 Census of Agriculture, which provides animal inventory levels as of December 31, 2002. During spring 2008, the most recent Census of Agriculture (2007) was conducted. Animal inventory levels were collected as of December 31, 2007. Published reports will be available in spring 2009.

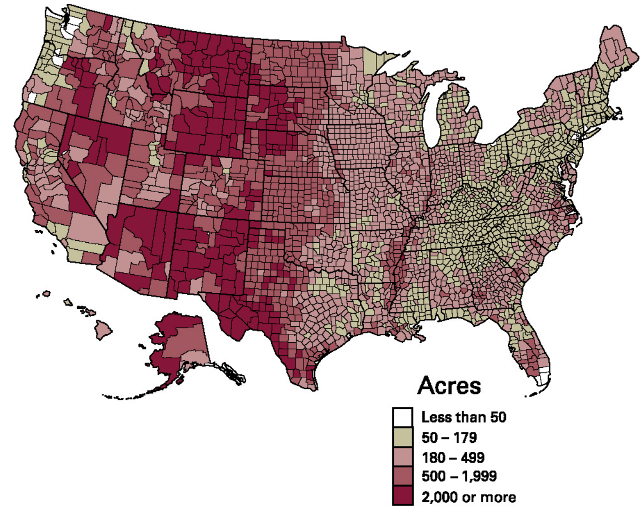
In NASS' ongoing sample survey and estimation programs, data is collected and estimates are published within the same month to provide users with the most up-to-date and timely information. This information is collected and published even during years the Census is conducted. The massive data-collecting, 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. For this reason, if you compare statistics printed in the 2006 Animal Health Report for that year with statistics published in this year's version of the report for 2006, the numbers do not always match. 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."

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 2002 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 2007, there were 2.08 million farms, 0.6 percent fewer than in 2006. Total land in farms was 930.9 million acres in 2007, which represents a decrease from 932.4 million acres in 2006. The average farm size of 449 acres in 2007 was slightly larger than the average acreage in 2006 (446 acres).

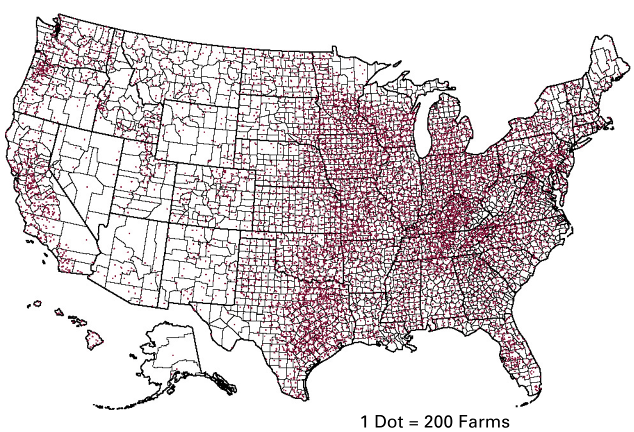
MAP 2: Average Size of Farms in Acres: 2002

United States Average: 441



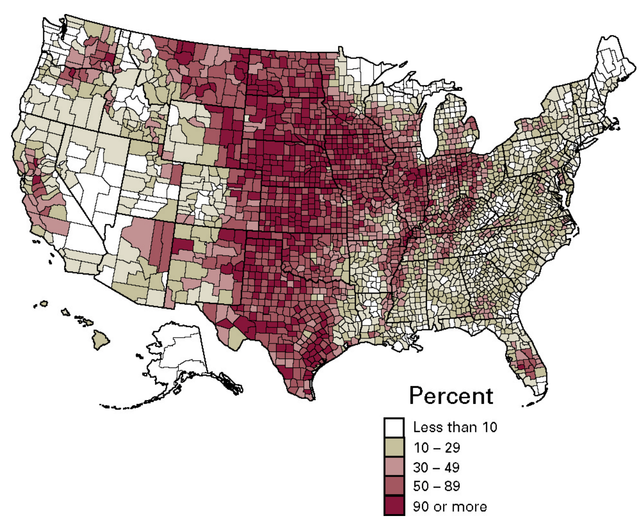
MAP 1: Number of Farms: 2002

United States Total: 2,128,982



MAP 3: Acres of Land in Farms as Percent of Land Area in Acres: 2002

United States: 41.4 Percent



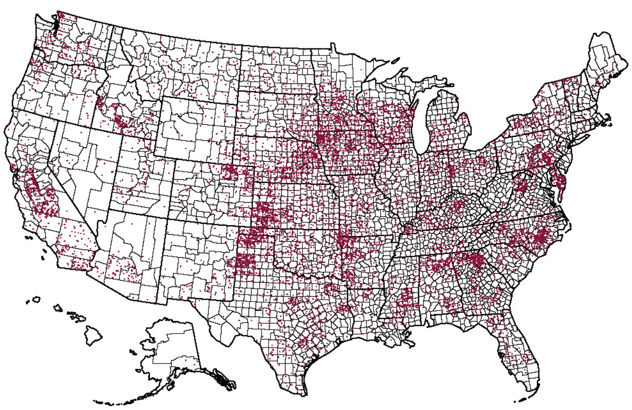
Relative Magnitude of Industries, by Value of Production

The Central and Eastern States had a higher concentration in value of livestock and poultry in 2002, 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 2002 Census of Agriculture, 52.6 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 A1.2 in appendix 1 identifies specific major livestock, poultry, and crop commodity values for 2007. Figure 6.1a shows that livestock and poultry accounted for less than half the total value of production (42.1 percent). Note that poultry contributed 27 percent of the total value of livestock, poultry, and their products (fig. 6.1b).

MAP 4: Value of Livestock, Poultry, and Their Products Sold: 2002

United States Total: $105,494,401,000



MAP 5: Value of Livestock, Poultry, and Their Products as Percent of the Total Market Value of Agricultural Products Sold: 2002

United States Total: 52.6 percent

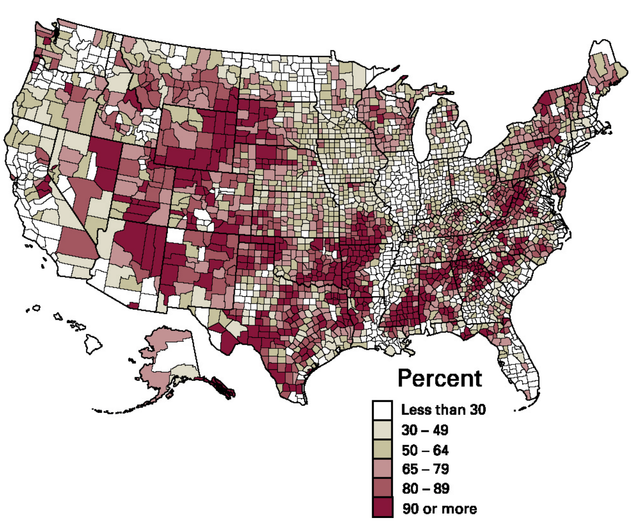


FIGURE 6.1A: Value of production in 2007: Crops *v.* livestock and poultry as a percentage of total

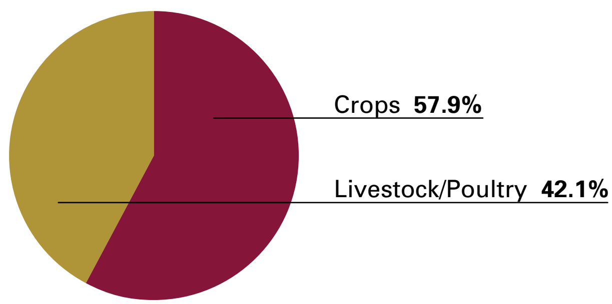
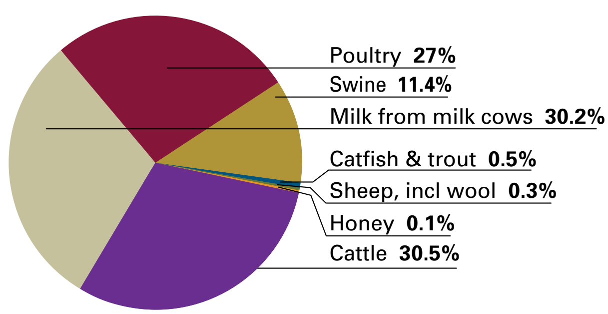


FIGURE 6.1B: Value of production in 2007: Specific commodities as a percentage of the respective total of livestock and poultry and their products, plus honey



Introduction to the Livestock, Poultry, and Aquaculture Industries

In 2007, 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 hand at any time during the year.) Only a small number of cattle operations (71,510) were dairies for milk production. The value of production for cattle and calves was roughly $36.1 billion. In addition, the value of milk production was about $35.7 billion, 51.3 percent higher than in 2006. The poultry industries were the next largest commodity in the United States, with production valued at around $31.9 billion. Numbers were very similar for operations with hogs and operations with sheep (65,640 and 70,590, respectively), although the comparative values of production were dissimilar (table 6.1). Note: Detailed statistics for each commodity are provided in tables A1.2 through A1.15 in appendix 1.

Cattle and Calves (Beef and Dairy)

In 2002, the Nation's nearly 100 million cattle and calves (beef and dairy) were dispersed widely across the country, with a heavier concentration generally in the Central States (map 6).

MAP 6: Cattle and Calves—Inventory: 2002

United States Total: 95,497,994

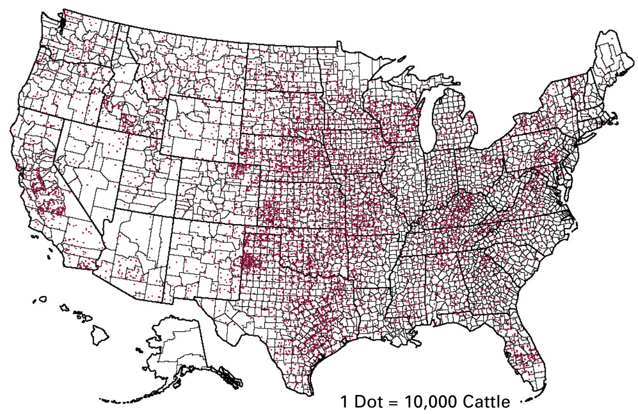


TABLE 6.1: Livestock, poultry, and aquaculture statistics for 2007

Commodity	Inventory (1,000)	Operations	Value of production ($1,000)	Appendix reference for detail
All cattle and calves	[1]96,669	967,440	35,740,774	A1.3
Milk cows	[1]9,224	71,510	[2]NA	A1.4
Beef cows	[1]32,553	757,900	NA	A1.5
Cattle on feed	[1]14,317	87,160	NA	A1.6
Hogs and pigs	[3]65,110	65,640	12,703,842	A1.7
Sheep and lambs (plus wool)	[1]6,055	70,590	392,598	A1.8
Goats	[1]3,015	108,130		A1.8
Poultry	[5]Detail	NA	26,842,833	A1.9
Equine	[5]5,317	NA	NA	A1.10
Catfish	[5]Detail	[6]1,064	444,650	A1.11
Trout	[5]Detail	[7]390	87,546	A1.11
Honey	[5]Detail	NA	153,233	A1.12

[1] Inventory as of January 1, 2008.

[2] Not available.

[3] Inventory as of December 1, 2007.

[4] Inventory as of January 1, 1999.

[5] Detailed breakout of inventory is shown in respective appendixes.

[6] Number of operations as of Janary 1, 2007.

[7] Number of operations selling trout.

Overall, the number of cattle and calves in the United States steadily increased from 1869, following a cyclical or "wave" pattern, until 1975 and then declined during the next two decades, despite a slight upturn in the mid-1990s. Historically, changes in the cattle cycle occur at roughly 10-year intervals. Recently, the Nation's inventory of cattle and calves has remained relatively steady after several years of gradual decline (fig. 6.1c).

In 2007, small cattle operations (1–49 head) accounted for 62.1 percent of all operations, but only 10.6 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 contained 44.2 percent of the total U.S. inventory of cattle and calves (fig. 6.3 and also table A1.3 in appendix 1).

FIGURE 6.1C: Cattle and calves: U.S. inventory on January 1 for selected years, 1869–2007

2008 Inventory = 97.0 million

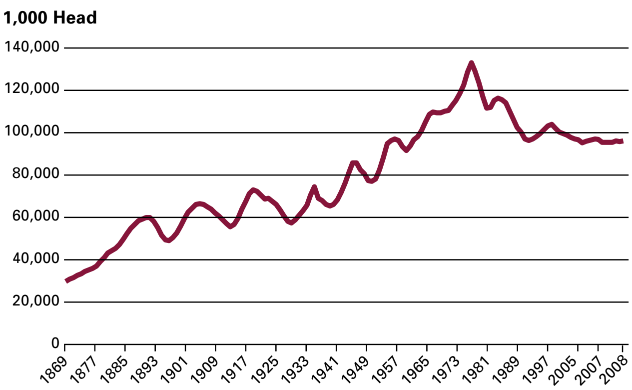
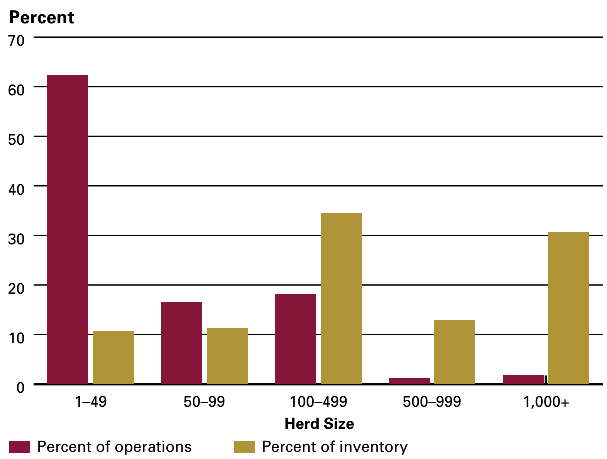


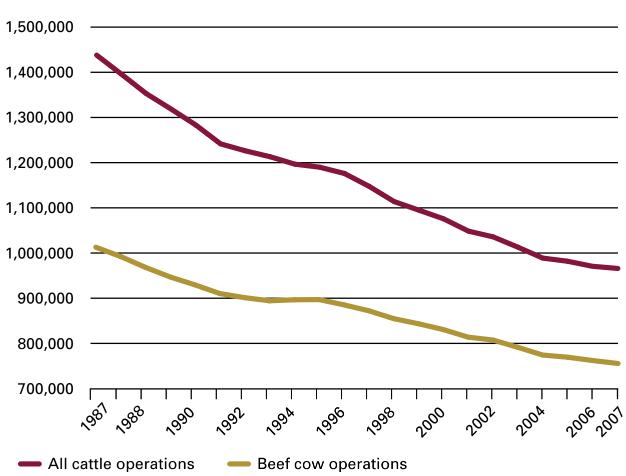
FIGURE 6.3: Cattle and calves: Percent operations and inventory, by herd size

2007 Operations = 967,440 Jan. 1, 2008, Inventory = 96.67 million



The number of cattle and calf operations has declined steadily during the past 15 years. A similar decline has also occurred in the number of beef operations (fig. 6.2). The decrease in the number of cattle and calf operations is due primarily to the decline in the number of small operations.

FIGURE 6.2: Number of all cattle and beef cow operations, United States, 1987–2007



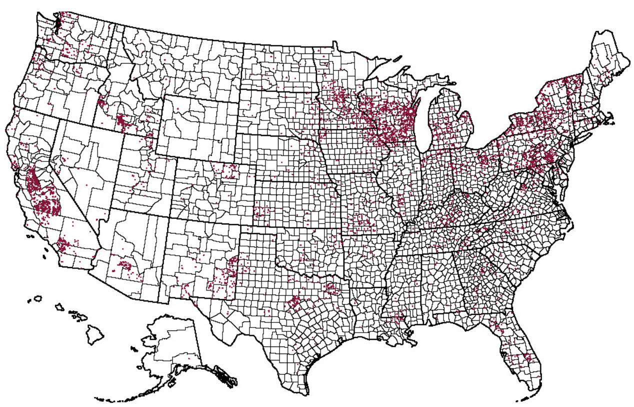
Milk Cows—Dairy

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

The overall U.S. population of milk cows has remained relatively stable over the last 10 years. In contrast, the number of operations with milk cows in 2007 was only 57.8 percent of the number of operations in 1997 (fig. 6.4). Large operations (500 or more milk cows) were a small percentage of all operations, but represented a large percentage of the total number of milk cows (fig. 6.5).

MAP 7: Milk Cows—Inventory: 2002

United States Total: 9,103,959



1 Dot = 2,000 Milk Cows

Annual milk production per cow increased from 17,180 pounds in 1997 to 20,267 pounds in 2007—an 18 percent increase. Table A1.4 in appendix 1 documents dairy production for 2006 and 2007.

FIGURE 6.5: Milk cows: Percent operations and inventory by herd size

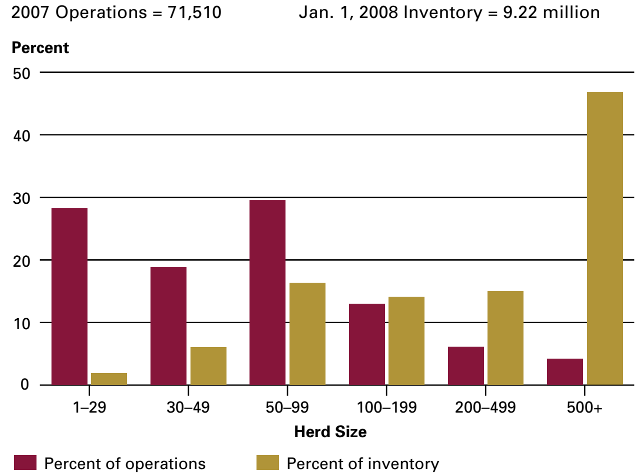
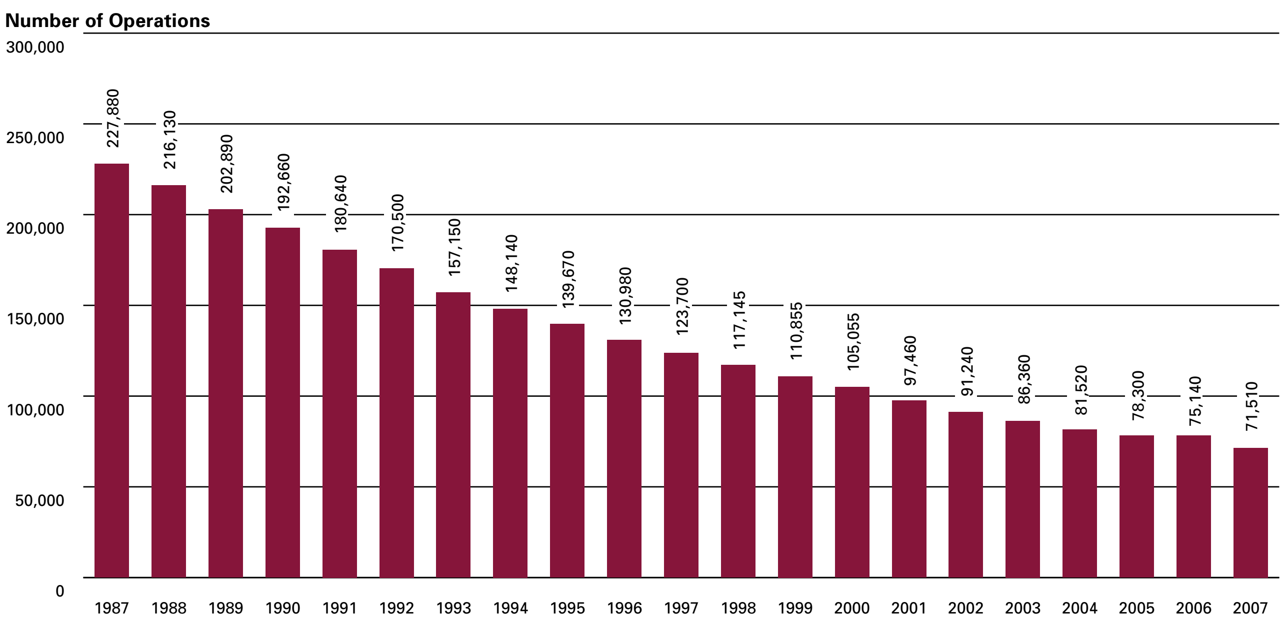


FIGURE 6.4: Milk cows: Number of U.S. operations, 1987–2007



Beef Cows

In 2002, beef cows were distributed widely across the United States. In general, however, States in the central part of the Nation had higher concentrations of beef cows (map 8).

The overall trend in the number of beef cows (fig. 6.6) follows the trend shown for the total inventory of cattle and calves (fig. 6.1c). Essentially, inventory levels have remained stable over the last decade (fig. 6.7). Beef cows accounted for 77.9 percent of the total cow inventory on January 1, 2008.

In 2007, a relatively large number of operations in the United States (757,900) had beef cows. However, the number of operations with beef cows has declined gradually since 1996 (1 to 2 percent per year, as shown in fig. 6.2). This decrease is most notable in 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 53.7 percent of total U.S. beef cow inventory as of January 1, 2008 (fig. 6.8 and table A1.5 in appendix 1). These large operations account for only 10.3 percent of all beef cow operations in the United States but have more than half the total beef cow inventory.

MAP 8: Beef Cows—Inventory: 2002

United States Total: 33,398,271

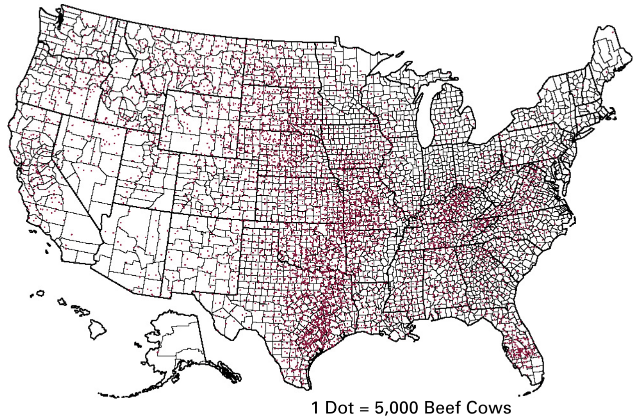


FIGURE 6.6: Beef cows: U.S. inventory on January 1 for selected years, 1920–2008

2008 Inventory = 32.55 million

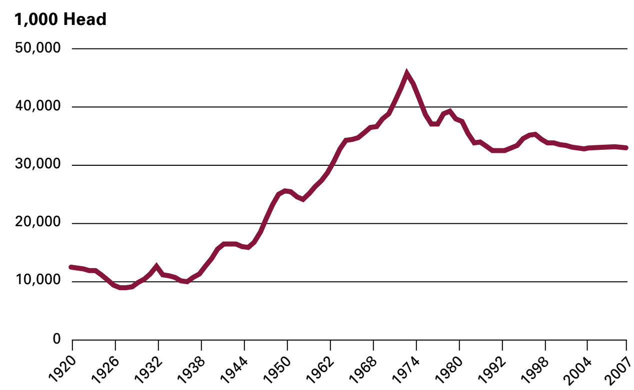


FIGURE 6.7: Beef cows: U.S. inventory on January 1 for selected years, 1988–2008

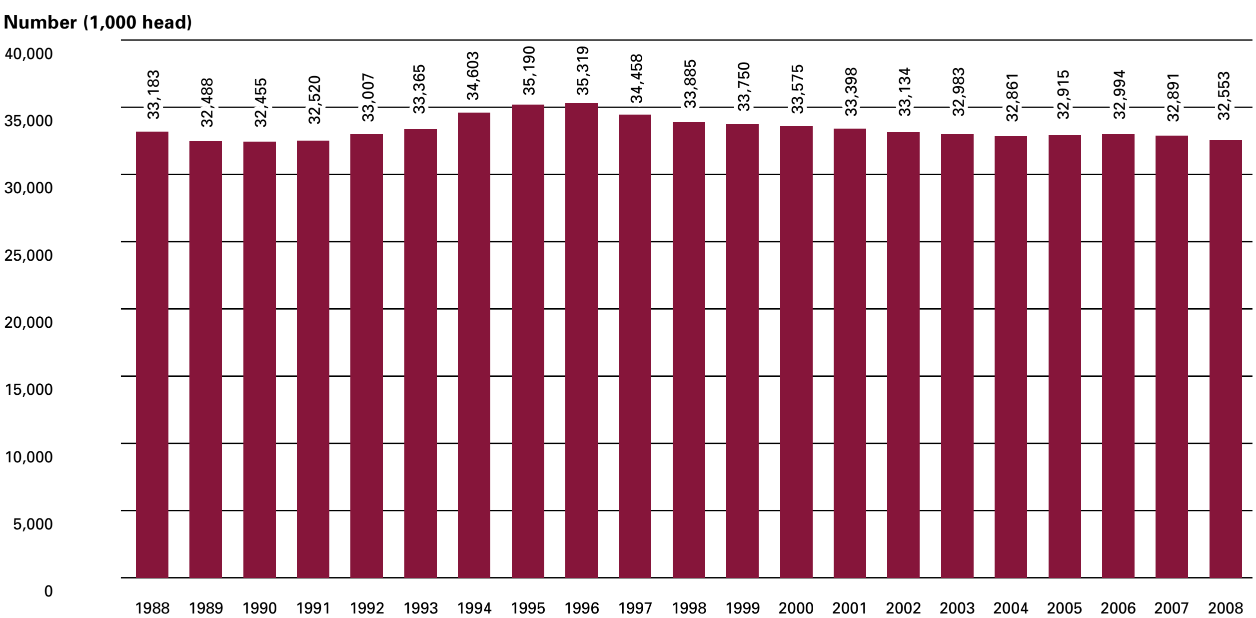
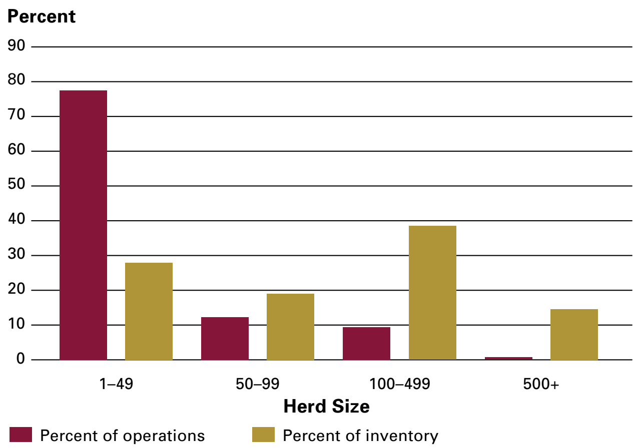


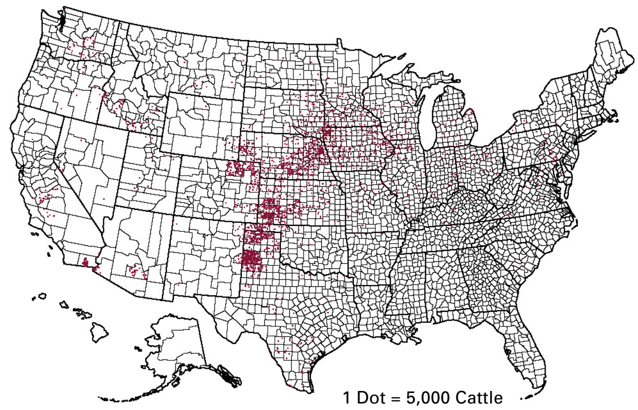
FIGURE 6.8: Beef cows: Percent operations and inventory by herd size

2007 Operations = 757,900 Jan. 1, 2008, Inventory = 32.55 million



MAP 9: Cattle on Feed—Inventory: 2002

United States Total: 14,905,545



Cattle on Feed

Cattle and calves on feed are fed a ration of grain or other concentrate in preparation for slaughter, and the majority of these are in feedlots in States with large grain supplies (map 9).

On January 1, 2008, three States (Kansas, Nebraska, and Texas) accounted for over half (58 percent) the inventory of cattle on feed. Large numbers of cattle on feed are concentrated in relatively few feedlots: 129 feedlots (0.1 percent of all feedlots) accounted for 41.7 percent of the total U.S. cattle-on-feed inventory (table A1.6 in appendix 1). Inventory numbers in feedlots with a capacity of 1,000 or more head 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. 6.9a). As a result, commercial cattle slaughter typically reaches a high point in May and June (fig. 6.9b). Steers and heifers accounted for 81.5 percent of 2007 federally-inspected cattle slaughter. Federally-inspected slaughter accounted for 98.4 percent of the 34.3 million head of commercially inspected cattle slaughter (table A1.6 in appendix 1).

FIGURE 6.9A: U.S. cattle on feed at feedlots with capacity of 1,000 or more head, 2005–07

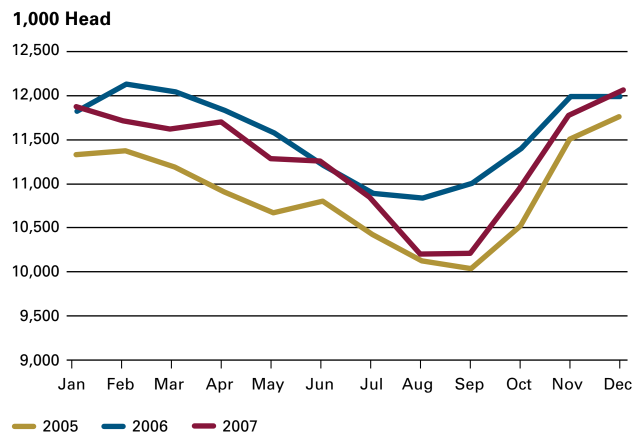
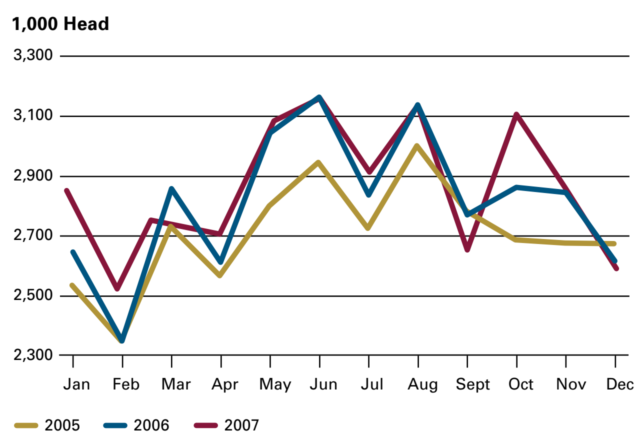


FIGURE 6.9B: Cattle: U.S. commercial slaughter, by month, 2005–07



Hogs

Historically, hog production has been most common in the upper Midwest (map 10). On December 1, 2007, Iowa, the largest hog-producing State, had 28.2 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 15.1 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 2007.

In the United States, inventory levels are estimated and published quarterly (December, March, June, and September). Over the past decade, the U.S. inventory of all hogs has fluctuated from quarter to quarter. During the period from 1996 to 2001, a greater degree of change was shown from quarter to quarter, compared with the quarter-to-quarter variation shown in the last 5 years. Typically, inventory numbers reach a low point on March 1 and peak on September 1 (fig. 6.10a). The number of hogs kept for breeding decreased by 11.5 percent during the last decade.

In 2 of the last 3 years, the number of hogs slaughtered commercially reached a low point in July, then increased until peaking in October (fig. 6.10b) in preparation for the holiday season. Commercial hog slaughter totaled 109.2 million head in 2007.

MAP 10: Hogs and Pigs—Inventory: 2002

United States Total: 60,405,103

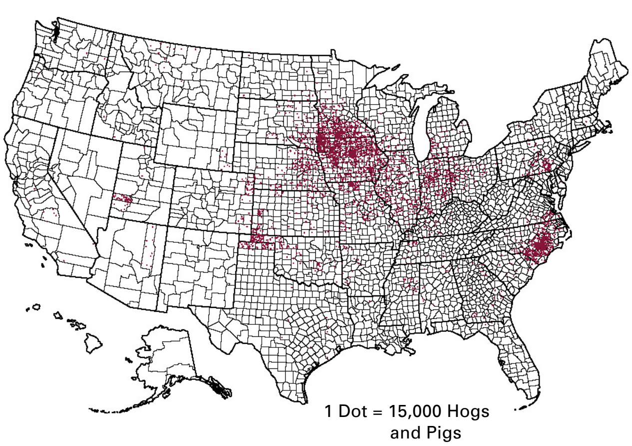


FIGURE 6.10A: Hogs and pigs: U.S. inventory, by quarter, 1997–2007

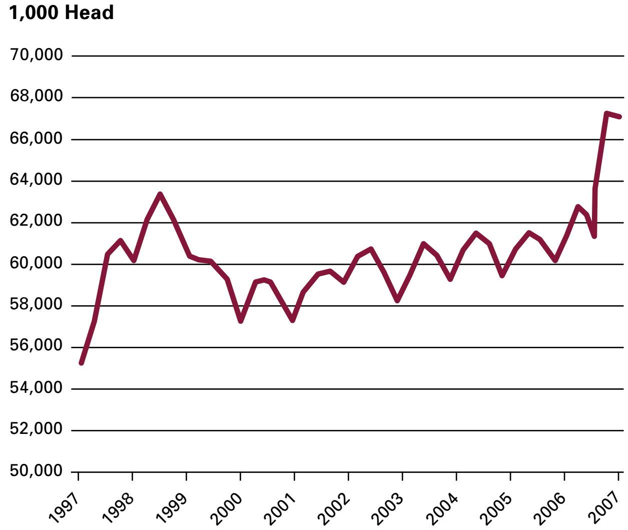
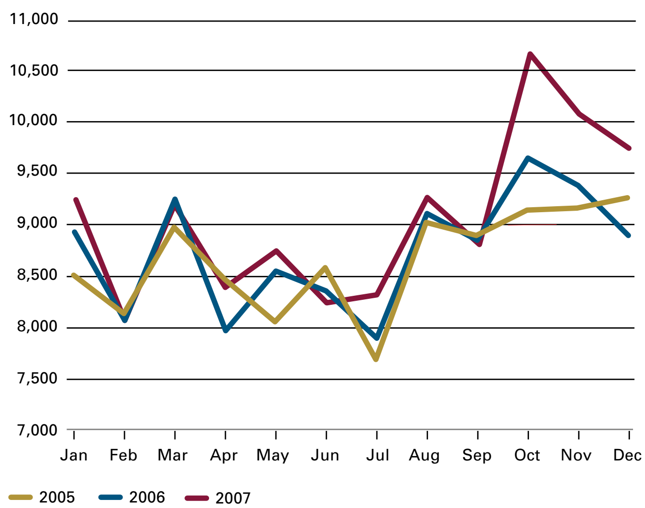


FIGURE 6.10B: Hogs: U.S. commercial slaughter, by month, 2005–07

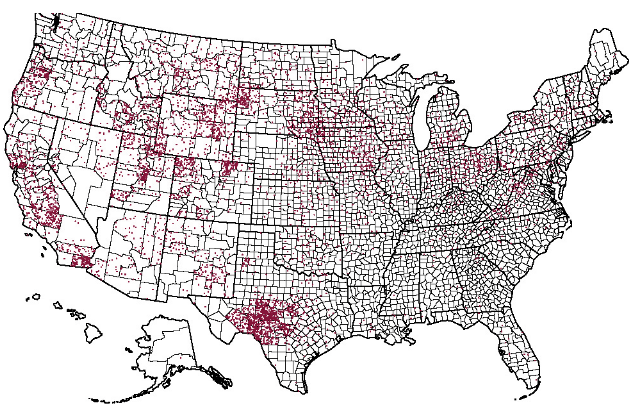


The number of operations with hogs declined steadily during the past decade, decreasing by 53.7 percent over the last 10 years (since 1997) (fig. 6.11). The majority of swine operations (61.1 percent) had fewer than 100 head, but these operations accounted for only 1 percent of the inventory. During 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 (3.9 percent of all operations) now maintain more than half of the U.S. hog inventory.

In 2007, the United States had 65,640 hog operations with a production value of $13.5 billion (table A1.7 in appendix 1).

MAP 11: Sheep and Lambs—Inventory: 2002

United States Total: 6,341,799



1 Dot = 1,000 Sheep and Lambs

Sheep and Goats

The U.S. sheep industry is located primarily in the Western and Central States (map 11). Typically, the Western States are characterized by large range flocks, whereas those in the Central and Eastern States are mostly small, fenced flocks.

The number of sheep has declined steadily since the late 1980s with the exception of a brief peak in inventory in 1990; however, there were small increases noted on both January 1, 2005, and January 1, 2006, followed by decreases on both January 1, 2007, and January 1, 2008 (fig. 6.12).

The number of operations with sheep since the late 1980s has declined gradually. However, 2-percent increases have been recorded in each of the last 2 years (fig. 6.13a).

The January 1, 2008, total inventory of U.S. sheep and lambs was 6.1 million head. Almost a third of these sheep (30.8 percent) are located on a large number of small operations; 91.1 percent of the 70,590 total operations had fewer than 100 head of sheep and lambs (table A1.8 in appendix 1). Commercial sheep and lamb slaughter totaled 2.7 million head in 2007. Slaughter typically peaks in March or April (fig. 6.13b).

There were 3.02 million goats in the United States on January 1, 2008, which represents a 3-percent increase over the January 1, 2007, population. Breeding goats accounted for 2.5 million head and there were 520,000 market goats. Breeding goats were comprised of 1.8 million does, 175,000 bucks, and 472,000 replacement kids under 1 year old. The number of kids born during 2007 was estimated at 1.94 million head. The number of Angora goats decreased 12 percent, while the number of milk goats increased 4 percent (210,000 and 305,000 head, respectively). Meat and other goats totaled 2.5 million head, which was up 4 percent from 2007.

FIGURE 6.11: Hogs and pigs: Number of U.S. operations, 1997–2007

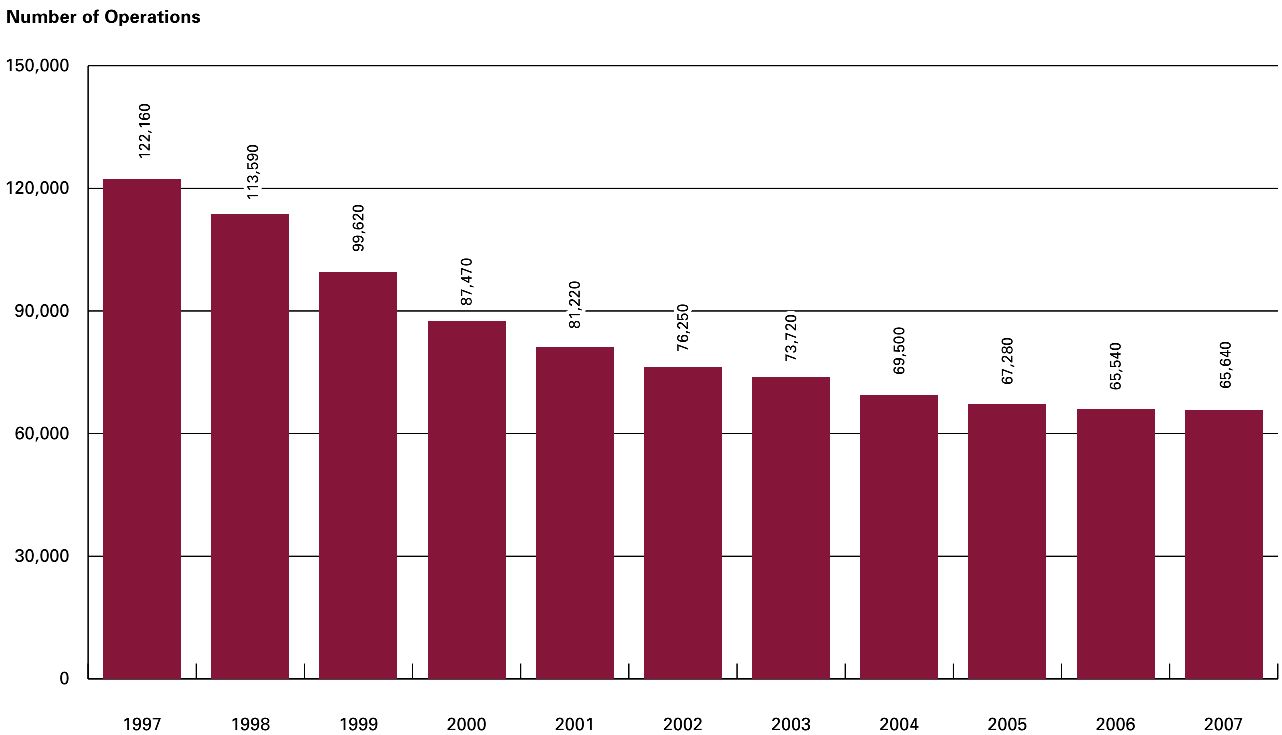


FIGURE 6.12: Sheep and lambs: U.S. inventory on January 1, 1988–2008

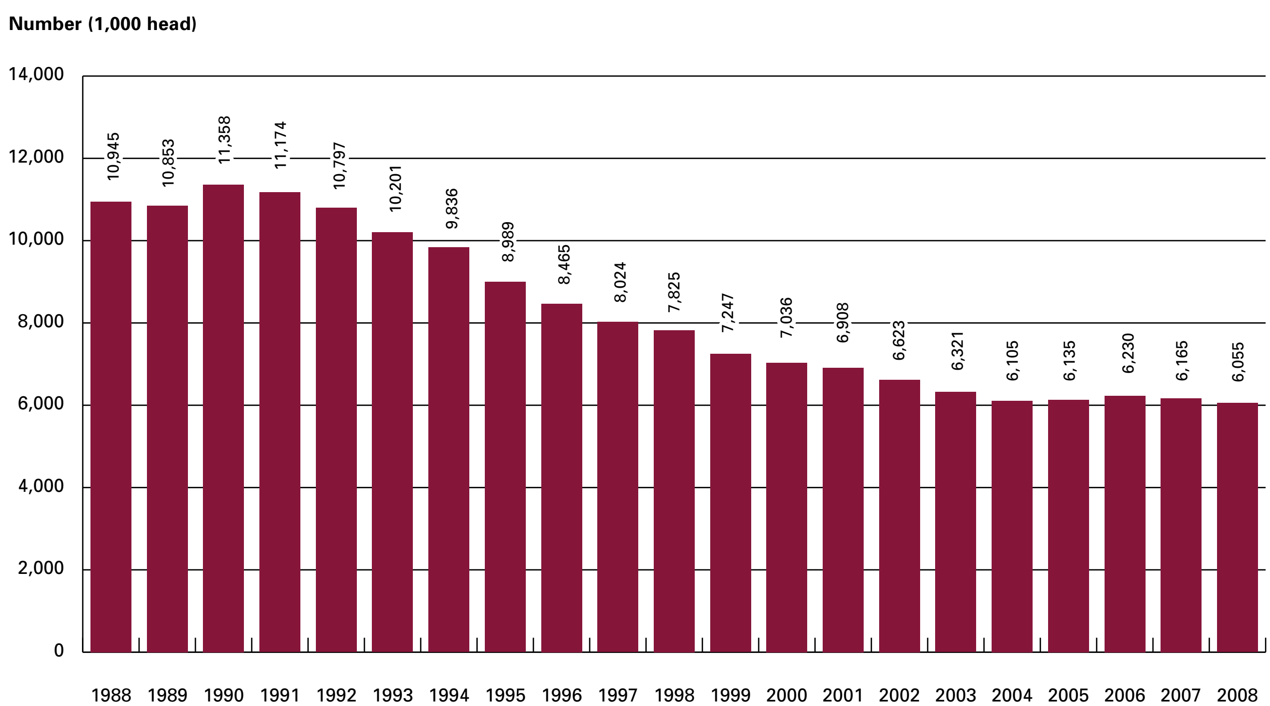


FIGURE 6.13A: Sheep and lambs: Number of U.S. operations, 1987–2007

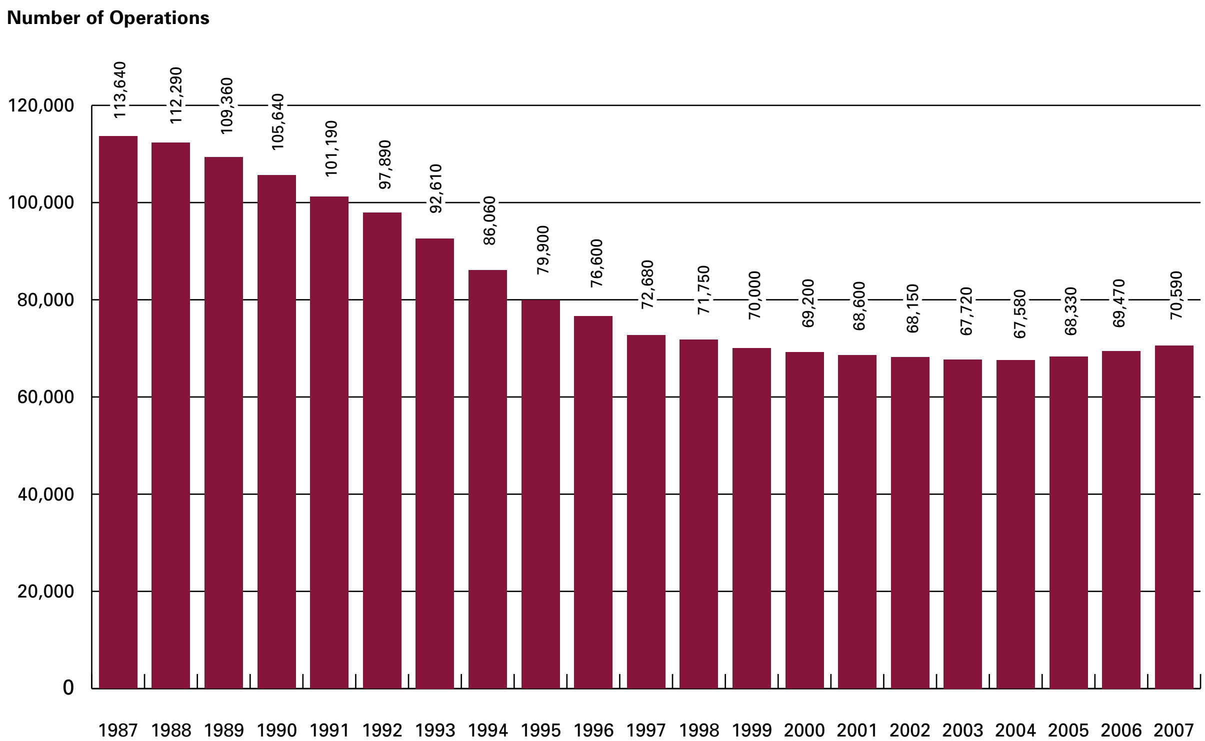
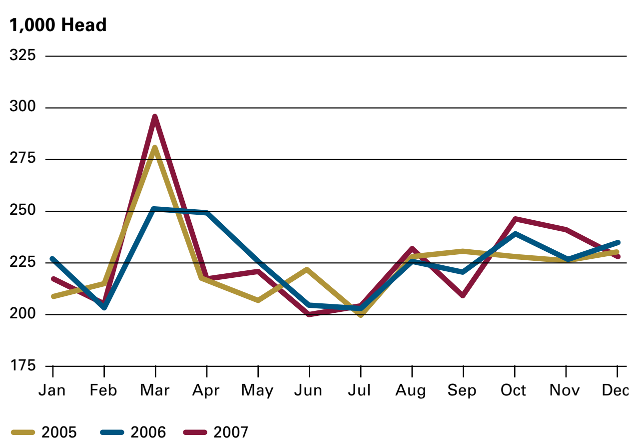


FIGURE 6.13B: Sheep: U.S. commercial slaughter, by month, 2005–07



Poultry Industries

The poultry industries are economically important to the Eastern States—especially the Southeastern States (map 12). 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 two-thirds of the value of production (fig. 6.14). The quantity of production for each segment has increased rapidly over the past 50 years (figs. 6.15a–c).

MAP 12: Value of Poultry and Eggs as Percent of Total Market Value of Agricultural Products Sold: 2002

United States: 11.9 Percent

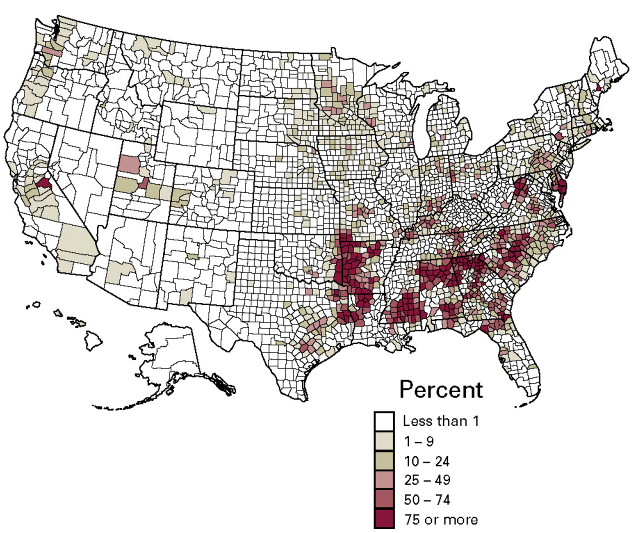


FIGURE 6.14: U.S. value of production: Broilers, eggs, turkeys, chickens, and total, 1997–2007

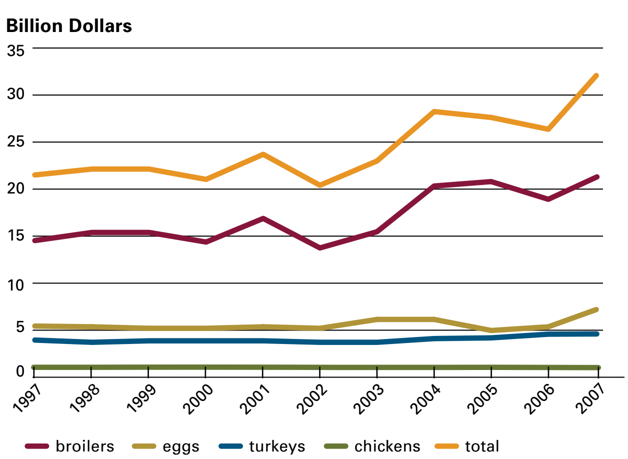


FIGURE 6.15A: U.S. broiler production, 1960–2006

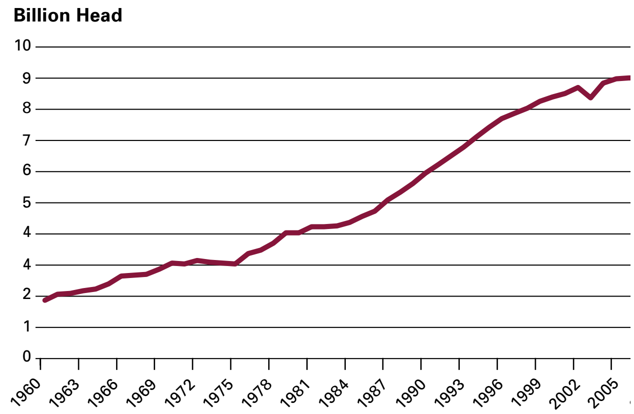


FIGURE 6.15B: U.S. egg production, 1960–2006

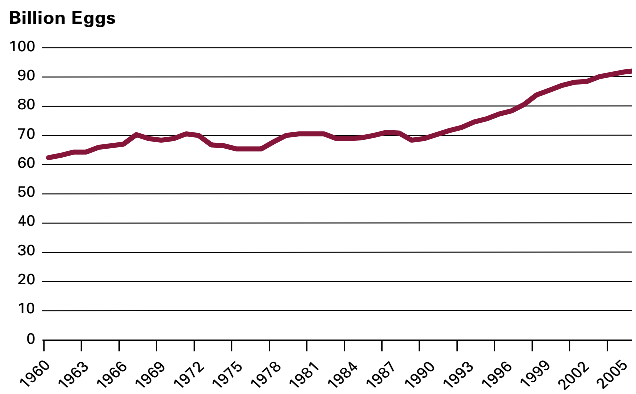
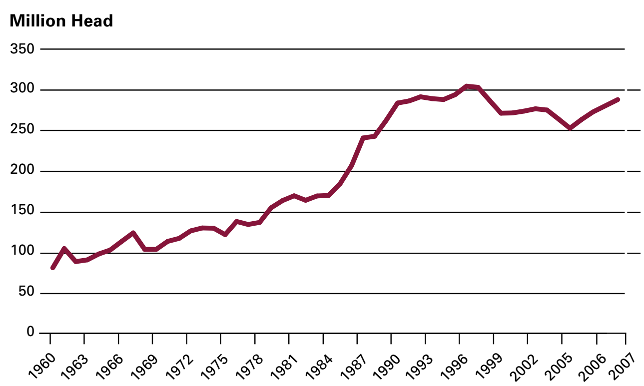


FIGURE 6.15C: U.S. turkey production, 1960–2006

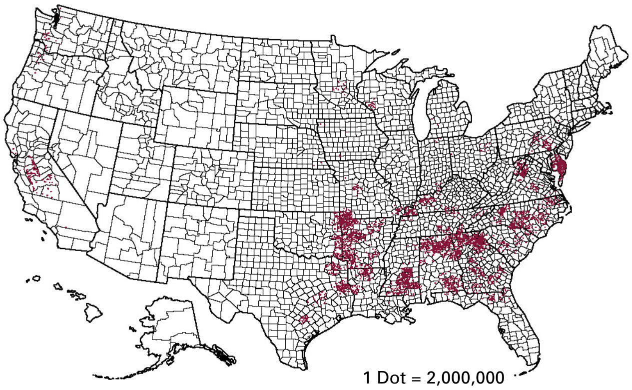


Broiler production is concentrated heavily in the Southeast (map 13), whereas layers are dispersed more widely over the Central and Eastern States (map 14).

Turkey production is concentrated in the eastern half of the United States (map 15). Arkansas, Minnesota, and North Carolina accounted for 43.4 percent of the 272 million turkeys raised in 2007.

MAP 13: Number of Broilers and Other Meat-Type Chickens Sold: 2002

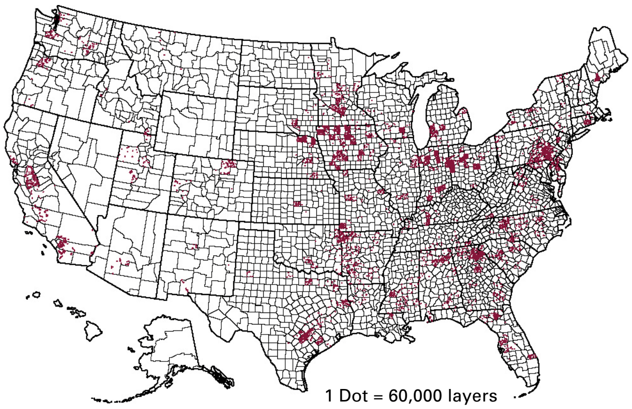
United States Total: 8,500,313,357



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 67.3 percent of the $31.9 billion poultry industries' production in 2007. Egg production accounted for 20.9 percent of the total value of production (table A1.10 in appendix 1).

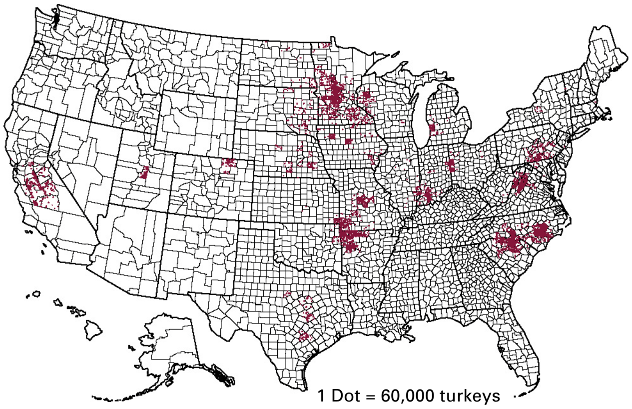
MAP 14: Layers 20 Weeks Old and Older – Inventory: 2002

United States Total: 334,435,155



MAP 15: Number of Turkeys Sold: 2002

United States Total: 283,247,649



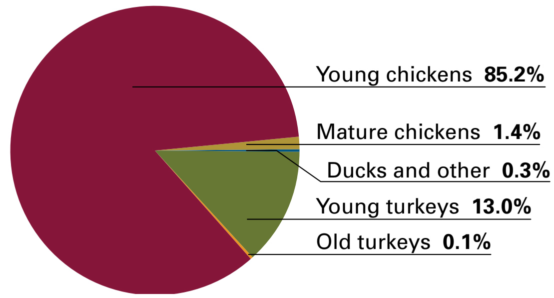
Hatchery statistics for 2007 include 9.57 billion broiler-type chickens hatched, 446 million egg-type chicks hatched, and 313 million poults hatched in turkey hatcheries. The collective capacity of the 315 chicken hatcheries on January 1, 2008, was 917 million eggs, and the capacity of the 54 turkey hatcheries was 40 million eggs.

More than 99 percent of total U.S. poultry slaughter for the major species takes place in federally-inspected slaughter plants.

In 2007, approximately 305 plants killed poultry under Federal inspection. Young chickens were killed in 34 States, and young turkeys were slaughtered in 26 States.

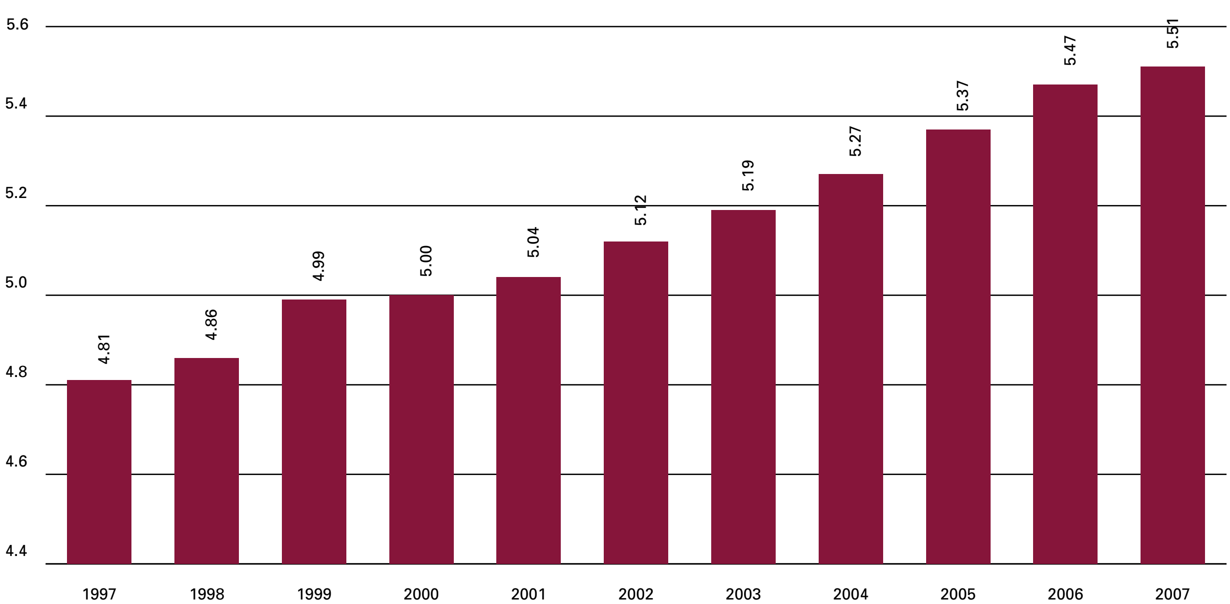
Slaughter of young chickens[1] accounted for 85.2 percent of the total live weight of poultry slaughtered in 2007 (fig. 6.16).

FIGURE 6.16: Poultry: Total live weight slaughtered in 2007, in percentage, by type of poultry



The average live weight of young chickens slaughtered has steadily increased over the previous decade (fig. 6.17).

FIGURE 6.17: Young chickens: Average slaughter live weight, in pounds, 1997–2007



Footnote

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

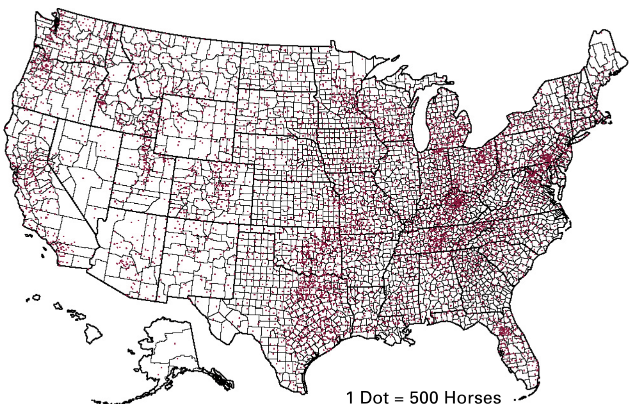
Equine Industry

Demographic statistics on the U.S. equine industry are sparse. USDA does not have an equine statistics program; the only data available date from 1998 and 1999.

The 2002 Census of Agriculture showed 3.64 million horses and ponies reported from 542,223 farms. Map 16 illustrates the broad and even distribution of horses and ponies across the United States. The 2002 Census also reported 105,358 mules, burros, and donkeys located on 29,936 farms.

MAP 16: Horses and Ponies—Inventory: 2002

United States Total: 3,644,278



Those 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 A1.11 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 sales was $1.64 billion for 1997 and $1.75 billion for 1998.

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

Fish and Other Aquaculture Products

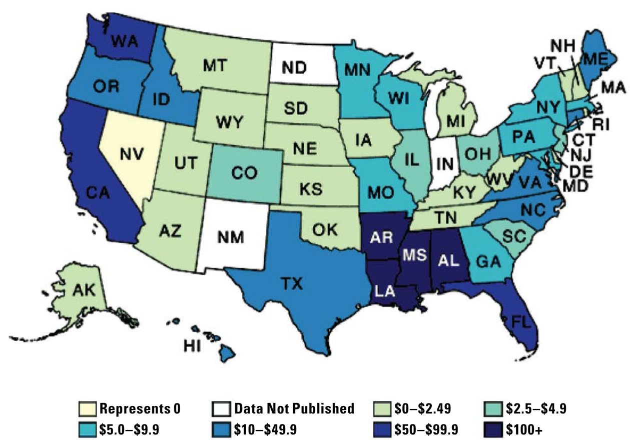
The 2002 Census of Agriculture estimated the value of aquaculture products sold at $1.1 billion, or about 1 percent of the total $105.5 billion sales for all livestock, poultry, and their products in the United States.

The 2005 Census of Aquaculture expanded data collection from the 2002 Census and now provides the most recent and comprehensive picture of the aquaculture sector. However, NASS collects information on the catfish and trout industries through monthly catfish processing surveys, semiannual catfish production surveys, and an annual trout survey (table A1.12 in appendix 1).

The target population for the 2005 Census of Aquaculture was comprised of all commercial or noncommercial sites that produced and either sold or distributed $1,000 or more of aquaculture products during the census year.

MAP 17: Aquaculture Sales: 2005

United States Total Sales: $1.09 Billion
Source: 2005 Census of Aquaculture, USDA–NASS



Aquaculture is important in the coastal States and is heavily concentrated in the four States of Alabama, Arkansas, Louisiana, and Mississippi (map 17). These four States account for over half (51.7 percent) of the aquaculture sales in the United States.

In 2005, the United States had 4,309 aquaculture producers with estimated total sales of $1.1 billion. Food fish accounted for 61.5 percent of sales. Table 6.2 shows that the industry is composed of relatively few (5.4 percent) large producers responsible for 61.8 percent of the total sales. Slightly more than one-half of water surface acres used for aquaculture production are from freshwater (table 6.3).

TABLE 6.2: Number of aquaculture farms and sales by sales category, 2005

Sales Category (in dollars)	Farms		Sales	
	No.	Pct.	($1,000)	Pct.
<25,000	1,898	44.0	16,217	1.5
25,000 to 49,999	528	12.3	18,540	1.7
50,000 to 99,999	542	12.6	37,733	3.4
100,000 to 499,999	897	20.8	200,082	18.3
500,000 to 999,999	210	4.9	144,868	13.3
1,000,000 or more	234	5.4	674,948	61.8
Total	4,309	100.0	1,092,386*	100.0

* Sum of commodities may not add to total.

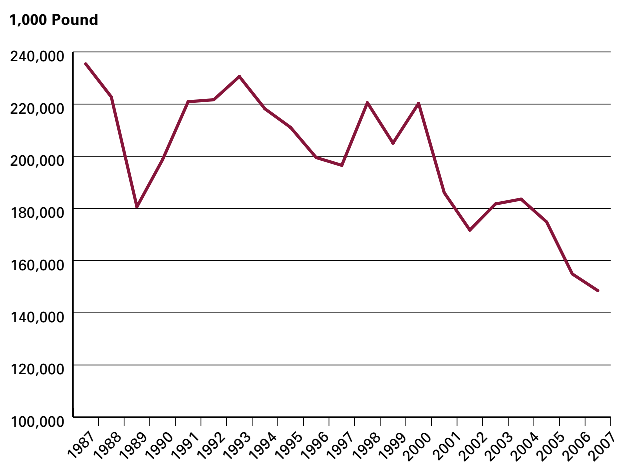
Honey Production

In 2007, honey production from producers with five or more colonies totaled 148.5 million pounds, which represents a 4-percent decrease from 2006 (table A1.13 in appendix 1). Figure 6.18 illustrates the decline in honey production over the last 20 years. This decrease, and a 0.4-percent decrease in honey prices, resulted in a 2007 production value of $153.2 million, down 4.5 percent from the previous year. The distribution of honey production across the United States is rather widespread, although North Dakota accounted for 20.9 percent of the total production.

TABLE 6.3: Surface water acres used in aquaculture production, 2005

	Acres	Pct.
Freshwater	365,566	52.7
Saltwater	327,487	47.3
Total	693,053	100.0

FIGURE 6.18: U.S. honey production, 1987–2007



Miscellaneous

The 2002 Census of Agriculture reported several miscellaneous livestock and poultry commodities, which are shown in table A1.14 in appendix 1.

Number of Livestock Slaughter Plants in the United States

On January 1, 2008, there were 808 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 inspection is carried out by State employees, who ensure that Federal regulations are being followed. During 2007, 626 plants slaughtered cattle (table A1.15 in appendix 1), and 14 of these plants accounted for 54 percent of the total cattle slaughtered. Six of the 232 plants that slaughtered calves accounted for 63 percent of the total, and 4 of the 480 plants that slaughtered sheep or lambs in 2007 produced 68 percent of the total number of head. (In 2007, 397 plants slaughtered goats.) Hogs were slaughtered at 618 plants; 11 of the largest plants accounted for 51 percent of the total. Iowa, Kansas, Nebraska, and Texas accounted for 51 percent of U.S. commercial red-meat production in 2007. Monthly commercial red-meat production typically reaches a low point in February (fig. 6.19). Beef and pork dominated commercial production in 2007 (54.2 and 45.1 percent, respectively), as shown in figure 6.20.

On January 1, 2008, there were 2,119 State-inspected or custom-exempt slaughter plants in the United States, compared with 2,060 such plants on January 1, 2007. State-inspected plants sell and transport intrastate exclusively. State inspectors

FIGURE 6.19: U.S. commercial red meat production, by month, 2005–07

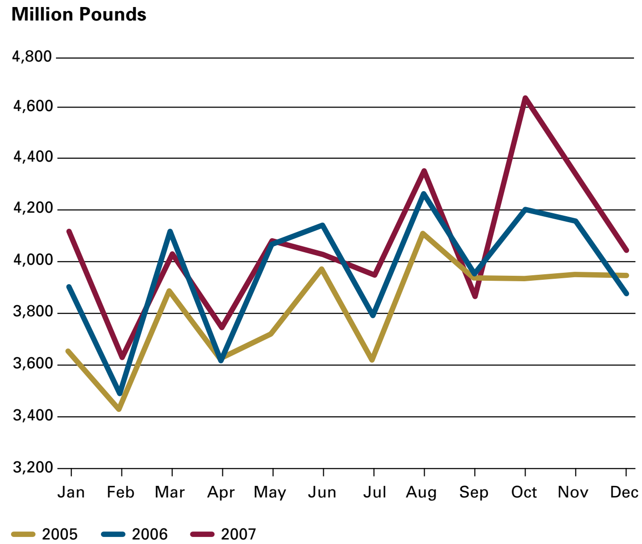
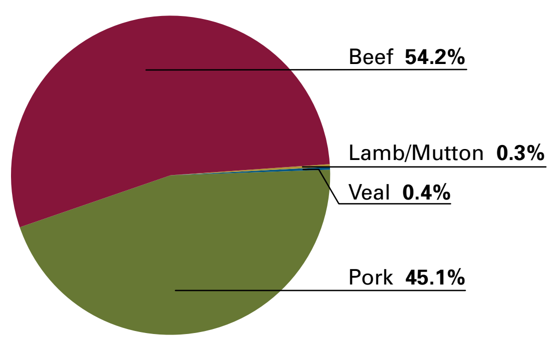


FIGURE 6.20: U.S. commercial red meat production, by percentage, 2007



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

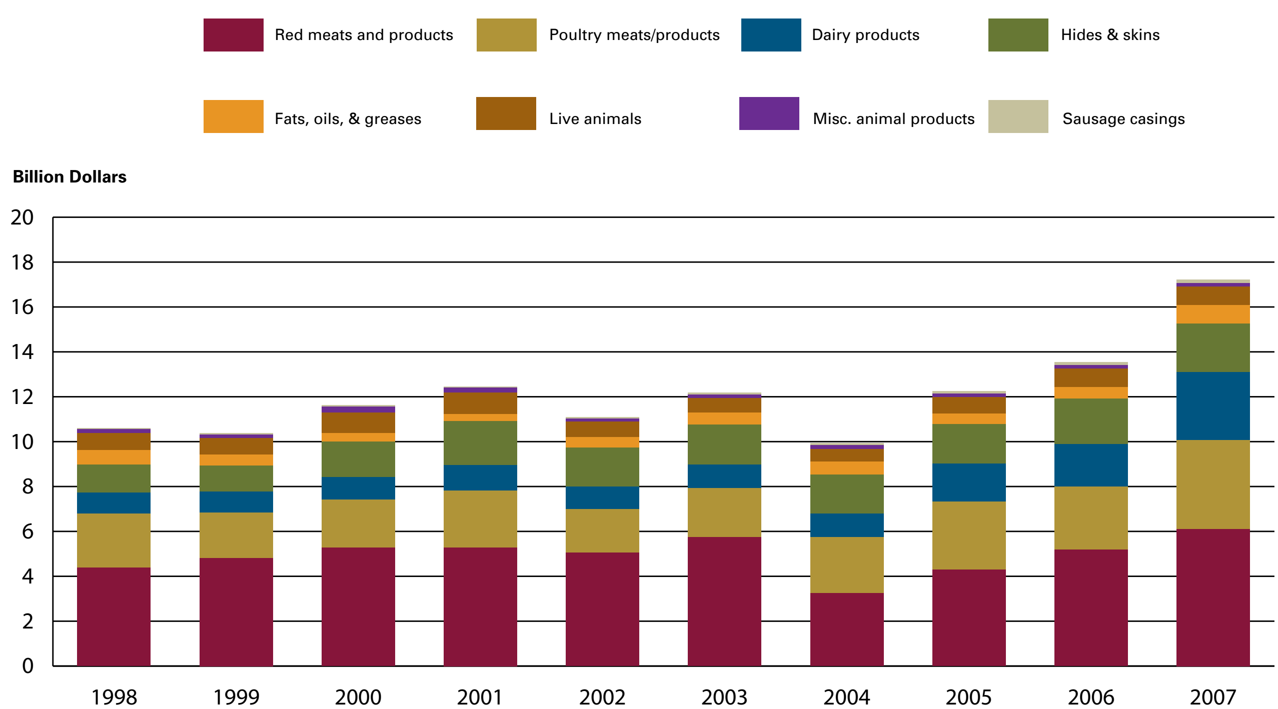
CHAPTER 7

Animal Trade

The strong U.S. commitment to animal health enhances international trade opportunities for U.S. animals and animal products. Exports of animals and animal products reached $17.2 billion in 2007 (fig. 7.1). From 1998 to 2007, exports of red meat and red meat products made up approximately 30 percent of the total trade value of U.S. animals and animal products. Poultry products contributed about 20 percent of that total trade value over the same period, while dairy products and hides and skins each accounted for just over 10 percent. Throughout the 10-year period, Mexico, Canada, and Japan collectively provided markets for approximately half the value of U.S. animals and animal-product exports (fig. 7.2). From 2005 to 2007, China claimed a larger share of U.S. export values. The remaining major markets were Korea and Russia, where the total value of U.S. animal and animal-product trade fluctuated from 5 to 12 percent and 3 to 7 percent, respectively.

During the past decade, two trends emerged in U.S. animal and animal-product trade. Due to the 2004 detection of BSE in North American cattle, U.S. beef exports decreased sharply and have yet to fully recover their previous percentage of the total export value. The other trend is the strong increase in exports of U.S. pork, poultry, and dairy products, which reached record values in 2007, aided by the declining value of the U.S. dollar. Figure 7.3 summarizes the 2007 status of U.S. animal and animal-product export values by destination, emphasizing the dominant role of the North American and Asian markets in trade of pork, beef, poultry products, dairy products, hides, and skins.

FIGURE 7.1: Value of U.S. exports of live animals and products



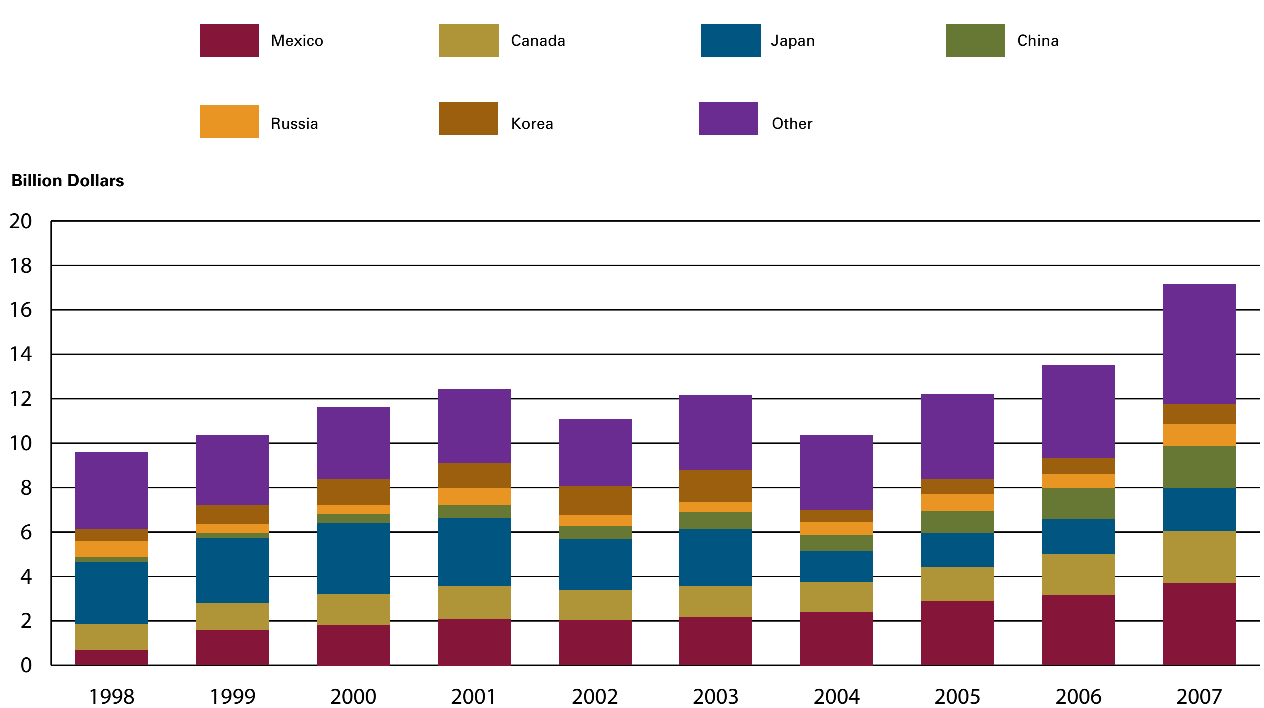
Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

The value of U.S. imports of animals and animal products runs approximately 30 percent below the value of exports. However, as was true for exports, the value of imports increased over this period, rising from $6.9 billion in 1998 to $12.4 billion in 2007 (fig. 7.4). Imports of red meat and meat products, live animals, and dairy products totaled more than 85 percent of import values throughout the 10-year period. The origins of U.S. imports vary more than the destinations of U.S. exports. Canada, Australia, and New Zealand provided approximately two-thirds of the value of U.S. animal and animal-product imports (fig. 7.5). The 2003 BSE discovery in North America led to a sharp drop in U.S. imports from Canada of beef and beef products. These imports slowly recovered to previous levels by 2006. Imports from Mexico and China increased in value from 2003 through 2007. Italy and Denmark contributed fairly constant values to U.S. imports from 1998 to 2007. Canada and Oceanic (Australia and New Zealand) countries contributed the highest share of U.S. import values for beef, dairy products, and pork in 2007 (fig. 7.6).

Trade in live animals, semen, and embryos accounts for a relatively small share of U.S. trade in animals and animal products. During the past decade, this trade was characterized first by increasing levels of exports and imports from 1998 to 2001 and then by marked declines in imports and exports through 2004. This was due in part to the BSE discoveries in North America (figs. 7.7 and 7.8). After 2004, imports recovered and, by 2006, exceeded 2001 levels. Export recovery since 2001 has been slower.

The value of U.S. exports of live animals and germplasm rose from just over $750 million in 1998 to a peak of $957 million in 2001 (fig. 7.7). Export value then fell by more than 40 percent, to $563 million in 2004, before recovering to $816 million in 2007. Exports of live horses accounted for 40 percent or more of U.S. live animal and germplasm exports from 2004 through 2007, with values ranging from $293 million to $497 million annually. These exports accounted for much of the year-to-year variation in total trade value throughout this period.

FIGURE 7.2: Value of U.S. animal and animal-product exports by destination



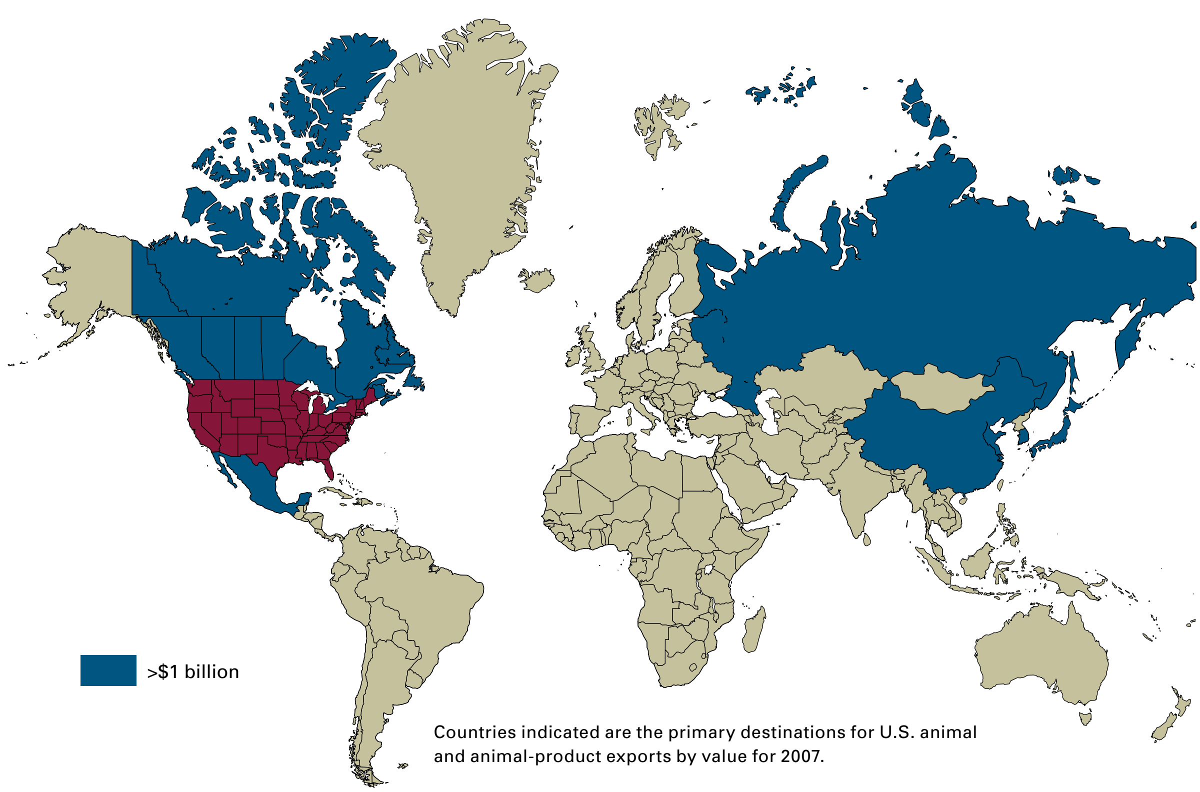
Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

The exception is the value of bovine exports, which dwindled from a high of $272 million in 2000 to $3 million in 2004 because of BSE-related trade restrictions imposed by other countries. By 2007, these bovine export values recovered only slightly. Combined, broiler-chick exports and layer-chick exports accounted for a fairly steady export value of $100 million over the decade, with broiler chicks comprising the majority. The value of bovine semen exports remained fairly steady at roughly $60 million annually through 2005; the value of exports then rose to $72 million in 2006 and to $87 million in 2007. Swine exports also contributed approximately $25 million per year to the total value of live-animal and germplasm exports. The total value of exports of live sheep and goats and bovine embryos was $39 million in 1998 but declined to $17 million by 2007.

The pattern of destinations for U.S. live-animal and germplasm exports (fig. 7.9) has changed considerably during the past decade, with much greater variation compared to the pattern for import values (fig. 7.10). While Canada and Mexico claimed about 40 percent of the value of these exports from 1998 through 2002, their combined share dropped to approximately 20 percent by 2005. Over the 10-year period, Ireland, Japan, the United Arab Emirates, and France maintained fairly constant shares of U.S. export value—between 5 and 10 percent. The share of U.S. export value destined for Great Britain in 2005 and 2006 was approximately twice that of the previous 7 years, largely because of the drop in bovine exports to Canada and Mexico.

Imports of live animals and germplasm into the United States exceeded $1.5 billion in 1998 and reached over $3 billion in 2007 (fig. 7.8). Bovine imports, particularly slaughter cattle from Canada and feeder cattle from Mexico, accounted for more than half the value of these imports in all years, with the exception of the 3 years from 2003 to 2005. Swine imports, overwhelmingly from Canada, followed cattle in terms of value, increasing from $273 million in 1998 to $653 million in 2007. Imports of horses, mostly from Canada and European countries, contributed a fairly constant share to the value of U.S. live-animal and germplasm imports, fluctuating between $200 million and $400 million

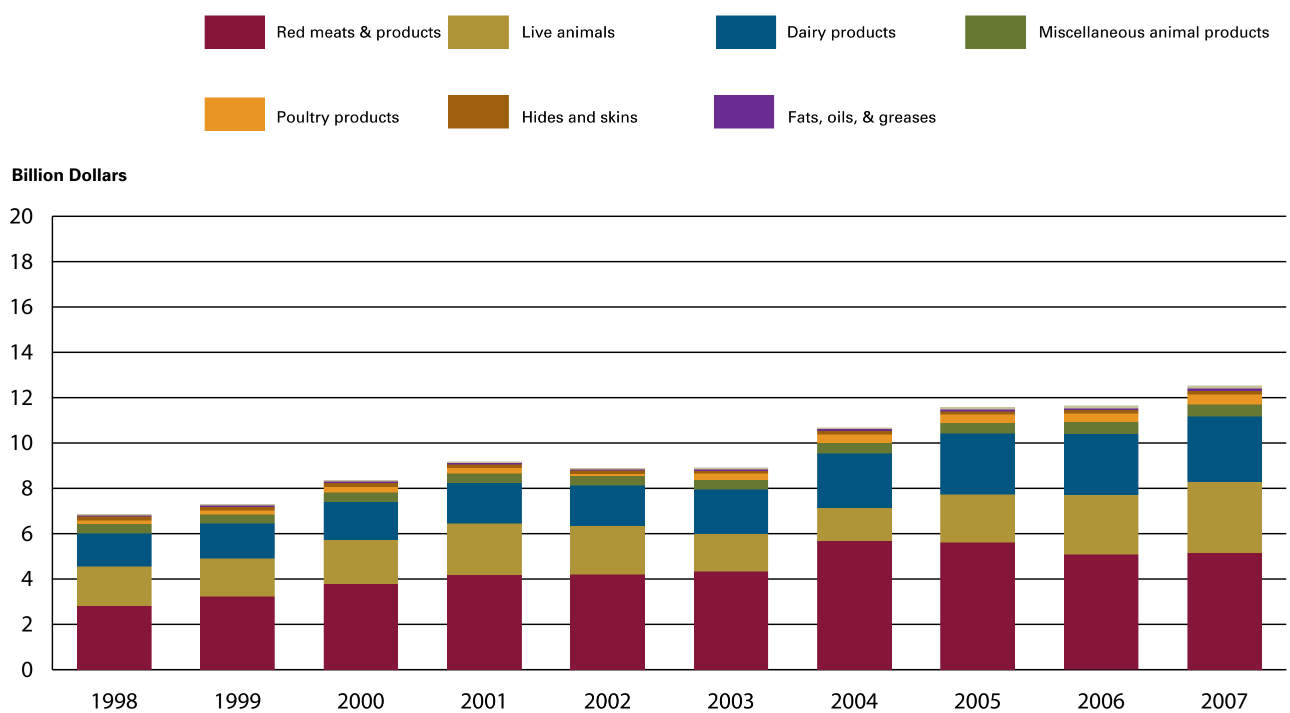
FIGURE 7.3: Primary destinations for U.S. animal and animal-product exports



over the 10-year period. Imports of bovine semen more than doubled in value, from $14 million in 1998 to $35 million in 2007, with Canada supplying approximately three-quarters of the imports. Live poultry imports, almost exclusively from Canada, increased from $19 million in 1998 to $32 million in 2007. Finally, imports of live sheep and goats grew in value from $6 million in 1998 to $13 million in 2002, before dropping below $0.1 million in 2007. Canada supplied more than 90 percent of the live sheep and goat imports to the United States in all but 3 of the 10 years.

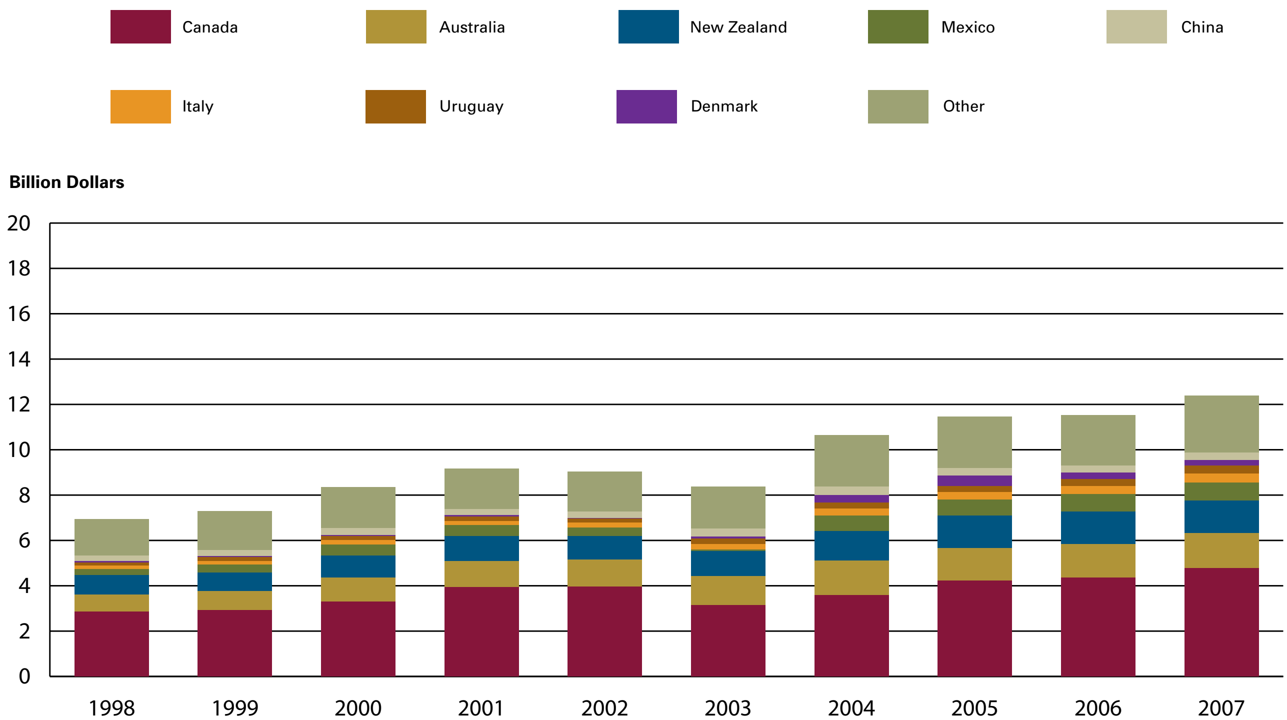
In value terms, at least 80 percent of live-animal and germplasm imports originated within North America (fig. 7.10). Another 10 percent of the value came from European origins, and only 5 to 10 percent of the total value of imports in a given year came from countries outside North America and Europe.

FIGURE 7.4: Value of U.S. imports of live animals and products



Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

FIGURE 7.5: Value of U.S. animal and animal-product imports by origin



Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

FIGURE 7.6: Primary origins for 2007 U.S. animal and animal-product imports

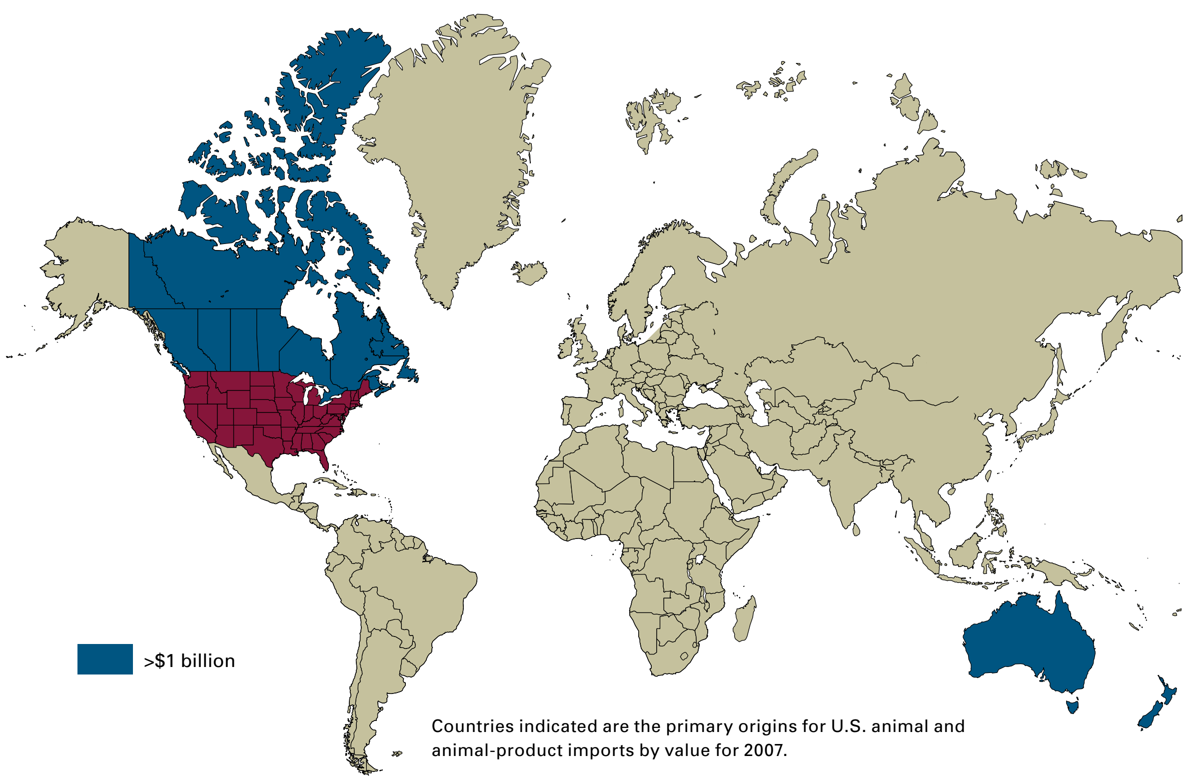
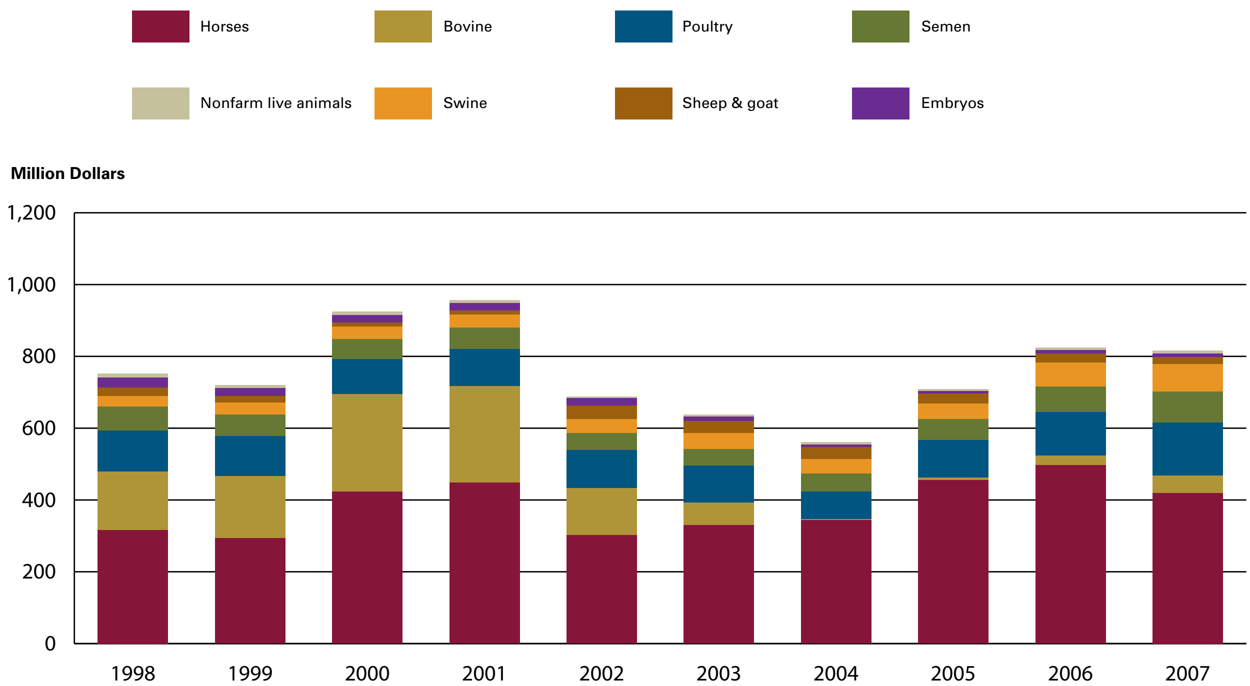
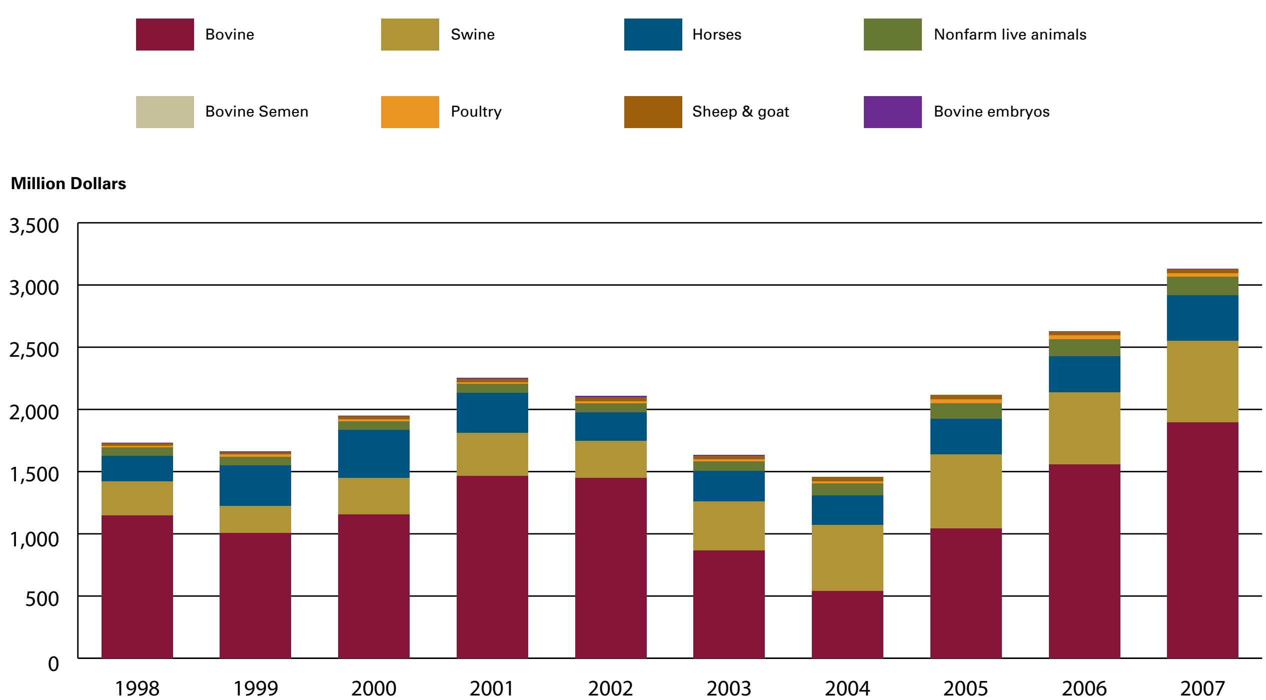


FIGURE 7.7: U.S. exports of live animals and germplasm



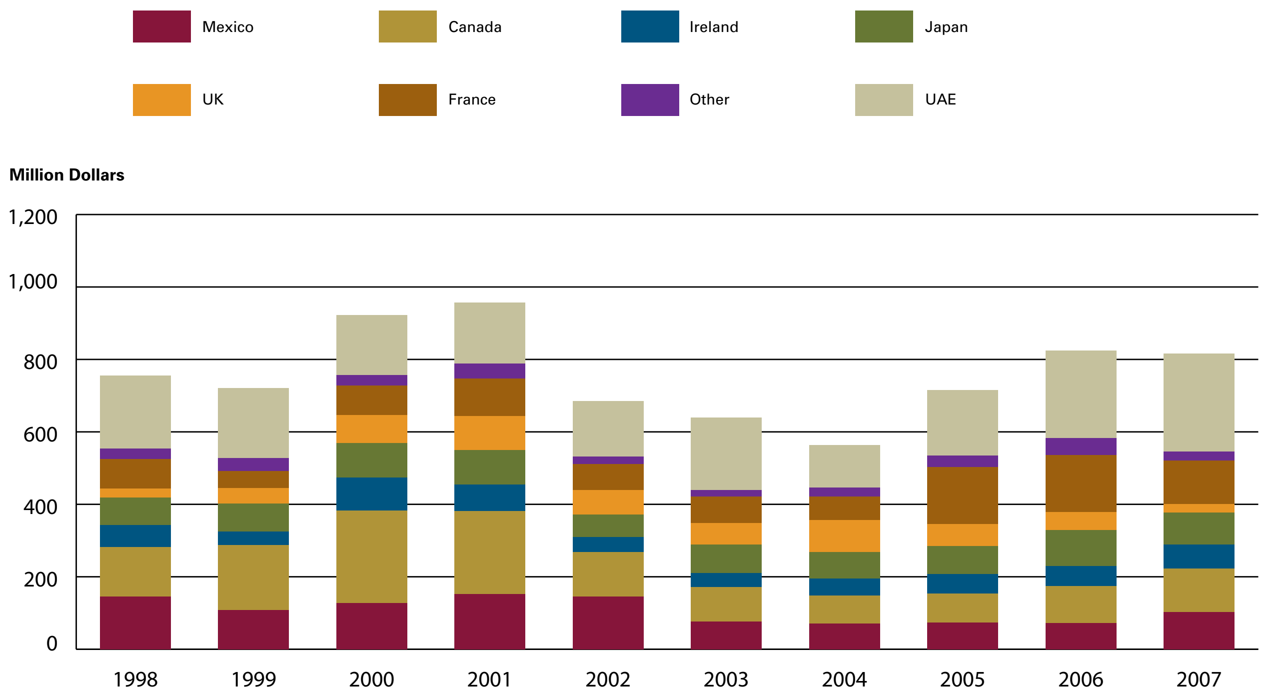
Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

FIGURE 7.8: U.S. live-animal and germplasm export value by destination



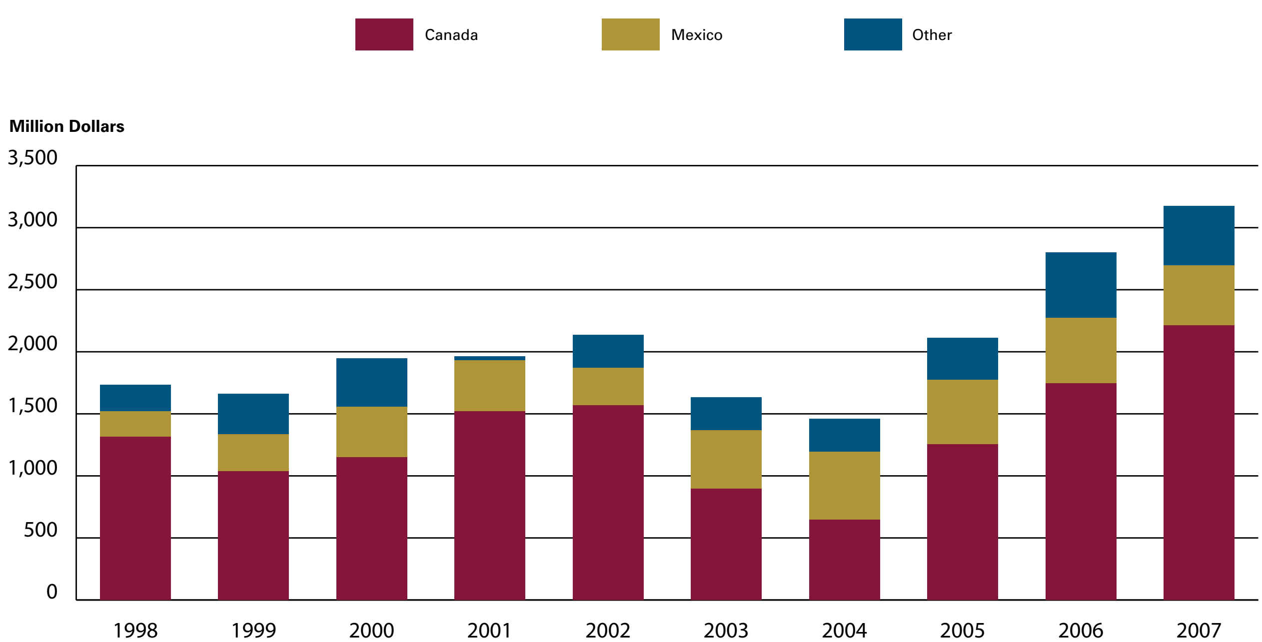
Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

FIGURE 7.9: U.S. imports of live animals and germplasm



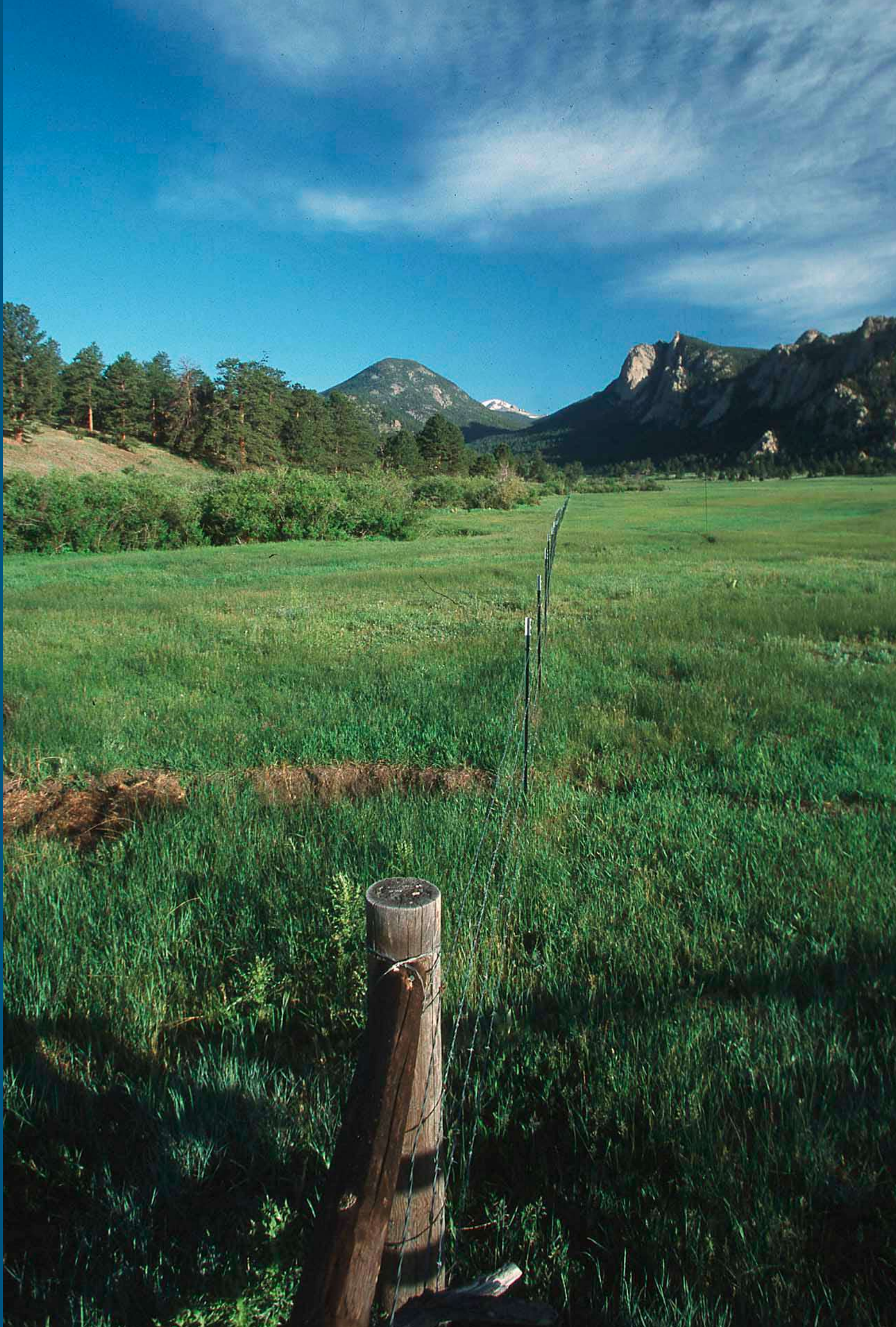
Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

FIGURE 7.10: U.S. live-animal and germplasm import value by origin



Source: Compiled from tariff and trade data provided by the U.S. Department of Commerce, the U.S. International Trade Commission, and USDA's Foreign Agricultural Service.

CHAPTER 8



CHAPTER 8

Background Elements Essential to the Veterinary Services Mission

This chapter discusses several programs and tools that are essential to APHIS-VS mission of protecting animal health through regulatory and disease-control activities. Although these elements tend to function "behind the scenes," they provide expertise and infrastructure critical to the VS mission.

These elements include the National Veterinary Accreditation Program (NVAP); VS information technology and data systems; and various VS surveillance methods and risk assessment tools, including the pathways assessment mapping tool (PAMT), targeted surveillance methodology, and the North American Animal Disease Spread Model (NAADSM).

National Veterinary Accreditation Program

Although most countries employ only government veterinarians for regulatory purposes, the United States uses a network that includes private practitioners to carry out these functions. The NVAP authorizes veterinarians to perform regulatory functions on behalf of VS in a manner consistent with international trade requirements and animal health safeguarding requirements. Approximately 80 percent of veterinarians in the United States are accredited through the voluntary program.

The accreditation program was first established in 1907 by USDA's Bureau of Animal Industry—now the Animal and Plant Health Inspection Service (APHIS)—in response to large numbers of horses being exported to Canada. It filled the need for regulatory oversight at a time when there were inadequate numbers of federally employed veterinarians to meet the demand for export certification. The Canadian government agreed to accept health inspections and certificates by authorized private practitioners, and NVAP was formed.

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

In addition to working to ensure that exported animals do not introduce disease into other countries, accredited veterinarians also provide the first line of surveillance for reportable domestic and foreign animal diseases. These activities help prevent U.S. animal agriculture from becoming a bioterrorism target. When large-scale animal disease or other emergency events occur, accredited veterinarians are often enlisted to help with APHIS' containment and eradication efforts.

While APHIS–VS supervises NVAP at the national level, the 41 VS area offices around the country 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 area office.

2007 Highlights

NVAP is establishing two accreditation categories in place of the former single category to add requirements for supplemental training and accreditation renewal and to offer program certifications. The changes are intended to support VS' animal health safeguarding initiatives, to involve accredited veterinarians in integrated surveillance activities, and to make provisions governing NVAP 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 proposed rule regarding these changes was published in the *Federal Register* in June 2006, and a supplemental rule was published in February 2007. An implementation plan to enact the amended regulation is being developed; implementation will depend on funding levels. VS and Iowa State University are developing several Web-based educational modules to satisfy the educational requirements for accreditation renewal.

VS Information Technology and Data Systems

VS information technology specialists are responsible for developing, deploying, and supporting automated information systems. These systems facilitate the collection, management, reporting, analysis, and dissemination of information that is critical to APHIS initiatives and VS programs. The information systems give VS field staff and managers access to the data they need for decisionmaking.

VS maintains five major information technology (IT) systems that support the data management requirements of national animal health program activities. These systems are the National Animal Health Laboratory Network (NAHLN) information system, the Animal Health and Surveillance Management (AHSM) information system, the Veterinary Services Process Streamlining (VSPS) information system, the Emergency Management Response System (EMRS), and the NAIS.

The VS information management systems are being transitioned to industry-standard, Web-based applications. VS has set several goals for its IT systems, including:

- Protecting confidential information, securing data, and controlling data access;
- Ensuring that the information systems' capacity and performance can support information needs during adverse animal health incidents;
- Collecting data at the source using intuitive, efficient, and mobile methods;
- Enforcing data standards and business rules; and,
- Providing for seamless exchange of relevant data with other certified VS, Federal, State, and private data systems.

2007 Highlights

- VS established steering committees for the AHSM, VSPS, and EMRS systems to guide development and implementation.
- The NAHLN Laboratory Registry module, which tracks, updates, and reports on NAHLN laboratory

capabilities and capacities for animal disease testing, was deployed. VS also enhanced the NAHLN Laboratory Reporting module, which standardizes reporting of NAHLN lab test results. The enhancements facilitate accurate processing and aggregating of data.

- EMRS was deployed to support animal-disease incident management in Texas, Louisiana, Wyoming, and New Mexico. EMRS is a Web-based system designed to automate many of the tasks routinely associated with disease outbreaks and animal emergencies. It is used for routine reporting of FAD investigations, State-specific disease outbreaks or control programs, national animal health emergency responses, or natural disasters involving animals.
- Three mobile information management (MIM) applications were developed and used in wildlife AI surveillance, bovine TB incident activities, and scrapie genotype tracking. These applications use personal digital assistants or tablet PC devices, along with Bluetooth and barcode or radio-frequency identification technologies, to facilitate fast and efficient data collection in the field and transmission of the data to participating laboratories and national databases.
- VSPS enhancements and architecture restructuring were completed. VSPS manages data important to animal and animal-product movement activities, providing a consistent and standard method of VS data capture at all levels, and disseminates data to the appropriate existing databases. Once data are captured, targeted information is shared with appropriate VS personnel, accredited veterinarians, State animal health officials, importers, exporters, or other members of the VS community for their particular data analysis needs.
- Web-based applications for the VS Laboratory Submission (VSLS) systems were launched for CSF surveillance and scrapie specimen collection. The VSLS enables electronic data submission and laboratory submission forms.
- The NAIS animal trace processing system was deployed. Four private animal tracking databases are currently in production. These NAIS databases contain animal sighting records that can be accessed when an adverse animal health event occurs.

In 2008, VS will continue to support the EMRS, NAHLN, VSPS, AHSM, and NAIS information systems. Development projects include enhancements to an animal reservation system for USDA animal import centers; modernization of a legacy import tracking system; a brucellosis MIM application; enhancements to the CSF, scrapie, and CWD modules; a data messaging application for the LBMS; and, an improved EMRS mapping module.

Pathways Assessment Mapping Tool

In 2007, the APHIS–VS' CEAH developed PAMT, a tool that helps VS analysts identify various pathways through which an FAD agent can enter the United States and cause an outbreak. Such pathways include imports of live animals or of legal/illegal commodities.

The pathways tool allows analysts to query various internal APHIS databases as well as other government databases and external public data sets, including import tracking systems, foreign agricultural statistics databases, and air travel records. Analysts can collect and process various data elements relating to animals and commodities that represent a potential disease threat. The tool has a mapping interface to perform basic spatial and statistical calculations for pathways risk assessments and then, based on demographic information, map the target risk zones for a potential outbreak or focus of an FAD. In preparation for an animal disease outbreak, PAMT would help analysts rapidly collect data to identify pathways of release of the disease-causing agent into the United States, evaluate the risk for each path of entry, and identify the State/county with the highest potential for an outbreak.

Targeted Surveillance Methodology

Collaborators from the CEAH's National Surveillance Unit (NSU) and the University of Minnesota recently developed methodology to define the concept of targeted sampling, draw valid population inference from targeted sampling data, and evaluate the methodology's use in surveillance applications.

Targeting subpopulations of animals for sampling has long been used as a surveillance strategy to find diseases in a cost-effective manner. This strategy is generally based on expert opinion or subjective conclusions about the relative risk of disease in subpopulations and even individual animals in each group. Targeted surveillance assumes that specified high-risk subpopulations will have higher prevalence, which can be more readily detected during surveillance efforts compared to surveillance in the whole population where the overall disease prevalence is low. One commonly used type of targeted surveillance has been the visual observation of individual animals within herds that show specific clinical signs of disease. This form of targeted surveillance has proven critical for detecting and eradicating important diseases, such as FMD, contagious pleuropneumonia, and others.

Although targeted surveillance has traditionally been used for disease detection, the NSU and University of Minnesota work demonstrated that, in combination with epidemiological information such as relative risk and the number of animals in specific subpopulations, targeted surveillance results can also be used to estimate disease prevalence in the population as a whole. The researchers demonstrated the application of the methodology for estimating population disease prevalence in three animal disease scenarios.

North American Animal Disease Spread Model

The NAADSM is designed to simulate the spread and control of highly contagious diseases in a population of susceptible animals. The model has been developed through a continuing international collaboration among researchers from the United States and Canada, along with support, involvement, and advice from a broad international pool of subject matter experts. The NAADSM Development Team includes representatives from USDA; Colorado State University; Department of Computing and Information Science at the University of Guelph; Canadian Food Inspection Agency; and, the Ontario Ministry of Agriculture, Food and Rural Affairs.

While the model has been developed for use in North America, the project has also been employed in several training courses offered largely to international audiences. The NAADSM has also been used to assist with emergency disease preparedness. On three occasions, the model was used to simulate outbreaks of HPAI under different conditions. The resulting scenarios were then used during tabletop exercises to illustrate the potential scope and impact of an HPAI outbreak. Most recently, the model was used to estimate the number of vaccine doses needed in the event of a PRV outbreak in Iowa and North Carolina.

The NAADSM can be used to:

- Evaluate the effectiveness of various surveillance strategies;
- Compare the consequences associated with different probabilities of detection and reporting;
- Provide realistic exercise scenarios;
- Evaluate proposed disease control strategies, plans, and policies and develop animal disease emergency preparedness and response plans;
- Assess the potential economic impacts of disease and associated control measures; and,
- Support researchers who incorporate disease modeling in their work.

The NAADSM application is available via the Internet at *http://www.naadsm.org*.

CHAPTER 9

CHAPTER 9

International and Domestic Collaborations in Animal and Public Health

USDA–APHIS has traditionally looked beyond the U.S. borders in its efforts to control animal diseases. Recently, many factors have magnified the need for an international focus on animal disease control efforts. These factors include regionalization, worldwide movement toward more open market access, intensified animal production, the constant evolution of infectious agents, increased international passenger travel, interactions of wildlife with livestock, and the potential impact of biotechnology and bioterrorism. In light of the changing global environment and the increasing potential for disease spread, international collaborations must be forged and combined with domestic efforts to establish more effective animal health programs.

Within U.S. borders, collaborations are equally important; the domestic animal health infrastructure is a complex network that would not function without the combined efforts of Federal and State agencies, industry, and academic institutions. APHIS–VS continues to strengthen relationships and collaborations with traditional and nontraditional stakeholders such as the aquaculture industry, wildlife producers, and emergency response organizations to improve the service provided to U.S. animal agriculture.

This chapter describes some of USDA–APHIS' international and domestic collaborations, partnerships, and activities. While not a comprehensive list, the information here provides a brief overview of the agency's collaborative efforts abroad and at home to safeguard animal health on a global level.

APHIS International Activities

APHIS' safeguarding strategy includes controlling pest and disease risks at U.S. borders by working overseas to detect and prevent the spread of pests and diseases at their points of origin before they can become larger regional or global threats. APHIS works with foreign countries to monitor, control, or eradicate animal diseases and pests that pose a risk of being introduced into, and potentially established in, the United States, causing severe damage to U.S. agriculture. This includes diseases and pests such as screwworm, CSF, FMD, and TBT.

Animal health officials from Canada, Mexico, and the United States have created the North American Animal Health Committee, which meets regularly to discuss common animal health issues. Similarly, U.S. animal health officials meet regularly with their Australian, New Zealand, and Canadian counterparts in the Quadrilateral Animal Health Committee.

APHIS is initiating a new partnership with regional and international health organizations, the Government of France, and the Food and Agriculture Organization (FAO). The intent is to build a local field force of veterinary epidemiologists and para-epidemiologists to monitor animal diseases and disease syndromes; provide rapid laboratory access and diagnosis of diseases; assess and prioritize veterinary infrastructure; and, develop animal disease emergency response and management infrastructure.

Other international collaborative efforts are described below.

APHIS International Technical and Regulatory Capacity Building Center

APHIS' International Services program established the International Technical and Regulatory Capacity Building (ITRCB) Center in 2007 to coordinate the increasing number of international efforts undertaken by various APHIS units. The ITRCB Center handles all requests for APHIS international capacity building (domestic and foreign) as well as all requests to APHIS regarding international guests who wish to visit the Agency's facilities; APHIS is receiving increasing numbers of such requests. These contacts involve a wide range of topics, including biotechnology, regulatory processes and policy, pest risk analysis, epidemiology, wildlife control and surveillance, FAD, diagnostics, and animal and plant quarantine and inspection.

The goal of the APHIS ITRCB Center is to ensure that requests are handled in a timely and efficient manner, consistent with overall APHIS goals and priorities. Additional mid- to long-term goals include increasing the number and types of formal international technical and regulatory capacity-building training courses.

OIE Reference Laboratories and Collaborating Centers

The OIE 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. In the United States, the NVSL and CVB are recognized as OIE Collaborating Centers for the Diagnosis of Animal Diseases and Vaccine Evaluation in the Americas. APHIS–VS' CEAH is an OIE Collaborating Center for Animal Disease Surveillance Systems and Risk Analysis.

An OIE reference laboratory is expected to function as a center of expertise and standardization of diagnostic techniques for the specified disease. The reference laboratory must have a designated expert in the disease who is a leading and active researcher and can provide scientific advice and technical assistance on topics dealing with surveillance and disease control. The expert is expected to develop new procedures for the diagnosis of the disease and provide biological reference products and diagnostic reagents to other laboratories. The expert may also be asked to provide technical training to personnel from OIE member countries, coordinate scientific and technical studies with other laboratories, and contribute to the preparation or review of reference documents. The designation of OIE reference laboratory is determined by the level of international activity conducted by the laboratory. Annual documentation of activities supporting the designation is required.

NVSL is an OIE reference laboratory for vesicular stomatitis; bluetongue; END; anthrax; PRV; leptospirosis; contagious equine metritis; Eastern, Western, and Venezuela equine encephalomyelitis; EIA; HPAI; and West Nile encephalitis. NVSL also provides reference assistance to other veterinary diagnostic laboratories with regard to certain areas of expertise.

The CVB is the sole confirmatory and investigatory testing laboratory involved in regulation of commercial veterinary biologics in the United States. The CVB provides support to the OIE through the following activities:

- Development, distribution, and use of worldwide standard protocols for biologics evaluation and the training of scientists throughout the world on these protocols;
- Validation and supply of standard reagents to biologics manufacturers and regulatory laboratories worldwide;
- Improvement of biological techniques for diseases of significance in the Americas through developmental projects;
- Review, development, and harmonization of testing protocols in collaboration with industry and other governmental laboratories;
- Active participation in international harmonization initiatives aimed at improving standards and testing procedures for veterinary biologics; and,
- Hosting of scientific meetings in the area of veterinary biologics (see Chapter 5 for more information).

For 10 years, CEAH has served as an OIE Collaborating Center for Animal Disease Surveillance Systems and Risk Analysis. Each year, the amount and type of support that CEAH provides in this capacity increases. Examples of CEAH's assistance to the OIE during 2007 included:

- Presentations and discussions at Johne's disease workshops in Japan and Switzerland;
- Review of and commentary on country surveillance protocols for FMD, rinderpest, and AI;
- International discussions on antimicrobial resistance and monitoring;
- Collaboration with an OIE working group on epidemiology to develop or review guidelines for compartmentalization and surveillance for AI, END, and rinderpest;
- Participation in the OIE–FAO AI steering committee;
- Provision to the OIE of information concerning possible emerging animal health events;
- Participation in the Global Livestock Early Warning System joint project between FAO-OIE-World Health Organization (WHO); and,
- Participation in an OIE followup mission to South America to assess the FMD situation there.

In addition, CEAH supported the OIE mission in 2007 by providing training courses relating to spatial analysis, epidemiology, and risk assessment. International courses on these topics were held in Indonesia, Mali, Taiwan, and Myanmar. In support of the HPAI identification and response initiatives of OIE and FAO, experts participated in training classes in Egypt, Senegal, Austria, and Indonesia. Many foreign visitors were welcomed by and trained at CEAH during 2007, including delegations from Ethiopia, Taiwan, Iraq, China, Russia, and Afghanistan.

In part because of the increasing opportunity to interact with OIE, FAO, and other OIE or FAO collaborating/reference centers, CEAH has created an Office for International Collaboration and Cooperation. The office will assist CEAH in identifying and prioritizing opportunities for international training, seminars, and collaborative projects in cooperation with APHIS International Services' ITRCB Initiative.

FAO Reference Laboratories and Collaborating Centers

The NVSL is an FAO reference laboratory for FMD, CSF, viral hemorrhagic disease of rabbits, malignant catarrhal fever, rinderpest, other vesicular diseases, African horse sickness, and ASF.

In the past, FAO has designated reference laboratories for specific diseases and collaborating centers for disciplines such as public health. These designations were formalized through appropriate exchanges of letters and other types of agreements. In October 2006, the FAO elected to have a more formal process that will reflect the agreed-upon terms of reference and concrete areas for collaboration as specified in a mutually agreed work plan. The term "FAO reference center" is used to designate both reference laboratories and collaborating centers and the designation will initially be good for a maximum of 4 years. There are currently 14 FAO reference laboratories and 25 FAO collaborative centers.

USDA International Coordination Group for Highly Pathogenic Avian Influenza

Recognizing the potential impact of HPAI, USDA formed an International Coordination Group for HPAI. With the continued spread of HPAI (H5N1) throughout the world, concern that the United States might become infected increases. USDA's involvement in international HPAI efforts during disease outbreaks provides training and educational opportunities in foreign countries to better prepare USDA to address the disease should it arrive here. More than 60 countries have now reported infection with HPAI (H5N1); in 2007, 6 new countries reported first-time infections, and 7 countries previously reported to be free of the virus reported new outbreaks.

Capacity-building initiatives in HPAI-affected countries will increase the overall likelihood of identification and control of HPAI and of other highly contagious and possibly zoonotic diseases. This, in turn, will help protect the United States by reducing the spread of these diseases worldwide.

Goals of the international partnership for avian and pandemic influenza include elevating the issue on national agendas; coordinating efforts among affected nations and those trying to provide help; mobilizing and leveraging resources; increasing transparency in disease reporting and surveillance; and, developing infrastructure and resources to identify, contain, and respond to avian influenza in birds and a potential human pandemic influenza.

USDA involvement focuses on

- Rapid reaction to the first signs of accelerated transmission of H5N1 and other highly pathogenic influenza strains in birds so that appropriate international and national resources can be allocated;
- Prevention and containment of an incipient epidemic through capacity building and in-country collaboration with international partners;
- Support expanded cooperation with appropriate multilateral organizations such as WHO, FAO, and OIE;
- Timely coordination of bilateral and multilateral resource allocations, dedication of domestic resources (human and financial), improvements in public awareness, and development of economic and trade contingency plans;
- Increased coordination and harmonization among nations of preparedness, prevention, response, and containment activities, complementing domestic and regional preparedness initiatives, and encouraging appropriate development of strategic regional initiatives; and,

- Use of the best available science for decisionmaking.

In 2007, USDA activities in support of these goals were spread across the globe and fell into the primary categories of preparedness and communication, surveillance and detection, and response and containment. USDA conducted workshops on animal health communications, epidemiology, surveillance technology, and LBMS sampling. In addition, diagnostic test kits and real-time PCR machines were provided to some countries to enhance their ability to rapidly diagnose AI.

Domestic Partnerships and Collaborations

As with international collaborations, domestic partnerships and collaborations are becoming increasingly important to APHIS–VS. Traditional stakeholders, such as the various livestock industries and State animal health officials, have long worked in partnership with VS to achieve successes in animal disease eradication and control programs. More recently, it has become apparent that VS' role in emergency preparedness and response and in veterinary public health requires additional collaborations, as described below, to enhance effectiveness.

In addition, the growing recognition of the interdependencies among animal, human, and environmental health necessitates a new view of health partnerships and has led to development of a "one health" concept.

Public Health and Agriculture Partnerships

Worldwide, veterinarians and human health care professionals recognize the need to improve collaborations among organizations within the agriculture and public health sectors. The increasing frequency of outbreaks of emerging and re-emerging zoonoses (for example, severe acute respiratory syndrome, monkeypox, West Nile virus, Nipah virus, etc.) have heightened the public's awareness of zoonotic diseases and, in the United States, have resulted in a number of formal efforts to improve cooperation among government agencies. Policy reforms—such as the 2001 Animal Health Safeguarding Review, the 2002 Public Health Security and Bioterrorism Act, and Homeland Security Presidential Directives 5-10—call for an integration of agriculture, public health, and food safety surveillance to defend against both natural and intentional disease threats. In addition, WHO's technical report "Future Trends in Veterinary Public Health" and article "Converging Issues in Veterinary and Public Health" underscore the mutual need for and benefit of developing and strengthening the partnership between veterinary medicine and human health care.

The following sections describe some of the collaborative domestic projects in the United States related to public health and agriculture.

Interagency Working Group for the Coordination of Zoonotic Disease Surveillance

The Interagency Working Group for the Coordination of Zoonotic Disease Surveillance (IWGCZDS) was created in 2002 and tasked to address coordination of human and animal disease surveillance systems. This group is working to (1) identify essential partners and their needs; (2) develop a system of communication and action triggers; (3) divide the workload to maximize efficiency and identify roles and responsibilities; and, (4) incorporate animal health surveillance into existing systems. The IWGCZDS membership includes representatives from VS, CDC, FDA, the National Assembly of State Animal Health Officials, and the National Association of State Public Health Veterinarians.

One of the IWGCZDS group's efforts is a survey of all State agriculture and public health veterinarians. This survey, developed and administered in partnership with the USAHA, will provide a better understanding of current reporting and response methods and jurisdictional complexities at the State level. The IWGCZDS plans to use the survey results to develop examples of "best practices" among agriculture and public health departments. In addition, the IWGCZDS intends to use bioterrorism preparedness exercises to identify obstacles to coordinating efforts.

Laboratory Networks

Laboratory networks provide promising potential for coordinating zoonotic disease surveillance. Networks include the NAHLN, the Laboratory Response Network (LRN), and the Food Emergency Response Network (FERN). NAHLN, a USDA-coordinated network of Federal and State veterinary diagnostic laboratories, is being developed to conduct targeted surveillance for early detection of disease outbreaks and to ensure rapid and sufficient laboratory capacity in response to animal health emergencies (see Chapter 5 for more information on NAHLN). The LRN, a CDC-coordinated network of Federal and State laboratories, is working to expand its membership to include one animal disease diagnostic laboratory in each State to provide preparedness and integrated response capacity for bioterrorism or other public health emergencies. The FERN, coordinated jointly by FDA and USDA–FSIS is a national network of food-testing laboratories designed to integrate the detection of threat agents in the food supply. NAHLN, LRN, and FERN are working to maximize efficiencies among the three networks; together, they represent a cornerstone in the development of comprehensive agriculture, public health, and food safety monitoring systems.

One Health Initiative Task Force

In 2007, a One Health Initiative Task Force was formed, led jointly by the American Veterinary Medical Association (AVMA) and the American Medical Association (AMA). The task force is charged with strengthening the relationship between animal and human medicine and articulating a vision of one health that encompasses and integrates animal, human, and environmental health. The primary goal of the initiative is to help physicians and veterinarians recognize, monitor, and respond to outbreaks of zoonotic diseases.

The One Health Initiative began as a 2006 proposal by the AVMA to encourage better cooperation between veterinary medicine and human medicine, including participation of schools, industry, associations, and individual practitioners. In June 2007, the AMA moved to support the One Health Initiative, and the AVMA selected task force members for the initiative. Task force members include representatives from VS, HHS (including CDC), AVMA, AMA, student AVMA and AMA chapters, State public health veterinarians, veterinary colleges, schools of public health, and industry.

The group will prepare a comprehensive report with recommendations and actions to support and sustain the One Health Initiative concept.

Wildlife Disease Surveillance

Surveillance and monitoring for wildlife disease is becoming increasingly important to public and animal health. New and emerging livestock and human diseases sometimes appear first in wildlife. Wildlife health also is important for conservation management and may serve as an indicator of environmental health.

For some diseases, programs that include wildlife surveillance may support domestic animal health, increase international trade and consumer confidence in products, and protect public health. For this reason, wildlife disease surveillance and monitoring needs to be approached through partnerships and cooperation among the appropriate Federal and State wildlife, agriculture, and public health agencies; industry; nongovernmental organizations such as the USAHA; and, academia.

Common disease surveillance objectives include

- Rapidly detecting FADs,
- Monitoring risk of introduction,
- Establishing baseline data on herd or population health,
- Estimating disease prevalence, and
- Assessing population health in the case of a human disease epidemic.

Three current examples of national collaborative efforts for disease surveillance in wildlife are the interagency approaches for surveillance of CSF, HPAI, and CWD. These interagency efforts involve surveillance for a foreign animal or emerging disease and rely heavily on cooperative relationships at the local level, as well as diagnostic support through partnerships such as the NAHLN. (For more information on these efforts, see Chapters 2 and 5.)

Collaboration for Incident Response Preparedness

States have concurrent authorities and responsibilities that support the APHIS mission to protect the health and value of U.S. agriculture and natural resources. Consequently, State officials are often called upon to respond with APHIS to emergencies or incidents that threaten agricultural and natural resources. This includes responding to specific threats to agriculture and providing support during more general or “all hazards” incident responses such as hurricanes, large-scale fires, and other natural or human-caused disasters. APHIS and State officials recognize that strategic alliances and collaboration are imperative so that agencies can best prepare to respond appropriately.

APHIS and State agencies have a history of successful collaborative responses to animal and plant pest and disease outbreaks and are also building successes in the area of all-hazards response. Recent incidents that have been very large in scope and complexity include the 2003 END outbreak and 2005 hurricanes Katrina and Rita, which stretched State and APHIS resources. These experiences have confirmed the need for incident response preparedness principles and standards that are flexible, robust, and able to integrate APHIS and State personnel across multiple locations.

Although USDA has achieved successful outcomes resulting from the long-standing alliance between APHIS and States related to incident preparedness and response, there is still a need to further strengthen the alliances, and, in particular, the collaborations that support them. In 2007, these needs were examined by APHIS Policy and Program Development analysts with the assistance and concurrence of an Assessment Working Group, made up of representatives of APHIS, the National Association of State Departments of Agriculture, and other members of the APHIS/State strategic alliance.

The assessment and subsequent reviews led to four recommendations, which resulted in the following goal statements for APHIS and States:

- To clarify and document roles and responsibilities;
- To institute good organizational practices that support collaboration;
- To institute mechanisms for providing additional support when needed;
- To develop, document, and monitor communication principles that support collaboration; and,
- To work to create a culture of collaboration across all boundaries.

To improve collaborations with States, APHIS recently created a State liaison position for State officials to contact regarding issues of concern, as recommended by the Assessment Working Group. Once the position has been filled, the liaison will be stationed in Riverdale, Maryland, as part of APHIS' Legislative and Public Affairs program.

APPENDIX 1

APPENDIX 1

Statistics on Major Commodities

TABLE A1.1: Major commodity surveys conducted by NASS

Commodity	Month conducted	Approximate sample size	No. States
Cattle and calves	January	50,000	50
	July	40,000 - June + 10,000 - July	50
Sheep and goats	January	24,000	50
	July	39,000 - June + 4,700 - July	50
Cattle on feed	Monthly	NA	17
Hogs and pigs	December	12,100	50
	March, June, September	9,300 each	30
Catfish	January	NA	9
	July	NA	4
Trout	January	NA	25
Livestock slaughter	Monthly	808 federally-inspected plants, 2,119 State-inspected or custom-exempt plants	50
Poultry slaughter	Monthly	320 federally-inspected plants	50
Turkeys raised	December	NA	28
Chickens and eggs	December	650 operations (30,000 or more layers)	50
Broiler hatchery production	Monthly	300 hatcheries	50
	Weekly	NA	19
Honey	December/January	NA	49

NA = not available.

TABLE A1.2: Value of production for selected agricultural commodities for 2006 and 2007

Commodity	2006 ($1,000)	Percent of total value	2007 ($1,000)	Percent of total value
Cattle	35,555,125	16.1	36,066,735	12.8
Milk from milk cows	23,557,661	10.6	35,652,656	12.7
Poultry	25,798,423	11.6	31,899,987	11.4
Swine	12,702,125	5.7	13,467,996	4.8
Catfish and trout	564,670	0.3	532,381	0.2
Sheep	379,531		383,576	
Wool	24,510		30,258	
Total sheep and wool	404,041	0.2	413,834	0.1
Honey	160,484	0.1	153,233	0.1
Total of preceding livestock and products[1]	98,742,529	44.6	118,186,822	42.1
Field and miscellaneous crops	93,693,779	42.3	132,409,479	47.1
Fruits and nuts	16,971,781	7.7	17,853,647	6.4
Commercial vegetables	12,066,771	5.4	12,514,820	4.4
Total value of preceding crops	122,732,331	55.4	162,777,946	57.9
All commodities above	***221,474,860***	***100.0***	***280,964,768***	***100.0***

[1] Production data for equids were not available.

TABLE A1.3: Cattle and calves production, 2006 and 2007

		2006	2007
All cattle and calves		97,003	
All cows		42,023	
Size of operation		**Percentage operations (percentage inventory)**	
1–49 head	62.3	(10.7)	(10.6)
50–99 head	16.7	(11.2)	(11.2)
100–499 head	18.1	(34.5)	(34.0)
500 or more head	3.1	(43.6)	(44.2)
Calf crop (1,000 head)		37,519	37,361
Deaths—cattle (1,000 head)		1,819	1,857
Deaths—calves (1,000 head)		2,348	2,394
Commercial calves slaughter (1,000 head)			
Federally inspected		699	745
Other		13	13
Total commercial		*[1]711*	*758*
Commercial cattle slaughter (1,000 head)			
Federally inspected			
Steers		17,478	17,285
Heifers		9,820	10,207
All cows		5,336	5,675
Bulls and stags		511	554
Other		553	543
Total commercial		*33,698*	*34,264*
Farm cattle and calves slaughter (1,000 head)[2]		187	187
Total cattle and calves slaughter (1,000 head)		*[1]34,597*	*35,209*
Value of production ($1,000)		35,555,125	36,066,735

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 A1.4: Milk cow production, 2006 and 2007

	2006	2007
January 1 following-year inventory (1,000 head)		
Milk cows	9,132	9,224
Milk replacement heifers	4,310	4,457
	Percentage operations (percentage inventory)	
	28.4 (1.9)	28.0 (1.7)
	18.8 (6.0)	18.8 (5.7)
	29.5 (16.3)	29.3 (15.4)
	13.0 (14.1)	13.0 (13.4)
	6.1 (15.0)	6.4 (14.9)
	4.2 (46.7)	4.5 (48.9)
Cows slaughtered (1,000 head), federally inspected		
Dairy cows	2,354	2,497
Other cows	2,983	3,178
All cows	[1]5,336	5,675
Milk production		
Average number of milk cows during year (1,000 head)	9,112	9,158
Milk production per milk cow (lb)	19,951	20,267
Milk fat per milk cow (lb)	736	746
Percentage of fat	3.69	3.68
Total milk production (million lb)	181,796	185,602
Value of milk produced ($1,000)	23,557,661	35,652,656

Source: USDA–NASS.
[1] Sum of categories may not add to total due to rounding.

TABLE A1.5: Beef cow production, 2006 and 2007

	2006		2007	
January 1 following-year inventory (1,000 head)				
Beef cows		32,891		32,553
Beef replacement heifers		5,877		5,670
Size of operation	**Percentage operations (percentage inventory)**			
1–49 head	77.4	(27.7)	77.2	(27.7)
50–99 head	12.3	(18.6)	12.5	(18.6)
100–499 head	9.6	(38.7)	9.6	(38.7)
500 or more head	0.7	(15.0)	0.7	(15.0)
Cows slaughtered (1,000 head), federally inspected				
Dairy cows		2,354		2,497
Other cows		2,983		3,178
All cows		*[1]5,336*		*5,675*

Source: USDA–NASS.
[1] Sum of categories may not add to total due to rounding.

TABLE A1.6: Cattle-on-feed production, 2006 and 2007

	2006	2007
January 1 following-year inventory (1,000 head) for all lots	14,269	14,317
January 1 following-year inventory (1,000 head) for lots 1,000+ capacity		
Steers and steer calves	7,574	7,646
Heifers and heifer calves	4,303	4,381
Cows and bulls	97	70
Total	*11,974*	*12,097*

Feedlot capacity (head)	Number of feedlots 2007	Pct.	January 1, 2008, inventory (1,000 head)	Pct.	Marketed (1,000 head) 2007	Pct.
<1,000	85,000	97.5	2,220	15.5	3,700	14.1
1,000–1,999	809	0.9	457	3.2	780	3.0
2,000–3,999	564	0.7	816	5.7	1,395	5.3
4,000–7,999	343	0.4	1,140	8.0	1,974	7.6
8,000–15,999	182	0.2	1,372	9.6	2,535	9.7
16,000–31,999	133	0.2	2,339	16.3	4,495	17.2
≥ 32,000	129	0.1	5,973	41.7	11,277	43.1
All feedlots	*87,160*	*100.0*	*14,317*	*100.0*	*26,156*	*100.0*

Source: USDA–NASS.

TABLE A1.7: Hog and pig production, 2006 and 2007

	2006		2007	
December 1 inventory (1,000 head)				
Breeding	6,087		6,161	
Market	56,402		60,801	
All hogs and pigs	*[1]62,490*		*66,963*	
Operations with hogs and pigs	65,940		65,640	
Size of operation	**Percentage operations (percentage inventory)**			
1–99 head	60.5	(1.0)	61.1	(1.0)
100–499 head	14.6	(4.0)	14.1	(3.5)
500–999 head	6.8	(5.0)	6.6	(4.5)
1,000–1,999 head	6.4	(10.0)	6.3	(9.5)
2,000–4,999 head	8.0	(26.0)	8.0	(25.5)
≥ 5,000 head	3.7	(54.0)	3.9	(56.0)
Total	*100.0*	*(100.0)*	*100.0*	*(100.0)*
Pig crop (1,000 head)				
December–November[1]	105,618		111,858	
Pigs per litter				
December–November[1]	9.08		9.21	
Deaths (1,000 head)	8,415		9,019	
Slaughter (1,000 head), federally inspected				
Barrows and gilts	100,113		104,352	
Sows	3,227		3,309	
Stags and boars	348		477	
Other	1,048		1,033	
Total commercial	[2]104,737		[2]109,172	
Farm slaughter	105		106	
Total slaughter	*104,842*		*[2]109,277*	
Value of production ($1,000)	**12,702,125**		**13,467,996**	

Source: USDA–NASS.
[1] December of the preceding year.
[2] Sum of categories may not add to total due to rounding.

TABLE A1.8: Sheep production in the United States, 2006 and 2007

	2006		2007	
January 1 following-year inventory (1,000 head)				
Ewes 1 year old and older	3,696		3,617	
Rams 1 year old and older	195		193	
All sheep and lambs	6,165		6,055	
Operations with sheep	69,470		70,590	
Size of operation	**Percentage operations (percentage inventory)[1]**			
1–99 head	90.8	(28.7)	91.1	(30.8)
100–499 head	7.6	(24.0)	7.4	(23.1)
500–4,999 head	1.5	(33.8)	1.4	(31.3)
≥ 5,000	0.1	(13.5)	0.1	(14.8)
Total	*100.0*	*(100.0)*	*100.0*	*(100.0)*
Lamb crop (1,000 head)	4,065		4,050	
Deaths—sheep (1,000 head)	237		247	
Deaths—lambs (1,000 head)	399		431	
Slaughter (1,000 head), federally inspected				
Mature sheep	118		116	
Lambs	2,429		2,413	
Other	151		165	
Total commercial	*2,699*		*2,694*	
Farm slaughter	68		75	
Total slaughter	*[2]2,766*		*2,769*	
Wool production				
Sheep shorn (1,000 head)	4,852		4,705	
Shorn wool production (1,000 lb)	36,019		34,533	
Value of wool production ($1,000)	24,510		30,258	
Value of production ($1,000)				
Sheep	379,531		383,576	
Wool	24,510		30,258	
Total	*404,041*		*413,834*	

Source: USDA–NASS.
[1] End-of-year survey for breeding sheep (inventory).
[2] May not total due to rounding.

TABLE A1.9: Goat production in the United States, 2006 and 2007

	2006	2007
January 1 following-year goat inventory (1,000 head)		
Does 1 year old and older		
Angora	162	143
Milk	185	193
Meat and other	1,451	1,512
All	*1,798*	*1,848*
Bucks		
Angora	11	11
Milk	20	21
Meat and other	137	143
All	*168*	*175*
All		
Angora	238	210
Milk	294	305
Meat and other	2,402	2,500
All	*2,934*	*3,015*
Operations with goats		
Angora	4,730	4,550
Milk	19,880	19,930
Meat and other	86,720	90,270
All	*104,170*	*108,130*
Kid crop		
Angora	129	108
Milk	214	220
Meat and other	1,574	1,610
All	*1,917*	*1,938*

TABLE A1.10: Poultry production in the United States, 2006 and 2007

	2006	2007
December 1 total layers (1,000 head)	349,888	344,492
Annual average number of layers (1,000 head)	347,880	344,385
Eggs per layer	263	263
Total egg production (million eggs)	91,328	90,581
Number of broilers produced (1,000 head)	8,867,800	8,898,200
Number of chickens lost (1,000 head)	101,078	100,663
Number of turkeys raised (1,000 head)	262,460	271,689
Young turkeys lost as a percentage of total poults placed	11.1	11.6
Number slaughtered (1,000 head)		
Chickens—young	8,837,544	8,898,486
Chickens—mature	131,122	132,549
Chickens—total	*8,968,666*	*9,031,035*
Turkeys—young	252,368	262,791
Turkeys—old	2,348	2,178
Turkeys—total	*254,716*	*264,969*
Ducks	*28,025*	*27,311*
Value of production ($1,000)		
Broilers	17,739,234	21,460,211
Eggs	4,431,745	6,678,147
Turkeys	3,573,690	3,710,846
Chickens (value of sales)	53,754	50,783
Total	*25,798,423*	*31,899,987*

Source: USDA–NASS.

TABLE A1.11: Equine production in the United States, 1997, 1998, and 2002

	1997[1]	1998[1]	2002[2]
January 1 following-year inventory (1,000 head)			
All equids	5,250	5,317	
On farms	[2]3,200	NA	[3]3,750
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.

TABLE A1.12: Catfish and trout production in the United States, 2006 and 2007

	2006	2007
Catfish		
Number of fish on January 1, following year (1,000)		
Foodsize	313,066	293,848
Stockers	575,627	570,447
Fingerlings	964,814	894,005
Broodfish	902	760
Number of operations on January 1, following year	1,240	1,064
Sales ($1,000)		
Foodsize	455,095	408,750
Stockers	6,918	15,212
Fingerlings	21,315	20,103
Broodfish	677	770
Total sales	*484,005*	*444,835*
Trout		
Number of fish sold (1,000)		
≥ 12 inches	52,452	59,729
6–12 inches	6,249	4,994
1–6 inches	8,725	9,563
Sales ($1,000)		
≥ 12 inches	72,733	80,013
6–12 inches	6,388	5,838
1–6 inches	1,544	1,695
Total sales	*80,665*	*87,546*
Eggs sold		
Number of eggs (1,000)	*	392,973
Total value of sales ($1,000)	*	7,460
Total value of fish sold plus value of eggs sold ($1,000)	*	[1]95,007
Number of operations selling trout	412	390
Number of operations selling or distributing trout, or both	765	747

Source: USDA–NASS.
[1] Sum of categories may not add to total due to rounding.
* Not published to avoid disclosure of individual operations.

TABLE A1.13: Honey production[1] in the United States, 2006 and 2007

	2006	2007
Honey-producing colonies (1,000)	2,393	2,442
Yield per colony (lb)	64.7	60.8
Production (1,000 lb)	154,907	148,482
Stocks on December 15 (1,000 lb)	60,548	52,484
Value of production ($1,000)	160,484	153,233

Source: USDA–NASS.
[1] For producers with five or more colonies.

TABLE A1.14: Production data on miscellaneous livestock, 2002

Commodity	Number of farms	Inventory	Number sold
Milk goats	22,389	290,789	113,654
Angora goats	5,075	300,753	91,037
Meat and other goats	74,980	1,938,924	1,109,619
Mules, burros, donkeys	29,936	105,358	17,385
Mink	310	1,113,941	2,506,819
Rabbits	10,073	405,241	886,841
Ducks	26,140	3,823,629	24,143,066
Geese	17,110	173,000	200,564
Pigeons	4,405	449,255	1,160,364
Pheasants	4,977	2,267,136	7,206,460
Quail	3,742	4,888,196	19,157,803
Emus	5,224	48,221	15,682
Ostriches	1,643	20,560	16,038
Bison	4,132	231,950	57,210
Deer	4,901	286,863	43,526
Elk	2,371	97,901	16,058
Llamas	16,887	144,782	18,653

Source: USDA–NASS 2002 Census of Agriculture.

TABLE A1.15: Slaughter statistics, 2007

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	626	33,720.7	543.3
Calves	232	744.8	13.3
Hogs	618	108,138.2	1,033.4
Sheep and lambs	480	2,528.6	165.1
Goats	397	639.4	187.9
Bison	132	50.1	16.9

Source: USDA–NASS Livestock Slaughter 2007 Summary, March 2008.
[1] Includes data for the calendar year.

APPENDIX 2

APPENDIX 2

Tables on FAD Investigations

TABLE A2.1: FAD investigations by State, 2004–07

		2004	2005	2006	2007
AK	Alaska	1	3	0	5
AL	Alabama	2	2	5	4
AR	Arkansas	9	10	7	5
AZ	Arizona	28	57	15	12
CA	California	62	25	33	31
CO	Colorado	300	146	24	22
CT	Connecticut	7	4	4	3
DE	Delaware	1	0	0	0
FL	Florida	9	16	6	11
GA	Georgia	26	25	13	25
HI	Hawaii	3	2	1	1
IA	Iowa	11	8	12	10
ID	Idaho	22	20	14	11
IL	Illinois	11	12	3	7
IN	Indiana	9	4	3	14
KS	Kansas	9	10	9	6
KY	Kentucky	10	10	4	17
LA	Louisiana	11	11	6	4
MA	Massachusetts	7	7	3	2
MD	Maryland	1	5	0	0
ME	Maine	0	1	0	1
MI	Michigan	6	6	23	13
MN	Minnesota	9	6	1	4
MO	Missouri	6	3	7	1
MS	Mississippi	3	9	9	6
MT	Montana	6	45	16	4
NC	North Carolina	13	6	10	4
ND	North Dakota	0	1	0	0
NE	Nebraska	13	27	6	9
NH	New Hampshire	4	0	1	0
NJ	New Jersey	7	11	7	5
NM	New Mexico	102	44	24	17
NV	Nevada	10	4	2	0
NY	New York	4	2	1	1

TABLE A2.1: FAD investigations by State, 2004–07
continued

		2004	2005	2006	2007
OH	Ohio	7	13	4	9
OK	Oklahoma	10	10	14	5
OR	Oregon	8	5	3	2
PA	Pennsylvania	9	9	5	9
PR	Puerto Rico	5	11	6	4
RI	Rhode Island	0	0	1	1
SC	South Carolina	2	4	9	5
SD	South Dakota	2	7	7	3
TN	Tennessee	23	11	46	16
TX	Texas	142	47	47	30
UT	Utah	4	144	9	7
VA	Virginia	12	15	15	7
VI	Virgin Islands	0	0	1	0
VT	Vermont	7	4	3	6
WA	Washington	14	31	9	4
WI	Wisconsin	34	11	12	8
WV	West Virginia	6	1	2	5
WY	Wyoming	6	130	29	7
Total		1,013	995	491	383

TABLE A2.2: Complaints, by species, disclosed in FAD investigations, 2006 and 2007

	Species		Number	
Complaint	**Major group**	**Minor group**	**2006**	**2007**
	Avian	Avian (birds)	5	3
		Chicken, egg-type	3	1
		Chicken, meat-type	2	0
		Poultry (chickens and turkeys)	2	2
		Pet birds	0	1
		Subtotal avian	*12*	*7*
	Bovine (cattle)		4	3
	Canine (dogs)		0	0
	Equine (e.g.,horses, donkeys, mules)		31	5
	Porcine	Feral swine	1	0
		Hogs	0	0
		Subtotal porcine	*3*	*0*
	Rabbits		0	0
	Elk		0	1
Diarrhea and discharge	Avian	Avian (birds)	4	1
		Chicken, egg-type	3	2
		Poultry (chickens and turkeys)	1	0
		Waterfowl, exhibition poultry, and gamebirds	0	0
		Gamefowl	0	0
		Turkey	0	1
		Subtotal avian	*8*	*5*
	Bovine (cattle)		2	1
	Canine (dogs)		1	0
	Ovine (sheep)		0	0
	Porcine (hogs)		0	0
	Rabbits		0	0
	Total diarrhea and discharge		*11*	*6*
Epidemic abortion	Bovine (cattle)		0	3
	Total Epidemic abortion		*0*	*3*
Hemorrhagic vessels	Bovine (cattle)		0	0
	Canine (dogs)		0	1
	Equine (e.g., horses, donkeys, mules)		0	1
	Ovine (sheep)		0	1
	Porcine (hogs)		0	0
	Rabbits		3	1
	Total hemorrhagic vessels		*3*	*3*

TABLE A2.2: Complaints, by species, disclosed in FAD investigations, 2006 and 2007
continued

Complaint	Species		Number	
	Major group	Minor group	2006	2007
	Avian	Avian (birds)	15	13
		Chicken, egg-type	18	3
		Chicken, meat-type	8	4
		Gamefowl	2	2
		Pet birds	0	1
		Poultry (chickens and turkeys)	6	8
		Turkeys	2	2
		Waterfowl, exhibition poultry, and gamebirds	7	6
		Subtotal avian	*58*	*39*
	Bison		0	1
	Bovine (cattle)		4	1
	Caprine (goats)		0	2
	Cervidae		0	1
	Deer		0	1
	Elk		0	1
	Equine (e.g., horses, donkeys, mules)		1	1
	Fish		1	2
	Ovine (sheep)		0	1
	Porcine (hogs)		3	4
	Rabbits		3	1
	Total high death rate		*70*	*55*
	Avian	Avian (birds)	1	0
		Chicken, egg-type	1	0
		Subtotal avian	*2*	*0*
	Total illegal import		*2*	*0*
	Avian	Avian (birds)	1	0
	Bovine (cattle)		0	2
	Canine (dogs)		2	9
	Caprine (goats)		1	0
	Feline (cats)		2	2
	Rabbita		0	1
	Reptiles		0	1
	Zoological	Aardvark	0	1
	Total maggots and ticks		*6*	*16*

TABLE A2.2: Complaints, by species, disclosed in FAD investigations, 2006 and 2007
continued

	Species		Number	
Complaint	**Major group**	**Minor group**	**2006**	**2007**
Positive surveillance sample	Avian	Avian (birds)	1	2
		Chicken, meat-type	1	1
		Gamefowl	0	1
		Poultry (chickens and turkeys)	1	0
		Subtotal avian	*3*	*4*
	Bovine (cattle)		1	0
	Crustacean		0	1
	Equine (e.g., horses, donkeys, mules)		2	0
	Ovine (sheep)		0	1
	Total positive surveillance		*6*	*6*
Reproductive not abortion	Avian (birds)		0	0
	Total reproductive not abortion		*0*	*1*
Respiratory	Avian	Avian (birds)	8	4
		Chicken, egg-type	11	0
		Chicken, meat-type	1	3
		Pet birds	0	1
		Poultry (chickens and turkeys)	3	4
		Turkeys	1	0
		Subtotal avian	*24*	*12*
	Bovine (cattle)		5	3
	Caprine (goats)		1	0
	Equine (e.g., horses, donkeys and mules		0	1
	Ovine (sheep)		1	1
	Porcine (hogs)		3	1
	Rabbits		2	0
	Total respiratory		*36*	*18*
Septicemia	Bovine (cattle)		0	0
	Equine (e.g., horses, donkeys, mules)		0	0
	Porcine (hogs)		0	1
	Rabbits		1	0
	Total septicemia		*1*	*1*

TABLE A2.2: Complaints, by species, disclosed in FAD investigations, 2006 and 2007
continued

	Species		Number	
Complaint	**Major group**	**Minor group**	**2006**	**2007**
Skin, other than muzzle and feet	Avian	Avian (birds)	0	0
		Chicken, egg-type	0	0
		Subtotal avian	*0*	*0*
	Alpaca		0	1
	Bison		0	1
	Bovine (cattle)		9	5
	Caprine (goats)		8	4
	Equine (e.g., horses, donkeys, mules)		12	7
	Ovine (sheep)		2	0
	Porcine (hogs)		3	1
	Total skin		*34*	*19*
Vesicular–skin of muzzle and feet	Avian	Pet birds	0	1
	Bison		1	0
	Bovine (cattle)		60	60
	Alpaca		0	2
	Caprine (goats)		20	32
	Cervidae		3	0
	Equine (e.g., horses, donkeys, mules)		204	130
	Exotics	Hedgehog	1	0
	Ovine (sheep)		11	11
	Porcine (hogs)		5	2
	Total vesicular		*305*	*238*

TABLE A2.3: Status of the occurrence of OIE[1]-reportable diseases in the United States, 2007

Disease	Status	Date of last occurrence/Notes
Multiple-species diseases		
Anthrax	Present	Sporadic/limited distribution
Aujeszky's disease	Present	Sporadic (feral, wild animals)/limited distribution, national eradication program
Brucellosis *(Brucella abortus)*	Present	Sporadic—one domestic cattle detection in 2007 (wild animals)/limited distribution/national eradication program
Brucellosis *(Brucella melitensis)*	Free	1999
Brucellosis *(Brucella suis)*	Present	Sporadic (feral transitional only)/limited distribution/national control program
Bluetongue	Present	Sporadic/limited distribution
Crimean Congo haemorrhagic fever	Free	Never occurred
Echinococcosis/Hydatidosis	?	Sporadic (uncommon in all species)/no detections reported in 2007
Foot-and-mouth disease	Free	1929
Heartwater	Free	Never occurred
Japanese encephalitis	Free	Never occurred
Leptospirosis	Present	
New World screwworm	Free	1982/animal health officials responded to an imported case in a canine in 2007
Old World screwworm	Free	Never occurred/animal health officials responded to an imported case in a canine in 2007
Paratuberculosis	Present	National control program
Q fever	Present	Sporadic
Rabies	Present	
Rift Valley fever	Free	Never occurred
Rinderpest	Free	Never occurred
Trichinellosis	Present	Sporadic (feral, wild animals)/limited distribution/national control program
Tularemia	Present	Sporadic (primarily wild animals)/limited distribution
Vesicular stomatitis	Seasonal	2006, sporadic/limited distribution/no detections reported in 2007
West Nile fever/encephalitis	Present	
Cattle diseases		
Bovine anaplasmosis	Present	
Bovine babesiosis	Present	Limited distribution (endemic in the territories of Puerto Rico and the U.S. Virgin Islands; last U.S. mainland occurence was in 1943)
Bovine genital campylobacteriosis	Present	Sporadic/limited distribution
Bovine spongiform encephalopathy	Controlled risk	No detection in 2007
Bovine tuberculosis	Present	Sporadic/limited distribution/national eradication program
Bovine viral diarrhea	Present	
Contagious bovine pleuropneumonia	Free	1892

TABLE A2.3: Status of the occurrence of OIE[1]-reportable diseases in the United States, 2007
continued

Disease	Status	Date of last occurrence/Notes
Cattle diseases, continued		
Enzootic bovine leucosis	Present	
Hemorrhagic septicemia	?	Sporadic/limited distribution (bison)/no detections reported in 2007
Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis	Present	
Lumpy skin disease	Free	Never occurred
Malignant catarrhal fever (wildebeest only)	Free	Never occurred
Theileriosis	Free	Never occurred
Trichomonosis	Present	
Trypanosomosis (tsetse-transmitted)	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 diseases	Free	Never occurred
Ovine epididymitis (*Brucella ovis*)	Present	Sporadic
Peste des petits ruminants	Free	Never occurred
Salmonellosis (*S. abortusovis*)	?	Sporadic/limited distribution/no detections reported in 2007
Scrapie	Present	National eradication program
Sheep pox and goat pox	Free	Never occurred
Equine diseases		
African horse sickness	Free	Never occurred
Contagious equine metritis	Free	2006, import associated
Dourine	Free	1934
Equine encephalomyelitis (Eastern)	Present	Sporadic/limited distribution
Equine encephalomyelitis (Western)	?	Sporadic/limited distribution/no detections reported in 2007
Equine infectious anemia	Present	Sporadic/limited distribution/national control program
Equine influenza	Present	
Equine piroplasmosis	Present	Limited distribution (limited to Puerto Rico and the U.S. Virgin Islands)
Equine rhinopneumonitis	Present	Sporadic
Equine viral arteritis	Present	Sporadic/limited distribution
Glanders	Free	1942
Surra (*Trypanosoma evansi*)	Free	Never occurred

TABLE A2.3: Status of the occurrence of OIE[1]-reportable diseases in the United States, 2007
continued

Disease	Status	Date of last occurrence/Notes
Venezuelan equine encephalomyelitis	Free	1971
Swine diseases		
African swine fever	Free	Never occurred
Classical swine fever	Free	1976
Nipah virus encephalitis	Free	Never occurred
Porcine cysticercosis	Free	2004
Porcine reproductive and respiratory syndrome	Present	
Swine vesicular disease	Free	Never occurred
Transmissible gastroenteritis	Present	
Avian diseases		
Avian chlamydiosis	Present	Sporadic (wild birds, pet birds, backyard poultry)
Avian infectious bronchitis	Present	
Avian infectious laryngotracheitis	Present	Sporadic (primarily vaccine-related)
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	Present	
Fowl typhoid	Free	1981
High-pathogenicity avian influenza	Free	2004
Infectious bursal disease (gumboro disease)	Present	
Low-pathogenic avian influenza (poultry)	Present	Sporadic (wildlife, backyard-live bird markets) (routine surveillance detected three nonclinical events in three commercial flocks in 2007)
Marek's disease	Present	
Newcastle disease (neurotropic and viscerotropic strains)	Free	2003
Pullorum disease	?	Sporadic/limited distribution (commercial production flocks are free)/no detections reported in 2007
Turkey rhinotracheitis	Present	Sporadic/limited distribution
Lagomorph diseases		
Myxomatosis	?	

TABLE A2.3: Status of the occurrence of OIE[1]-reportable diseases in the United States, 2007
continued

Disease	Status	Date of last occurrence/Notes
Rabbit hemorrhagic disease	Free	2005
Bee diseases		
Acarapisosis of honey bees	Present	
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 diseases		
Camelpox	Free	Never occurred
Leishmaniasis	?	Sporadic (canine)/limited distribution
Aquatic animal diseases		
Fish		
Epizootic hematopoietic necrosis	Free	Never occurred
Epizootic ulcerative syndrome	Free	2004 (wild species)
Gyrodactylosis *(Gyrodactylus salaris)*	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
Spring viremia of carp	Present	Sporadic (wild species)/limited distribution
Viral hemorrhagic septicemia	Present	Sporadic (wild species)/limited distribution
Molluscs		
Abalone viral mortality	Free	Never occurred
Infection with *Bonamia ostrae*	Free	2006
Infection with *Bonamia exitiosus*	Free	Never occurred
Infection with *Marteilia refringens*	Free	Never occurred
Infection with *Microcytos roughleyi*	Free	Never occurred
Infection with *Perkinsus marinus*	Present	Sporadic (wild species)/limited distribution
Infection with *Perkinsus olseni*	Present	Confirmed infection, no clinical disease

TABLE A2.3: Status of the occurrence of OIE[1]-reportable diseases in the United States, 2007
continued

Disease	Status	Date of last occurrence/Notes
Infection with *Xenchaliotis californiensis*	Free	2006
Crustaceans		
Crayfish plague (*Aphanomyces astaci*)	Free	
Infectious hypodermal and haematopoietic necrosis	Free	
Spherical baculovirosis (*Penaeus monodon*-type baculovirus)	Free	Never occurred
Taura syndrome	Present	Sporadic/limited distribution (Hawaii, routine surveillance detected one nonclinical event in 2007
Tetrahedral baculovirosis (*Baculovirus penaei*)	Free	2006
White spot disease	Present	Sporadic/limited distribution (2007-Louisiana; through expanded surveillance activitied, WSSV in crayfish considered endemic in Louisiana
Yellowhead disease	Free	2004

Sporadic = occurring only occasionally.
Limited distribution = limited geographic distribution.
? = presence of the disease suspected but not confirmed.
Free = negative occurrence of the disease.

[1]OIE stands for L'Office International des Epizooties, which changed its name to the World Organization for Animal Health.

APPENDIX 3

APPENDIX 3

Animal Health Infrastructure in the United States

Introduction

The U.S. animal health infrastructure is a complex network of activities, programs, and people. This network responds to animal health issues; scientific, economic, and political conditions pertinent to consumers; public health and food safety issues; trade interests; and, environmental, wildlife, and animal welfare concerns.

The various components of the infrastructure implement measures that promote animal health, mitigate risks, and deter hazardous activities to ensure healthy animal populations, wholesome and safe food supplies, rapid response to animal health emergencies, effective disease-control programs, efficient surveillance and reporting systems, and viable export markets. Among the key components of the infrastructure are

- Federal animal health services,
- State animal health authorities,
- Diagnostic laboratories,
- Federally accredited veterinarians,
- The United States Animal Health Association USAHA and other animal health organizations, and
- The global animal health infrastructure.

Coordination and cooperation among these organizations and facilities are essential in order to improve animal health, work toward eliminating disease risks, and limit transmission of diseases from animal to animal as well as from animals to people.

Federal Animal Health Services

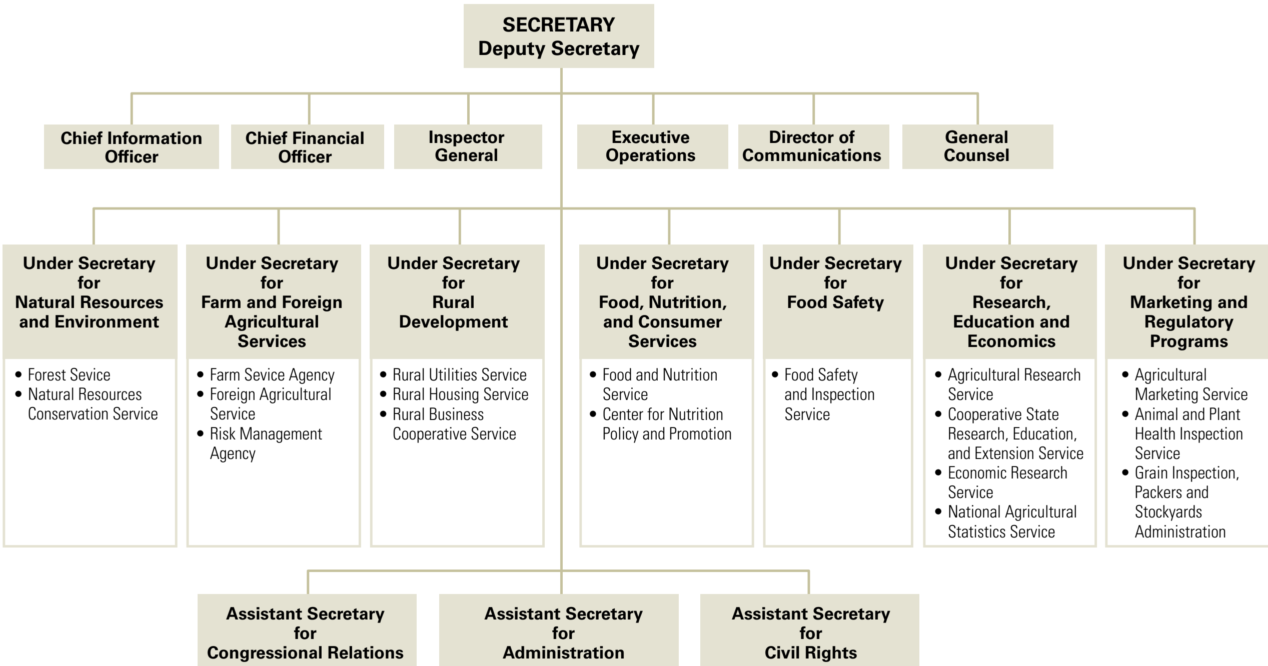
Many Federal agencies work to ensure the health of U.S. livestock; most are within the USDA (fig. A3.1). Each agency is charged with specific tasks and responsibilities, and all work to protect the health and vitality of U.S. agriculture through established rules and regulations. Within USDA, APHIS, which is part of Marketing and Regulatory Programs, plays a lead role in animal health matters through its legal authorities, national perspectives, and responsibility as the Nation's representative in international livestock issues.

Federal animal health and food safety regulations are outlined in the *U.S. Code of Federal Regulations* (CFR). The CFR, which is revised annually, codifies regulations developed by Government agencies under laws passed by Congress and signed by the President. Animal health and food safety regulations are detailed in Titles 9 and 21 of the code (9 CFR, 21 CFR).

Before adoption, proposed regulations appear for public review and comment in the *Federal Register*, which is published each business day. All proposed rules that might affect U.S. trade in livestock and animal products are also provided to the World Trade Organization (WTO) to allow for comment by foreign governments and overseas suppliers. Further, APHIS publishes Uniform Methods and Rules, which are minimum program standards for the implementation of specific animal health programs covered by regulations.

FIGURE A3.1: USDA organizational chart. APHIS falls under the Marketing and Regulatory Programs branch of the Department

Updated April 2003



Role of APHIS in U.S. Animal Health Infrastructure

APHIS consists of six program units: Animal Care (AC), Biotechnology Regulatory Services (BRS), International Services (IS), Plant Protection and Quarantine (PPQ), Veterinary Services (VS), and Wildlife Services (WS).

- AC is responsible for administering the Animal Welfare and the Horse Protection Acts and for providing leadership in establishing acceptable standards of humane animal care and handling.
- BRS assesses the agricultural and environmental safety of genetically engineered organisms and evaluates petitions to USDA to cease the regulation of specific engineered organisms. Through a permit and notification process, BRS regulates the field testing (confined release of genetically engineered organisms into the environment), interstate movement, and importation of genetically engineered organisms.
- IS provides animal and plant health experts overseas and in Washington, D.C., to enhance USDA's capacity to safeguard American agricultural health and promote agricultural trade.
- PPQ develops regulations, policies, and guidelines to safeguard agricultural and natural resources from the risks associated with the entry, establishment, or spread of plant pests and noxious weeds.
- WS provides leadership for managing wildlife damage and resolving wildlife-related conflicts involving human activities, agricultural production, and natural resource protection.
- VS plays a lead role in protecting and improving the health, quality, and marketability of U.S. livestock, animal products, and veterinary biologics by preventing, controlling, and eradicating animal diseases and monitoring and promoting animal health and productivity.

Role and Structure of VS

To perform its diverse roles in protecting animal health, VS employs more than 1,800 people with a wide range of scientific, technical, and administrative skills (table A3.1). The VS workforce includes veterinarians, animal health technicians, animal caretakers, budget analysts, biological technicians, computer specialists, economists, entomologists, epidemiologists, geographers, management analysts, microbiologists, pathologists, statisticians, spatial analysts, and administrative and animal health support professionals.

Most VS program policy and regulatory development occurs at headquarters facilities in Riverdale, Maryland, and Washington, D.C. (fig. A3.2). These offices also provide liaison with other Federal agencies, members of the executive branch, and congressional offices. VS functions are organized into three branches: Regional Operations, Emergency Management and Diagnostics, and National Animal Health Policy and Programs.

Regional Operations—Most of the VS veterinarians work as Veterinary Medical Officers in the field, where they interact with producers, respond to reports of potential FADs, and help administer regulatory programs and research projects. This VS field force is distributed nationally and administered via area offices in most of the 50 States and major ports-of-entry. VS also has employees and offices in Puerto Rico and other U.S. territories. VS disease eradication and control activities (see Chapter 3), export certification, and surveillance actions (see Chapter 2) take place primarily out of these field-office sites, which are overseen by the Eastern Regional Office in Raleigh, North Carolina, and the Western Regional Office in Fort Collins, Colorado.

Emergency Management and Diagnostics—The emergency management arm of VS comprises three groups (fig. A3.2): National Center for Animal Health Emergency Management (NCAHEM), the National Veterinary Services Laboratories (NVSL), and the Center for Veterinary Biologics (CVB). Please see Chapter 1 for information on NCAHEM and Chapter 5 for detailed information on NVSL and CVB.

TABLE A3.1: Veterinary Services permanent workforce, 2007

Occupation	Number	Percent of workforce
Veterinarians	540	29.6
Animal health technicians	318	17.4
Administrative and clerical support	426	23.4
Biological sciences	244	13.4
Information technology	102	5.6
Other	193	10.6
Total	*1,823*	*100.0*

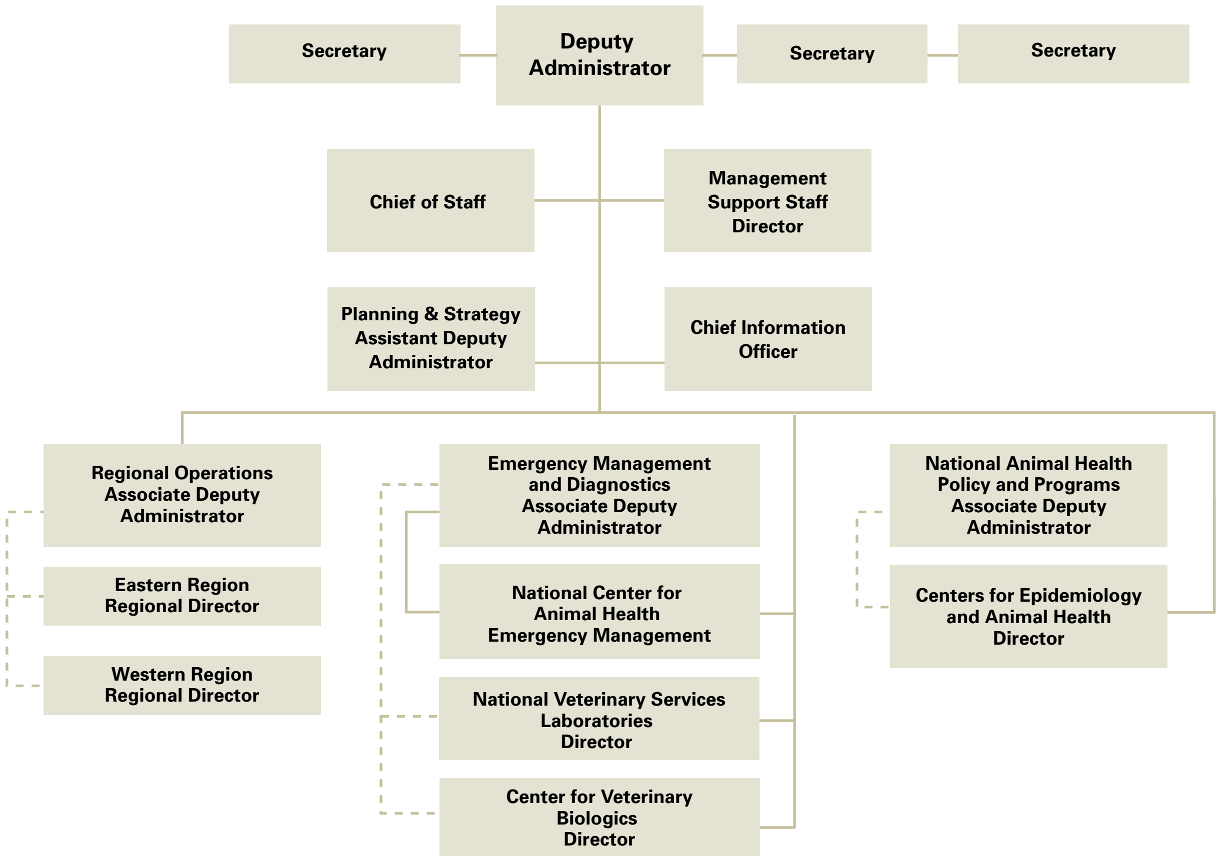
TABLE A3.2: Organization profile, USDA–APHIS Veterinary Services, 2007

Organization	Total
Office of Deputy Administrator	12
Planning and Strategy	5
Management support staff	17
Center for Veterinary Biologics	145
National Veterinary Services Laboratories	229
Emergency Management and Diagnostics	27
National Animal Health Policy and Programs	197
Centers for Epidemiology and Animal Health	135
Eastern Region	524
Western Region	532
Total permanent employees	*1,823*

National Animal Health Policy and Programs and Centers for Epidemiology and Animal Health—The third branch of the VS organization chart (fig. A3.2) consists of National Animal Health Policy and Programs (NAHPP) and the Centers for Epidemiology and Animal Health (CEAH). NAHPP initiates, leads, coordinates, and facilitates national certification and eradication programs that protect

FIGURE A3.2: Organizational chart for APHIS–VS

March 3, 2006



U.S. animal health by preventing, minimizing, or eradicating animal diseases of economic and public health concern. Some primary support functions also are administered by NAHPP, which includes five subunits: National Center for Import and Export (NCIE); National Center for Animal Health Programs (NCAHP); Information Systems; Professional Development Staff; and, Writing, Editing, and Regulatory Coordination Staff.

The NCAHP includes three subunits: Ruminant Health Programs (RHP); Aquaculture, Swine, Equine, and Poultry Health Programs (ASEPHP); and, the Surveillance and Identification Program (SIP).

RHP and ASEPHP are responsible for campaigns to eradicate scrapie in sheep and goats, bovine tuberculosis, swine pseudorabies, swine brucellosis, and bovine brucellosis (see Chapter 3 for more information). The RHP and ASEPHP also are responsible for the following disease control programs and activities:

- Johne's disease program,
- National Low-Pathogenicity Avian Influenza Program,
- Aquaculture disease programs,
- Chronic wasting disease efforts,
- Equine disease programs,
- Exotic Newcastle disease surveillance,
- Classical swine fever surveillance,
- National Poultry Improvement Plan, and
- Slaughter Horse Transport Program.

SIP helps coordinate national surveillance, animal identification, veterinary accreditation, and livestock markets.

CEAH is a collaborating center of the OIE for animal-disease information systems and risk analysis (see Chapter 9 for more information). CEAH personnel conduct epidemiologic, economic, and spatial analyses; develop technology applications; and, maintain key databases. CEAH consists of three subunits.

- The Center for Emerging Issues (CEI) assesses the impacts of foreign and domestic disease outbreaks, economic events, and natural disasters; develops surveillance approaches for emerging diseases; performs pathway assessments and domestic risk analyses; informs VS management of trends and change forces to enhance strategic planning; and, provides geographic information systems support to VS activities.
- The National Animal Health Monitoring System (NAHMS) Unit provides baseline information on health, disease, and production.
- The National Surveillance Unit coordinates national animal health surveillance.

Table A3.2 shows the distribution of permanent VS employees by organizational unit.

The VS Web site can be accessed at *http://www.aphis.usda.gov/animal_health/index.shtml*. The site provides updates on VS programs and electronic copies of various VS forms.

Other USDA Agencies Providing Animal Health Services

In addition to APHIS, the following four USDA agencies also have important roles in protecting animal health (fig. A3.1).

- The Agricultural Research Service (ARS) is the primary research agency within USDA for livestock and crop-related production issues, including animal health and food safety.
- The Cooperative State Research, Education, and Extension Service (CSREES) seeks to advance knowledge for agriculture, the environment, human health and well-being, and communities by supporting research, education, and extension programs in the Land-Grant University System and other partner organizations.
- The Food Safety and Inspection Service (FSIS) inspects all meat, poultry, and processed egg products sold in interstate commerce to ensure that they are safe, wholesome, and properly labeled. FSIS also reinspects imported meat, poultry, and processed egg products.
- The Foreign Agricultural Service (FAS) reports on outbreaks of animal diseases worldwide and on the quarantine and trade measures that countries adopt because of these outbreaks. FAS publishes Food and Agricultural Import Regulations and Standards (FAIRS) Reports, FAIRS Certificate Reports, and Sanitary and Phytosanitary Food Safety Reports that identify the entry requirements for livestock and livestock products. FAS also helps remove unfair trade barriers to U.S. products.

Other Federal Agencies Providing Animal Health Services

The USDA organizations described previously work in concert with many other Federal agencies that exercise authority and responsibility for maintaining domestic animal health. A few of these agencies are described below.

- The U.S. Department of Health and Human Services' Food and Drug Administration (FDA) oversees the manufacture, importation, and use of human and animal pharmaceuticals, including antimicrobial and anti-inflammatory drugs, and a variety of natural and synthetic compounds. FDA also regulates food labeling, food product safety (except meat, poultry, and certain egg products), livestock feed, and pet food.
- The U.S. Department of Homeland Security (DHS) has responsibility for emergencies related to animal diseases, with USDA serving as the lead coordinating agency for such emergencies.

Within DHS, Customs and Border Protection (CBP) is responsible for agricultural inspection at the Nation's borders and ports-of-entry to prevent the introduction of foreign animal and plant pests and diseases that could harm the country's agricultural resources.

- The U.S. Department of Commerce's National Marine Fisheries Service (NMFS) provides a voluntary inspection service to fisheries and aquaculture industries.

State Animal Health Authorities

Each State has animal health authorities to monitor and control diseases in its domestic livestock and poultry. States control diseases through inspections, testing, vaccinations, treatments, quarantines, and other activities. States have authority to prohibit the entry of livestock, poultry, aquaculture species, and animal products from other States if those animals or products are considered health risks to local animal populations. Consequently, each State develops its own respective domestic commerce regulations.

VS cooperates with States at markets where interstate movements may occur and helps States conduct disease surveillance programs at slaughter plants and livestock concentration points. States and VS also work together in national and State animal disease control and education programs. In addition, States maintain veterinary diagnostic laboratories, provide animal disease information to veterinary practitioners, and encourage prompt reporting of specific conditions. Also, departments of public health, colleges of veterinary medicine, and wildlife agencies within each State have important roles within each State's animal health activities.

Although States must adhere to specific requirements to participate in national programs, State-specific requirements can be developed to meet individual States' needs. Generally, State-specific requirements are more stringent than national program requirements.

In addition, States cooperate with Federal agencies to develop animal health emergency plans. States also implement producer education programs for disease management and control.

Diagnostic Laboratories

Frequently, diagnosing livestock and poultry diseases requires laboratory tests. Diagnostic laboratories diagnose endemic and exotic diseases, support disease control and reporting programs, and meet expectations of trading partners. OIE reference laboratories confirm FAD detections.

In the United States, the American Association of Veterinary Laboratory Diagnosticians (AAVLD) accredits laboratories. Accreditation is dependent on several criteria, including promoting excellence in diagnostic service, establishing internal quality control, hiring and retraining qualified staff and professional personnel, developing innovative techniques, and operating adequate facilities to conduct laboratory diagnostic services. Additionally, laboratories can become certified by VS to conduct specific tests to certify animals for movement or to participate in disease-eradication programs.

Multiple APHIS-approved laboratories serve livestock and poultry producers (see *http://www.aphis.usda.gov/vs/nvsl/Labs/labcertification.htm*). To coordinate the capabilities of Federal, State, and university laboratories, a laboratory network, called the National Animal Health Laboratory Network, has been created. Federal laboratories are described in detail in Chapter 5.

Federally Accredited Veterinarians

Private veterinary practitioners are an integral part of the U.S. veterinary infrastructure. The VS National Veterinary Accreditation Program (NVAP), a voluntary program that certifies private veterinary practitioners to work cooperatively with Federal veterinarians and State animal health officials, is described in more detail in Chapter 8.

USAHA and Other National Associations

USAHA is a science-based, nonprofit, voluntary organization with the mission of protecting animal and public health. With 1,400 members, USAHA provides a forum for communication and coordination among State and Federal governments, universities, industry, and other groups on issues of animal health and welfare, disease control, food safety, and public health. USAHA also serves as a clearinghouse for new information and methods. USAHA develops solutions to animal health issues based on science, new information and methods, and public policy risk-benefit analysis.

USAHA works to develop consensus among varied groups for changing laws, regulations, policies, and programs. Committees are formed within USAHA dedicated to specific topics and issues. USAHA provides input to, and makes requests of, VS and other Federal agencies in the form of resolutions from the committees, which are approved by membership.

Other national associations with important roles in U.S. animal health are described below.

- The National Institute for Animal Agriculture provides a forum for building consensus and advancing solutions for animal agriculture and provides continuing education and communication linkages for animal agriculture professionals. The organization is dedicated to eradicating diseases that pose a risk to the health of animals, wildlife, and humans; promoting a safe and wholesome food supply for the United States and trading partners; and, encouraging the best practices in environmental stewardship, animal health, and well being.
- The American Veterinary Medical Association (AVMA) seeks to improve animal and human health and advance veterinary medicine and its role in public health, biological science, and agriculture. Representing more than 76,000 veterinarians working in private and corporate practice, government, industry, academia, and uniformed services, the not-for-profit AMVA serves as an advocate for the veterinary profession by presenting views to government, academia, agriculture, and other concerned publics.
- The AAVLD works to establish uniform diagnostic techniques; improve existing techniques and develop new ones; coordinate diagnostic activities of regulatory, research, and service laboratories; and disseminate information about the diagnosis of animal diseases. The AAVLD also acts as a consultant to the USAHA on uniform diagnostic criteria involved in regulatory animal disease programs.
- The Animal Agriculture Coalition is an alliance of livestock, poultry, and aquaculture trade associations and the veterinary and scientific communities, all of which monitor and influence animal health, the environment, food safety, research, and education issues.
- The National Association of State Departments of Agriculture (NASDA) represents the State and U.S. Territory departments of agriculture in the development, implementation, and communication of public policy and programs related to the agriculture industry. For example, in a cooperative program with the National Agricultural Statistics Service to further collection of meaningful and objective agricultural information, NASDA employs more than 3,500 part-time statistical enumerators to collect data using both on-farm and telephone surveys with ranch and farm operators. See Chapters 4 and 6 for more information.

The Global Animal Health Infrastructure

The United States is a signatory country to the WTO and is obligated to comply with the WTO's Agreement on the Application of Sanitary and Phytosanitary Standards (SPS Agreement). The SPS Agreement's main intent is to facilitate trade while recognizing the right of countries to protect the life and health of humans, other animals, and plants. To prevent the use of SPS measures as unjustified trade barriers, the SPS Agreement dictates that all protective measures must be science based and not unnecessarily restrictive.

The WTO assigned standards-setting authority to the OIE for international trade-related animal health issues, to the International Plant Protection Convention (IPPC) for plant health issues, and to the Codex Alimentarius Commission of the United Nations for food safety.

Since 1976, VS has reported to OIE data from State officials, veterinary journals, diagnostic test results, and disease surveillance programs and, since 1998, data from the National Animal Health Reporting System (NAHRS). NAHRS is a joint effort of USAHA, AAVLD, and APHIS. NAHRS assimilates data from chief State animal health officials regarding the presence of confirmed OIE-reportable diseases in specific commercial livestock, poultry, and aquaculture species in the United States. (See Chapter 4 for more information on NAHRS.) This information is used by the United States and other OIE member countries to

- Improve livestock and public health strategies,
- Prioritize animal health programs and research activities,
- Strengthen border security,
- Provide a basis for trade negotiations, and
- Certify point-of-origin health status of exported animals, poultry, and related products.

USDA agencies (including APHIS, FAS, and FSIS) regularly send representatives to negotiate animal health and food safety issues in bilateral, regional (such as the North America Free Trade Agreement), and multilateral forums, including the WTO. These representatives also work in dozens of specialized animal health and food safety committees under the OIE, IPPC, and Codex Alimentarius. Working together, U.S. specialists promote sound science, transparent rulemaking, and effective monitoring to reduce the risk of exposure to animal disease, while at the same time promoting fair and safe trade.

APPENDIX 4

APPENDIX 4

Animal Health Contacts in the United States

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APPENDIX 5

APPENDIX 5

Key U.S. Animal Health Web Sites

Agricultural Marketing Service (USDA)
http://www.ams.usda.gov

Agricultural Research Service (USDA)
http://www.ars.usda.gov

American Association of Bovine Practitioners
http://www.aabp.org

American Association of Equine Practitioners
http://www.aaep.org

American Association of Swine Veterinarians
http://www.aasp.org

American Sheep Industry Association
http://www.sheepusa.org

American Veterinary Medical Association
http://www.avma.org

Animal and Plant Health Inspection Service (USDA)
http://www.aphis.usda.gov

Animal Welfare (USDA–APHIS)
http://www.aphis.usda.gov/animal_welfare

Centers for Disease Control and Prevention (U.S. Department of Health and Human Services)
http://www.cdc.gov

Centers for Epidemiology and Animal Health (USDA)
http://www.aphis.usda.gov/vs/ceah

Center for Veterinary Biologics (USDA–APHIS)
http://www.aphis.usda.gov/animal_health/vet_biologics

Code of Federal Regulations
http://www.gpoaccess.gov/cfr

Commodity Credit Corporation (USDA)
http://www.fsa.usda.gov/ccc

Economic Research Service (USDA)
http://www.ers.usda.gov

Environmental Protection Agency
http://www.epa.gov

Exotic Wildlife Association
http://www.exoticwildlifeassociation.com

Federal Emergency Management Agency (DHS)
http://www.fema.gov

Federal Register
http://www.archives.gov/federal_register

Food Animal Residue Avoidance Databank
http://www.farad.org

Food Safety and Inspection Service (USDA)
http://www.fsis.usda.gov

Foreign Agricultural Service (USDA)
http://www.fas.usda.gov

Grain Inspection, Packers and Stockyards Administration (USDA)
http://www.gipsa.usda.gov

International Organization for Standardization
http://www.iso.org/iso/home.htm

International Services Program (USDA–APHIS)
http://www.aphis.usda.gov/international_safeguarding

National Agricultural Statistics Service (USDA)
http://www.nass.usda.gov

National Animal Health Emergency Management System (USDA–APHIS))
http://emrs.aphis.usda.gov/nahems.html

National Aquaculture Association
http://www.nationalaquaculture.org

National Association of State Departments of Agriculture
http://www.nasda.org

National Cattlemen's Beef Association
http://www.beef.org

National Center for Animal Health Surveillance (USDA–APHIS)
http://www.aphis.usda.gov/vs/ceah/ncahs

National Center for Import and Export (USDA–APHIS)
http://www.aphis.usda.gov/vs/ncie

National Marine Fisheries Service (National Oceanic and Atmospheric Administration)
http://www.nmfs.noaa.gov

National Pork Board
http://www.pork.org

National Pork Producers Council
http://www.nppc.org

National Poultry Improvement Plan
http://www.aphis.usda.gov/animal_health/animal_dis_spec/poultry

National Veterinary Services Laboratories (USDA–APHIS)
http://www.aphis.usda.gov/animal_health/lab_info_services

North American Deer Farmers Association
http://www.nadefa.org

North American Elk Breeders Association
http://www.naelk.org

Plant Health (USDA–APHIS)
http://www.aphis.usda.gov/plant_health

United States Animal Health Association
http://www.usaha.org

U.S. Department of Agriculture
http://www.usda.gov

U.S. Department of Defense
http://www.defenselink.mil

U.S. Department of Health and Human Services
http://www.hhs.gov

U.S. Department of Homeland Security
http://www.dhs.gov/dhspublic

U.S. Fish and Wildlife Service
http://www.fws.gov

U.S. Food and Drug Administration
http://www.fda.gov

U.S. Registered Holsteins
http://www.holsteinusa.com

Veterinary Services (USDA–APHIS)
http://www.aphis.usda.gov/animal_health

Wildlife Services (USDA–APHIS)
http://www.aphis.usda.gov/wildlife_damage

World Organization for Animal Health
http://www.oie.int

World Trade Organization
http://www.wto.org

APPENDIX 6

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Acronyms and Abbreviations

AHE	Animal health emergency
AHSM	Animal Health and Surveillance Management
AI	Avian influenza
AMA	American Medical Association
AMS	Agricultural Marketing Service
APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
AVMA	American Veterinary Medical Association
BMST	Brucellosis milk surveillance test
BQFS	Bison Quarantine Feasibility Study
BSE	Bovine spongiform encephalopathy
BTV	Bluetongue virus
BVD	Bovine viral diarrhea
BVDV	Bovine viral diarrhea virus
CDC	Centers for Disease Control and Prevention
CEAH	Centers for Epidemiology and Animal Health
CEI	Center for Emerging Issues
CHAPA	Cow/Calf Health and Productivity Audit
CNS	Central nervous system
CSF	Classical swine fever
CSREES	Cooperative State Research, Education, and Extension Service
CVB	Center for Veterinary Biologics
CWD	Chronic wasting disease
DBL	Diagnostic Bacteriology Laboratory
DHS	U.S. Department of Homeland Security
DOI	U.S. Department of the Interior
DVL	Diagnostic Virology Laboratory
EHD	Epizootic hemorrhagic disease
EHDV-2	Epizootic hemorrhagic disease virus-2
EHM	Equine herpesvirus myeloencephalopathy
EHV-1	Equine herpesvirus type 1
EIA	Equine infectious anemia
EMLC	Emergency Management Leadership Council

EMRS	Emergency Management Response System
END	Exotic Newcastle disease
FAD	Foreign animal disease
FADDL	Foreign Animal Disease Diagnostic Laboratory
FAO	Food and Aquaculture Organization
FDA	Food and Drug Administration
FERN	Food Emergency Response Network
FMD	Foot-and-mouth disease
FPD	Foreign poultry disease
FSIS	Food Safety and Inspection Service
FWS	U.S. Fish and Wildlife Service
GYA	Greater Yellowstone area
HHS	U.S. Department of Health and Human Services
HPAI	Highly pathogenic avian influenza
HSPD-9	Homeland Security Presidential Directive-9
IBMP	Interagency Bison Management Plan
IC	Inspection and Compliance
ICS	Incident Command System
ISO	International Organization for Standardization
IT	Information technology
ITRCB	International Technical and Regulatory Capacity Building
IWGCZDS	Interagency Working Group for the Coordination of Zoonotic Disease Surveillance
JSA	Joint Subcommittee on Aquaculture
LBMS	Live-bird marketing system
LPAI	Low-pathogenicity avian influenza
LPNAI	Low-pathogenicity notifiable avian influenza
LRN	Laboratory Response Network
MAP	*Mycobacterium avium paratuberculosis*
MCI	Market Cattle Identification
MIM	Mobile information management
NAADSM	North American Animal Disease Spread Model
NAAHP	National Aquatic Animal Health Plan
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
NAI	Notifiable avian influenza

NAIS	National Animal Identification System
NASS	National Agricultural Statistics Service
NCAHEM	National Center for Animal Health Emergency Management
NCC	National Chicken Council
NDHEP	National Dairy Heifer Evaluation Project
NPIP	National Poultry Improvement Plan
NSU	National Surveillance Unit
NVAP	National Veterinary Accreditation Program
NVS	National Veterinary Stockpile
NVSL	National Veterinary Services Laboratories
NWRC	National Wildlife Resource Center
OIE	World Organization for Animal Health
OPIS	Offshore Pest Information System
PAMT	Pathways assessment modeling tool
PEL	Policy, Evaluation, and Licensing
PL	Pathobiology Laboratory
PPE	Personal protective equipment
PRV	Pseudorabies virus
RSSS	Regulatory Scrapie Slaughter Surveillance
rRT–PCR	Real-time reverse transcriptase polymerase chain reaction
SFCP	Scrapie Flock Certification Program
SIV	Swine influenza virus
TB	Tuberculosis
TBT	Tropical bont tick
TSE	Transmissible spongiform encephalopathy
UM&R	Uniform methods and rules
USAHA	United States Animal Health Association
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USTCP	U.S. Trichinae Certification Program
USVI	U.S. Virgin Islands
VBJDCP	Voluntary Bovine Johne's Disease Control Program
VHS	Viral hemorrhagic septicemia
VHSV	Viral hemorrhagic septicemia virus
VICH	International Cooperation on Harmonization of Technical Requirements for Registration of Veterinary Medicinal Products
VS	Veterinary Services; vesicular stomatitis

VSLS	Veterinary Services laboratory submission
VSPS	Veterinary Services process streamlining
VSTA	Virus Serum Toxin Act
VSV	Vesicular stomatitis virus
WHO	World Health Organization
WS	Wildlife Services

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