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

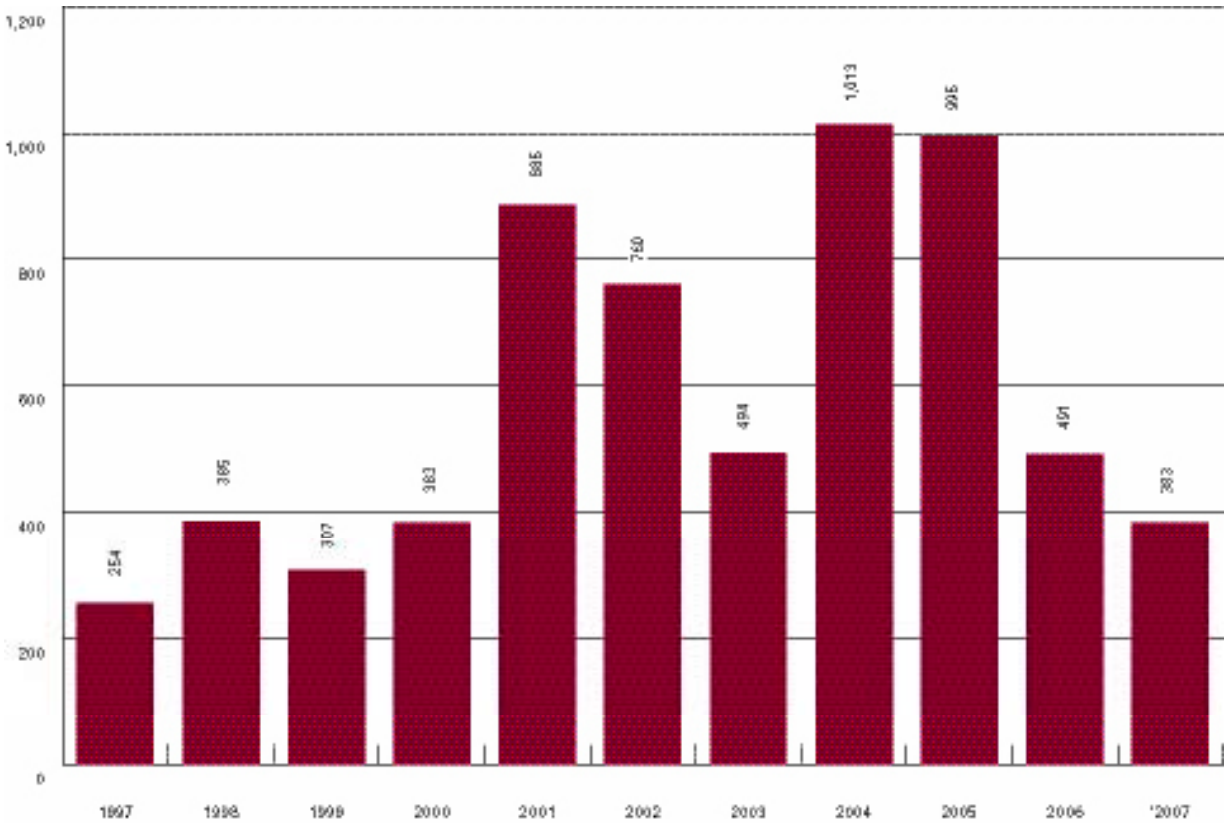
While hundreds of FAD investigations occur annually, only a small number require an active, sustained response. Often, the suspect animal(s) can easily be confined until a diagnostic laboratory test result is available. This was not the case with an investigation that occurred in June 2007. In this instance, 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

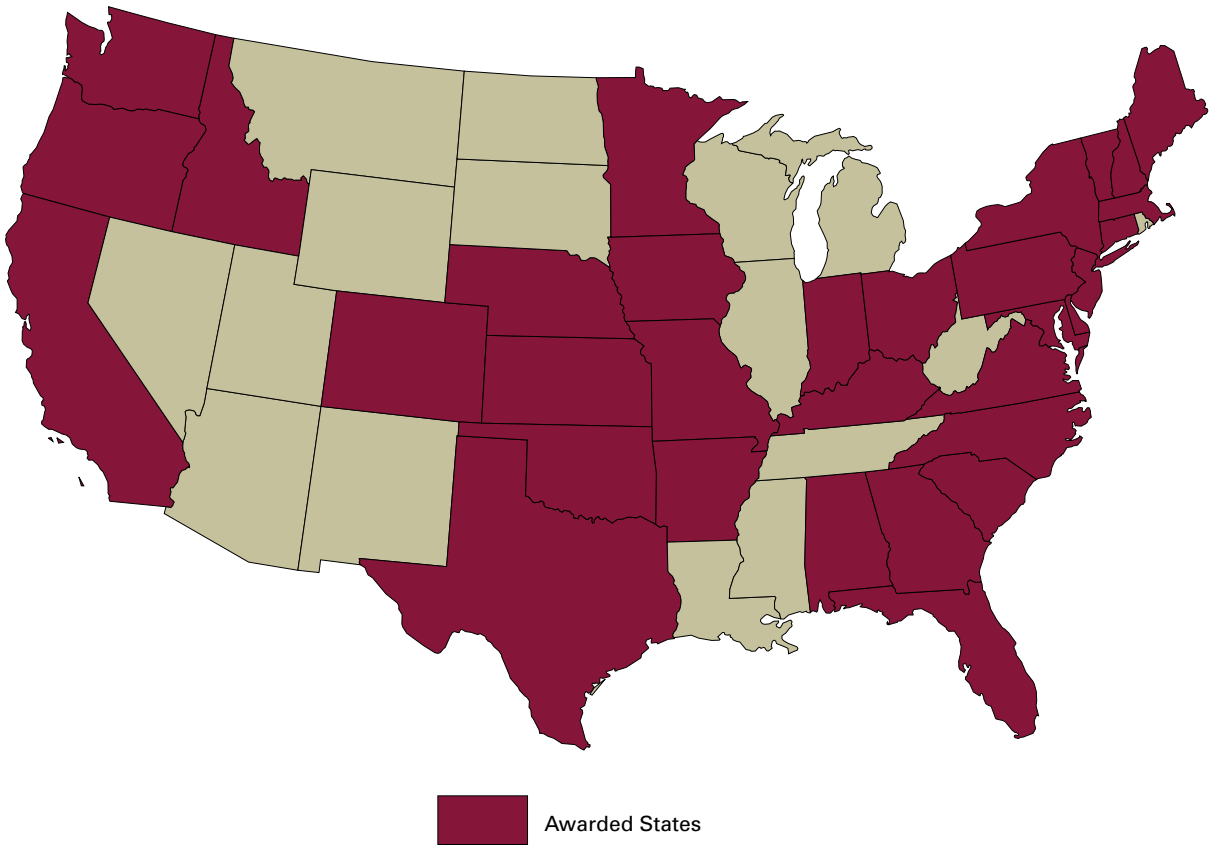


TABLE 2.2 CSF testing for FY 2007

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.

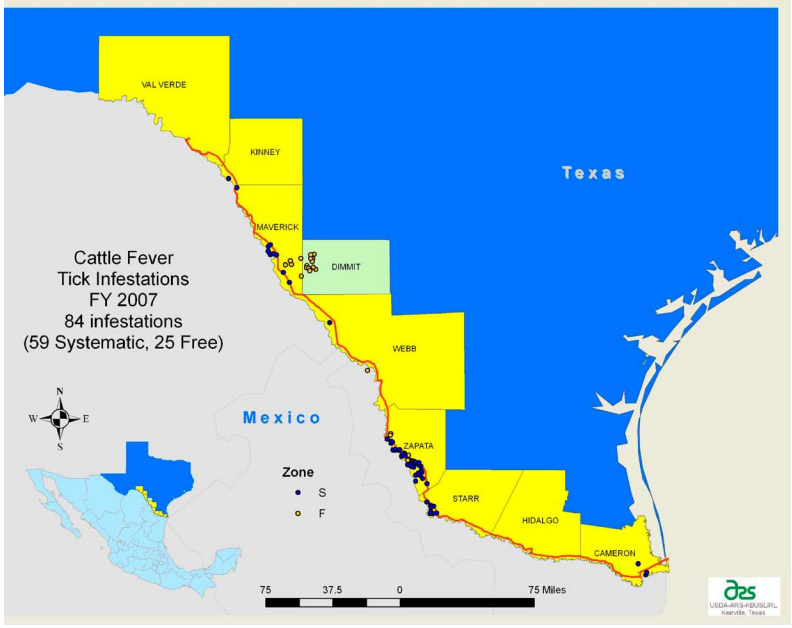
Sixty-one mounted inspectors patrol the Rio Grande along the Mexican border, conducting range inspections of premises within the quarantine zone and apprehending stray and smuggled livestock from Mexico. Program personnel also inspect and treat livestock on premises found to be infested with fever ticks, 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.

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 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.

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).