

■ Animal and Plant Health Inspection Service: Protecting Agricultural Health and Productivity

Why are the farmers and ranchers of the United States able to produce so much food for the tables of America's consumers? One key to our plentiful food supply is our healthy crops and livestock.

And this is no accident. America's agricultural health is a result of a team effort—good husbandry by farmers and ranchers plus an organized effort to control and eradicate pests and disease and to prevent the entry of devastating foreign plagues.

Pests and diseases—just like frosts, floods, and droughts— can wreak havoc on agricultural productivity, depressing farm incomes and driving up food costs for consumers in the process. Nobody can prevent weather-related disasters, but USDA can and does play a vital role in protecting our country's agricultural health. The result is a more abundant, higher quality, and cheaper food supply than is found anywhere else in the world.

With the advent of free trade initiatives, a global network of countries has agreed that valid agricultural health concerns—not politics, not economics—are the only acceptable basis for trade restrictions. In this environment, our country's agricultural health infrastructure will be our farmers' greatest ally in seeking new export markets.

Excluding Foreign Pests and Diseases

Agricultural Quarantine Inspection

Agriculture, America's biggest industry and its largest employer, is under constant threat of attack. The enemies are countless and often microscopic, and they gain access to our country in surprising ways. Their potential allies are every traveler entering the United States and every American business importing agricultural products from other countries.

Many passengers entering the United States don't realize that one piece of fruit packed in a suitcase has the potential to cause millions of dollars in damage to U.S. agriculture. Forbidden fruits and vegetables can carry a whole range of plant diseases and pests. Oranges, for example, can introduce diseases like citrus canker or pests like the Mediterranean fruit fly (Medfly).

Similarly, sausages and other meat products from many countries can contain animal disease organisms that can live for many months and even survive processing. Meat scraps from abroad could end up in garbage that is fed to swine. If the meat

came from animals infected with a disease, such as African swine fever, hog cholera, or foot-and-mouth disease, it easily could be passed to domestic swine, and a serious epidemic could result.

Agricultural quarantine inspection is the first line of defense against foreign pests and diseases. Seven days a week, around 1,300 inspectors with USDA's Animal and Plant Health Inspection Service (APHIS) are on duty at international airports, seaports, and border stations to inspect passengers and baggage for plant and animal products that could be harboring pests or disease organisms. These APHIS Plant Protection and Quarantine inspectors check millions of passengers and their baggage each year for plant or animal pests and diseases that might harm U.S. agriculture. They also inspect ship cargoes, rail and truck freight, and mail from foreign countries.

The following table provides selected inspection and interception data:

Table 12-1.

<i>FY</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>
Ships inspected	53,795	52,119	53,374	47,887	53,270
Aircraft inspected	356,434	356,915	378,643	378,634	451,342
Passengers and crew inspected	54,092,706	53,999,523	58,103,711	56,920,156	62,548,979
Interceptions, plant material	1,667,201	1,527,922	1,723,004	1,474,569	1,442,214
Interceptions of pests	57,856	56,213	54,831	51,829	54,831
Interceptions, meat/poultry products	166,520	205,407	246,878	224,340	281,230
Baggage civil penalties -number	n/a	29,089	29,700	27,137	22,164
Baggage civil penalties -Amount of fines	n/a	\$1,299,270	\$1,537,590	\$1,407,000	\$1,186,310

■ From high-tech to a keen nose, APHIS uses a variety of means to exclude foreign pests and protect American agriculture. Inspectors augment visual inspection with some 75 x-ray units that help check passenger baggage and mail for prohibited agricultural materials.

They also have enlisted trained detector dogs and their keen sense of smell to help sniff out prohibited fruit and meat. On leashes and under the constant supervision of their handlers, the friendly beagles in USDA's "Beagle Brigade" have checked the baggage of passengers arriving from overseas for the past 10 years.

Currently, APHIS has 37 canine teams at 19 airports, including 18 of America's 20 busiest international airports. Dogs also are used at three post offices. In addition to their actual function, the Beagle Brigade serves as an effective symbol of the need to protect American agriculture and the Nation's food supply from foreign pests. The Beagle Brigade program was responsible for approximately 60,000 seizures of prohibited agriculture products in FY 1994.

From Tex at Houston, Sparky in Chicago, and Taffy in Los Angeles to Abbot in Miami and Jackpot in Washington, DC, the Beagle Brigade spans the United States. These five dogs provide a good sample of what our Beagle Brigade dogs are like.

Texanna (nickname—Tex) is 4 years old and stationed at Houston's Intercontinental Airport. Her favorite smell is apples and in 1994 she worked 322 flights and made 460 seizures. Her proudest moments include finding 5 pounds of olives, 21 pounds of wheat, and a large quantity of pork. Tex's hobbies are chasing a ball and playing with her colleagues, and her pet peeve is people thinking she's a boy and calling her "fella."

Sparky is 7 1/2 years old and stationed at Chicago O'Hare International Airport. Adopted from a family in Miami, he has worked for USDA since August 1988. In FY 1994, he worked 1,619 flights and made 3,150 seizures. His proudest moments are when he finds smuggled birds; one month he found 362 pounds of meat. Sparky's hobbies are running loose at the kennel and playing with fellow O'Hare beagle Phyto. His pet peeve is people trying to distract him when he's working.

At Los Angeles International airport, beagle **Taffy** is 2 years old and was trained last year at John F. Kennedy International Airport, NY. Her favorite treats are rawhide treats, and she likes looking for apples and oranges. In FY 1994, Taffy worked 688 flights and made 491 seizures. Her hobbies are playing with colleagues, especially fellow USDA detector dog Kojak, and her best trick is shaking hands.

Abbott (nickname, "The Little Prince of PPQ") is 4 years old and he works at Miami International Airport. His favorite smells are beef

and pork, and in 1994 he worked 812 flights and made 1,308 seizures. Abbott's proudest moments include finding 30 pounds of pork and a 25-pound ham; his pet peeve is that when he finds something good and smelly to roll in, he then has to have a bath. His best trick is the belly crawl.

*Finally, at Washington, DC's Dulles International Airport, **Jackpot**, 5 years old, is hard at work. He loves looking for meat, and bits of pepperoni are his favorite treat. In FY 1994 he worked 1,052 flights and made 1,463 seizures. Jackpot is proud every time he finds something. He enjoys playing hide and seek, and his best trick is pointing out a suitcase with his paw.*

Preclearance—Checking at the Source

In addition to domestic exclusion efforts, APHIS' International Services has a corps of experts stationed overseas to bolster the Nation's defenses against exotic pests and diseases. Often it is more practical and effective to check and monitor commodities for pests or diseases at the source through preclearance programs. APHIS has special arrangements with a number of countries for preclearance programs, summarized in the following table.

Country	Commodities
Australia	Apples, pears, grapes
Belgium	Bulb inspection
Brazil	Mangoes (hot water treatment)
Chile	Stonefruit, berries, grapes, cut flowers, fruits, and vegetables
Costa Rica	Papaya
Ecuador	Mangoes (hot water treatment); melons (free zone)
Great Britain	Bulb inspection
Guatemala	Mangoes (hot water treatment)
Ireland	Bulb inspection
Israel	Bulb inspection
Japan	Sand pears, Unshu oranges
Korea	Sand pears, tangerines
Mexico	Mangoes (hot water treatment)
New Zealand	Apples, pears, Nashi pears
The Netherlands	Bulb inspection
Nicaragua	Mangoes (hot water treatment)
Peru	Mangoes (hot water treatment)
South Africa	Apples, pears
Spain	Lemons, clementines, Valencia oranges
Taiwan	Mangoes (hot water treatment), litchi (vapor heat)
Turkey	Bulb inspection
Venezuela	Mangoes (hot water treatment)

International Programs

Through direct overseas contacts, APHIS employees gather and exchange information on plant and animal health; work to strengthen national, regional, and international agricultural health organizations; and cooperate in international programs against certain pests and diseases that directly threaten American agriculture. Two of the latter are the MOSCAMED program—which combats Medfly infestations in Mexico and Guatemala—and a program to eradicate screwworms, a parasitic insect of warmblooded animals. Screwworm flies lay their eggs on the edge of open wounds, and the developing larvae feed on the living flesh of the host. Left untreated, the infestation can be fatal.

Screwworms were eradicated from the United States through the use of the sterile insect technique. With this method, millions of screwworm flies are reared in captivity, sterilized, and then released over infested areas to mate with native fertile flies. Eggs produced through such matings do not hatch, and the insect literally breeds itself out of existence.

To provide further protection to U.S. livestock, starting in 1972 eradication efforts were moved southward from the U.S.-Mexico border, with the eventual goal of establishing a barrier of sterile flies across the Isthmus of Panama. To date, screwworms have been eradicated from Mexico, Guatemala, Belize, Honduras, and El Salvador. Eradication efforts continue in Nicaragua, and agreements have been signed to start programs in Costa Rica and Panama. A production plant at Tuxtla-Gutierrez in Chiapas in southern Mexico can produce up to 500 million sterile flies weekly.

APHIS also works to prevent foot-and-mouth disease from entering Mexico, Central America, and Panama and works with Colombia to eliminate this disease from the northern part of that country.

Coping with Invasions

If, despite our best efforts, foreign pests or diseases do manage to slip past our border defenses, APHIS conducts appropriate control and eradication measures. Examples include Mediterranean fruit fly eradication projects in California in the early 1990's and outbreaks of exotic Newcastle disease in pet birds in several States during the 1980's.

APHIS has a special cadre of people who deal with introductions of exotic plant pests. Known as PEPPA—for “Preparedness for Emergency Plant Pest Actions”—these teams have been mobilized on several occasions to combat costly infestations of Medflies.

Early detection of exotic animal diseases by alert livestock producers and practicing veterinarians who contact specially trained State and Federal veterinarians is the key to their quick detection and elimination. More than 300 such trained veterinarians are located throughout the United States to investigate suspected foreign diseases. Within 24 hours of diagnosis, one of four specially trained task forces in APHIS' Veterinary Services can be mobilized at the site of an outbreak to implement the measures necessary to eradicate the disease.

Import-Export Regulations

APHIS is responsible for enforcing regulations governing the import and export of plants and animals and certain agricultural products.

Import requirements depend on both the product and the country of origin. Plants and plant materials usually must be accompanied by a phytosanitary certificate issued by an official of the exporting country. Livestock and poultry must be accompanied by a health certificate, also issued by an official of the exporting country. Animal products, such as meats and hides, are restricted if they originate in countries that have a different disease status than the United States.

APHIS regulates the importation of animals that enter the country through land ports along the borders with Mexico and Canada. Imports of livestock and poultry from other countries must be quarantined at one of four animal import centers: Newburgh, NY; Miami, FL; Los Angeles, CA; and Honolulu, HI

Personally owned pet birds can enter through one of six USDA-operated bird quarantine facilities: New York, NY; Miami, FL; San Ysidro, CA; Hidalgo, TX; Los Angeles, CA; and Honolulu, HI.

Pet birds from Canada can enter without quarantine because Canada's animal disease programs and import rules are similar to those of the United States. Commercial shipments of pet birds can enter through one of 60 privately owned, APHIS-supervised quarantine facilities. A special high-security animal import center at Key West, FL, provides a safe means of importing animals from countries infected with foot-and-mouth disease.

APHIS cooperates with the U.S. Department of the Interior in carrying out provisions of the Endangered Species Act that deal with imports and exports of endangered plant, animal, and bird species. Also, at many ports, APHIS officers inspect and sample seed imported from foreign countries to ensure that it is accurately labeled and free of noxious weeds.

APHIS also maintains 14 plant introduction stations, the largest of which is at Miami, FL, for commercial importation of plant materials. Smaller stations are at Orlando, FL; San Juan, PR; JFK International Airport, Jamaica, NY; Hoboken, NJ; Houston, El Paso, and Los Indios (Brownsville), TX; Nogales, AZ.; San Diego, Los Angeles, and San Francisco, CA; Seattle, WA; and Honolulu, HI.

To facilitate agricultural exports, APHIS officials certify the health of both plants and animals that are shipped to foreign countries. APHIS assures that U.S. plants and plant products meet the plant quarantine import requirements of foreign countries. This assurance is in the form of a phytosanitary certificate, issued by APHIS or State cooperators. During FY 1994, 271,000 phytosanitary certificates were issued for exports of plants and plant products worth \$23 billion.

APHIS' Veterinary Services officials and its National Center for Import and Export provide health certification for animals and animal products designated for export. Examinations and tests—usually done by USDA-accredited veterinarians—cover both U.S. export health requirements and the frequently complex import requirements of the receiving nation. An APHIS veterinarian endorses export health certificates after all tests and other requirements have been met. Then a final examination is conducted by an APHIS veterinarian at the port of export before the livestock

or poultry leaves the country. During 1994, livestock exports increased by 30 percent over the previous year.

Domestic Plant Health Programs

In most cases, plant pest problems are handled by individual farmers, ranchers, and other property owners and their State or local governments. However, when an insect, weed, or disease poses a particularly serious threat to a major crop, the Nation's forests, or other plant resources, APHIS may join in the control work.

Most pests and weeds that are targets of APHIS' Plant Protection and Quarantine programs are not native to America. They gained entry into this country through commercial trade channels, international travelers, or other means.

When pests are new to this country, control techniques may not be available. In any case, APHIS applies interstate quarantines and takes other steps to prevent spread until effective control measures can be developed.

In many cases, foreign pests are only minor problems in their native lands because they are kept in check by native parasites, predators, and diseases. Since many of these natural enemies may not exist in the United States, one of APHIS control techniques—in cooperation with USDA's Agricultural Research Service—is the importation, rearing, and release of parasites and other biological control organisms.

Biocontrol: Nature's Way

Biological control means using predators, parasites, and pathogens to combat plant pests. Predators and parasites include insects, mites, and nematodes that naturally attack a target pest. Pathogens include bacteria, viruses, or fungi that cause diseases specifically injurious to a target pest.

Biological control was first put to broad, practical use in the United States in the 1880's. At that time, California citrus groves were being devastated by an exotic insect, the cottony-cushion scale. A USDA scout working in Australia found the vedalia beetle feeding on the scale insect. The beetle, part of the lady beetle family, was successfully introduced into California and other citrus-growing regions and has kept the scale insect from causing economic damage ever since.

To coordinate the important search for new and better biocontrol opportunities, APHIS established the National Biological Control Institute in 1989. Its mission is to promote, facilitate, and provide leadership for biological control. Its main work is to compile and release technical information and coordinate the work needed to find, identify, and augment or distribute new biological control agents.

The Institute relies on scientists from ARS and elsewhere to identify potentially useful biological control agents. These agents are carefully screened at quarantine centers before being put to use.

Various agencies have successfully cooperated on biocontrol projects. For example, several decades ago, ARS scientists found six species of stingless wasps in Europe that keep alfalfa weevils in check. In 1980, APHIS took on the job of establishing these beneficial wasps across the land. Between 1980 and 1989, APHIS and its cooperators raised and distributed about 17 million wasps, and today there are beneficial wasps within reach of virtually every alfalfa field in the country. It's esti-

mated that the benefits of the alfalfa weevil biocontrol program amount to about \$88 million per year, representing a return of about \$87 for each \$1 spent on the project.

Other APHIS biocontrol programs currently underway in cooperation with State agencies include efforts against the cereal leaf beetle, sweet potato whitefly, Russian wheat aphid, Colorado potato beetle, euonymus scale, brown citrus aphid, leafy spurge, diffuse and spotted knapweed, and common crupina. Promising biocontrol agents for other pests are being tested at APHIS biocontrol labs in Mission, TX; Niles, MI; and Bozeman, MT.

“See No Weevil” Boll Weevil Eradication

One major domestic program that APHIS coordinates is the effort to eradicate boll weevils from the United States. The boll weevil entered this country from Mexico in the late 1890’s and soon became a major pest of cotton. It has caused an estimated \$12 billion in losses to the Nation’s economy. In 1973, it was estimated that insecticides applied to control boll weevils accounted for about one-third of the total applied to agricultural crops in the United States.

The success of a 1971-73 cooperative boll weevil eradication experiment in portions of Mississippi, Louisiana, and Alabama involving Federal and State agencies and grower associations led to two additional 3-year experiments. One was an eradication trial in North Carolina and Virginia; the second was an optimum pest management trial in Mississippi.

The current boll weevil eradication effort judiciously applies pesticides based on the number of adult weevils trapped around cotton fields. The traps contain a pheromone (insect attractant) and a small amount of insecticide that kills all captured weevils. In eradication program areas, one to three traps are placed per acre and are checked weekly. Pesticides are applied only to fields that reach a predetermined number of trapped weevils. This selective use of pesticides results in fields requiring minimal pesticide applications—sometimes none—during the growing season. After several seasons, the weevils are eradicated within the defined program area, eliminating any further need to spray for this pest.

The following table shows progress in eradicating boll weevils from U.S. cotton-growing areas.

	States involved	Eradication acres	Weevil-free acres
1983	VA/NC/SC	93,090	34,425
1987	+GA/FL/AL	405,225	174,720
1994	+MS/TN/TX	615,580	1,813,420
1995 (est.)	Same	1,089,450	2,363,235

In the cooperative boll weevil eradication program, APHIS supplies equipment, technical and administrative support, and a portion of program funds. Grower assessments and/or State appropriations finance the great majority of the program—70 percent or more.

The success of the program has brought a resurgence of cotton production. Planting intentions reported by the National Cotton Council indicated more than a 13.5-percent increase in cotton acreage in 1995 compared with 1994.

Witchweed: A Success Story

Witchweed is a parasitic plant that attaches itself to the roots of crops such as corn, sorghum, sugar cane, and other members of the grass family, robbing them of water and vital nutrients. Each plant can produce up to 500,000 seeds per year, and the seeds can remain viable in the soil for up to 15 years, germinating only when they come into contact with the root of a host plant.

Witchweed was introduced into the Carolinas from Africa in the mid-1950's. When the parasite first struck, corn plants mysteriously withered and died. A student visiting from India recognized the weed and told U.S. agricultural experts what it was.

Over the course of an eradication effort that began in 1974, some 450,000 acres have been infested. The eradication program was based on surveillance to locate infested fields, quarantines to prevent spread, and a combination of herbicides and germination stimulants to actually eradicate the weed.

At the beginning of FY 1995, with fewer than 28,000 infested acres remaining, APHIS turned operation of the program over to North Carolina to complete eradication there, but continues to help finish the eradication effort in South Carolina.

Grasshoppers and IPM

APHIS was the lead agency in a cooperative Integrated Pest Management (IPM) initiative for grasshopper control in the Western United States. This IPM project, which began in 1987 and closed down in 1994, was aimed at finding better and more acceptable ways of preventing grasshopper damage, while protecting the environment. Activities included developing means to predict and manage grasshopper outbreaks, developing biological control alternatives that minimize the use of chemicals, and integrating proven control techniques into guidelines for APHIS rangeland grasshopper programs.

Other domestic Plant Protection and Quarantine programs include a quarantine program to prevent the artificial spread of the European gypsy moth from infested areas in the northeastern United States through movement of outdoor household goods and other articles, quarantines to prevent the spread of imported fire ants through movement of plant nursery material from infested areas, and releasing irradiated sterile pink bollworm moths to keep this insect out of cotton in California's San Joaquin Valley.

Domestic Animal Health Programs

Protecting the health of the Nation's livestock and poultry industries is the responsibility of APHIS' Veterinary Services.

Veterinary medical officers and animal health technicians work with their counterparts in the States and with livestock producers to carry out cooperative programs to control and eradicate certain animal diseases. The decision to begin a nationwide campaign against a domestic animal disease is based on a number of factors, the most important of which is: "Are producers and the livestock industry a leading force in the campaign?"

This organized effort against livestock diseases began in 1884 when Congress created a special agency within USDA to combat bovine pleuropneumonia—a dreaded cattle disease that was crippling exports as well as taking a heavy toll on domestic cattle. Within 8 years, contagious bovine pleuropneumonia had been eradicated, and this campaign set the pattern for subsequent animal disease control and eradication programs.

To date, 13 serious livestock and poultry diseases have been eradicated from the United States. They are:

Table 12-2.
Diseases eradicated from the United States

<i>Year</i>	<i>Disease</i>
1892	Contagious bovine pleuropneumonia
1929	Foot-and-mouth disease
1929	Fowl plague
1934	Glanders
1942	Dourine
1943	Texas cattle fever
1959	Vesicular exanthema (VE)
1959 & 66	Screwworms (Southeast & Southwest)
1971	Venezuelan equine encephalitis
1973	Sheep scabies
1974	Exotic Newcastle disease
1978	Hog cholera
1985	Lethal avian influenza

Current disease eradication programs include cooperative State-Federal efforts directed at cattle and swine brucellosis, bovine tuberculosis, and pseudorabies in swine (see table).

Table 12-3.

Status of States in cattle and swine brucellosis, bovine tuberculosis, and pseudorabies in swine

State	Cattle Brucellosis*	Swine Brucellosis**	TB***	Cattle Pseudorabies****
AL	Class A	Stage 2	Free	Stage 3
AK	Free	Free	Free	Free
AZ	Free	Free	Free	Stage 3
AR	Class A	Stage 2	Free	Stage 3
CA	Class A	Free	M-A	Stage 3
CO	Free	Free	Free	Stage 4
DE	Free	Free	Free	Stage 4
FL	Class A	Stage 1	Free	Stage 2
GA	Class A	Stage 2	Free	Stage 3
HI	Free	Free	Free	Stage 3
IL	Free	Free	Free	Stage 2
IN	Free	Free	Free	Stage 2/3
IA	Class A	Free	Free	Stage 2
KS	Class A	Free	M-A	Stage 2
KY	Class A	Free	Free	Stage 3
LA	Class A	Stage 2	Free	Stage 3
ME	Free	Free	Free	Free
MD	Free	Free	Free	Stage 3
MA	Free	Free	Free	Stage 3
MI	Free	Free	Free	Stage 2/3
MN	Free	Free	Free	Stage 2/3
MS	Class A	Free	Free	Free
MO	Class A	Free	Free	Stage 3
MT	Free	Free	Free	Free
NE	Class A	Free	Free	Stage 2/3
NV	Free	Free	Free	Free
NH	Free	Free	Free	Stage 3
NJ	Free	Free	Free	Stage 3
NM	Class A	Free	M-A	Free
NY	Free	Free	Free	Free
NC	Free	Free	M-A	Stage 2/3
ND	Free	Free	Free	Free
OH	Free	Free	Free	Stage 3
OK	Class A	Stage 2	M-A	Stage 3
OR	Free	Free	Free	Free
PA	Free	Free	M-A	Stage 2
PR	Free	Free	M-A	Stage 2
RI	Free	Free	Free	Stage 2
SC	Free	Stage 1	Free	Stage 4
SD	Class A	Free	Free	Stage 3
TN	Class A	Free	Free	Stage 3
TX	Class A	Stage 2	M-A	Stage 3

Table 12-3 continued.

Status of States in cattle and swine brucellosis, bovine tuberculosis, and pseudorabies in swine

State	Cattle Brucellosis*	Swine Brucellosis**	TB***	Cattle Pseudorabies****
UT	Free	Free	Free	Free
VT	Free	Free	Free	Stage 4
VI	Free	Free	Free	Stage 2
VA	Free	Free	M-A	Stage 4
WA	Free	Free	Free	Free
WV	Free	Free	Free	Stage 3
WI	Free	Free	Free	Stage 3/4
WY	Free	Free	Free	Free

* Class A (less than .25 percent herd infection rate) or Class Free

** Stage 1, 2 or Free

*** Modified Accredited (M-A) or Accredited Free (Free)

**** Stage 1, 2, 3, 4 or Free

Disease control and eradication measures include quarantines to stop the movement of possibly infected or exposed animals, testing and examination to detect infection, destruction of infected (and sometimes exposed) animals to prevent further disease spread, treatment to eliminate parasites, vaccination in some cases, and cleaning and disinfection of contaminated premises. In addition to the programs listed above, APHIS also cooperates with the States in a Voluntary Flock Certification Program to combat scrapie in sheep and goats.

APHIS animal health programs are carried out by a field force of about 250 veterinarians and 360 lay inspectors working out of area offices (usually located in State capitals). Laboratory support for these programs is supplied by APHIS' National Veterinary Services Laboratories at Ames, IA, and Plum Island, NY, which are centers of excellence in the diagnostic sciences and integral parts of APHIS' animal health programs.

Under the Virus-Serum-Toxin Act of 1913, APHIS enforces regulations to assure that animal vaccines and other veterinary biologics are safe, pure, potent, and effective. Veterinary biologics are products designed to diagnose, prevent, or treat animal diseases. They are used to protect or diagnose disease in a variety of domestic animals, including farm animals, household pets, poultry, fish, and fur bearers.

In contrast to animal medicines, drugs, or chemicals—all of which are regulated by the U.S. Food and Drug Administration—veterinary biologics are derivatives of living organisms. Unlike some pharmaceutical products, most biologics leave no chemical residues in animals. Furthermore, most disease organisms do not develop resistance to the immune response produced by a veterinary biologic.

Veterinarians and other professionals in APHIS' Biotechnology, Biologics, and Environmental Protection regulate and license all veterinary biologics as well as the facilities where they are produced. They also inspect and monitor the production of

veterinary biologics, including both genetically engineered products and products produced by conventional means. Necessary tests of veterinary biologics are conducted at the APHIS National Veterinary Services Laboratories at Ames, IA.

More than a half-century ago, there were perhaps a half a dozen animal vaccines and other biologics available to farmers. Now there are 2,144 active product licenses and 116 licensed manufacturers.

Monitoring Plant and Animal Pests and Diseases

In order to combat plant pests and animal diseases, it's important to know their number and where they are located.

To monitor plant pests, APHIS' Plant Protection and Quarantine unit works with the States in a project called the Cooperative Agricultural Pest Survey, which started in 1982 as a pilot project. Survey data on weeds, insects, plant diseases, and pests are entered into a nationwide database, the National Agricultural Pest Information System (NAPIS). This database can be accessed from anywhere in the country by persons with an authorized account.

By accessing NAPIS, users can retrieve the latest data on pests. NAPIS data can assist pest forecasting, early pest warning, quicker and more precise delimiting efforts, and better planning for plant pest eradication or control efforts. Survey data—which can reflect the absence as well as the presence of pests—also helps U.S. exports, assuring foreign countries that our commodities are free of specific pests and diseases.

There are more than a million records in the NAPIS database. Approximately 200 Federal and State agencies use NAPIS. NAPIS contains survey data files as well as text and graphics files. The data can be downloaded and analyzed with geographic information systems to provide graphic representation of information. For example, locations of pine shoot beetle detections can be shown graphically as well as where and how often surveys have been conducted for the beetle. This information is used by the State and Federal agencies regulating this pest.

Describing animal health and management in the United States is the goal of the APHIS National Animal Health Monitoring System (NAHMS). This program, which is conducted by APHIS' Veterinary Services, began in 1983.

NAHMS compiles statistics and information from existing data bases and gathers new data through short- and long-term targeted studies to present a baseline picture of animal agriculture. This information then can be used to predict trends and improve animal production efficiency and food quality. NAHMS provides statistically sound data concerning U.S. livestock and poultry diseases and disease conditions, along with their costs and associated production practices. Information from NAHMS aids a broad group of users throughout agriculture.

Baseline animal health and management data from NAHMS national studies are helping analysts identify associations between *Escherichia coli* 0157:H7 and calf management. State and National officials, industry groups, and producers applied NAHMS national study data and information NAHMS compiled from State veterinary diagnostic laboratory reports to address a 1994 outbreak of acute bovine viral diarrhea disease.

Regulating Biotechnology in Agriculture

Scientists use agricultural biotechnology with a variety of laboratory techniques, such as genetic engineering, to improve plants, animals, and micro-organisms. Recent discoveries have led to virus-resistant crops such as cucumbers, tomatoes, and potatoes; to better vaccines and diagnostic kits used for diseases of horses, chickens, and swine; and even to new and improved varieties of commercial flowers.

APHIS' role in agricultural biotechnology is to manage and oversee regulations to ensure the safe and rapid development of the products of biotechnology. Applicants under APHIS' effective regulations and practical guidelines can safely test genetically engineered organisms and products—outside of the physical containment of the laboratory.

APHIS officials issue permits or acknowledge notification for the importation, interstate movement, or field testing of genetically engineered plants and microorganisms that are or may be plant pests.

Since 1987, APHIS has issued 1,287 interstate movement permits, 308 importation movement permits, 79 courtesy (nonregulated article) permits, and 585 release permits. Under a notification system begun in May 1993, 660 release/interstate movement, 531 movement, and 133 importation notifications have been acknowledged respectively. To date, with more than 1,700 field tests at more than 6,500 sites, no environmental problems have resulted from field tests of any of these organisms.

These biotechnology regulations also provide for an exemption process once it has been established that a genetically engineered product is safe and no longer needs to be regulated. Under this process, companies can petition APHIS for a determination of nonregulated status for specific genetically engineered products.

To date, there are eight genetically engineered plant lines that have been proven safe and no longer need to be regulated by APHIS. They are:

Year	Company	Plant/enhanced trait
1995	Ciba Seeds	An insect-resistant corn line
1995	Monsanto Co.	Russet Burbank potato lines resistant to Colorado potato beetles
1995	DNA Plant Technology Corp.	Delayed-ripening tomato line 1345-4
1994	Asgrow Seed Co. (Upjohn)	ZW-20 yellow crookneck squash resistant to certain mosaic virus diseases
1994	Calgene, Inc.	Laurate-producing canola lines
1994	Monsanto Co.	Soybeans tolerant of the herbicide glyphosate
1994	Calgene, Inc.	Cotton tolerant of the herbicide bromoxynil
1992	Calgene, Inc.	Flavr-Savr tomato (delayed ripening)

APHIS also regulates the licensing and production of genetically engineered vaccines and other veterinary biologics. These products range from diagnostic kits for feline leukemia virus to genetically engineered vaccines to prevent pseudorabies, a serious disease affecting swine. With the pseudorabies vaccines, tests kits have been developed to distinguish between infected animals and those vaccinated with genetically engineered vaccines.

Since the first vaccine was licensed in 1979, a total of 49 genetically engineered biologics have been licensed; all but 8 are still being produced.

Controlling Wildlife Damage

The mission of APHIS' Animal Damage Control program is to provide Federal leadership in managing problems caused by wildlife. Wildlife is a significant public resource that Americans greatly value. But by its very nature, wildlife also can damage agricultural and industrial resources, pose risks to human health and safety, and affect other natural resources. APHIS helps solve problems that occur when human activity and wildlife are in conflict with one another. In doing so, APHIS attempts to develop and use wildlife management strategies that are biologically, environmentally, and socially sound.

The need for effective and environmentally sound wildlife damage management is rising dramatically. One reason is that increasing suburban development intrudes upon traditional wildlife habitats. Also, population explosions of some adaptable wildlife species, such as coyotes and deer, pose increasing risks to human activities. However, advances in science and technology are providing alternative methods for solving wildlife problems.

APHIS' Denver Wildlife Research Center is the world's only research facility devoted entirely to developing methods for managing wildlife damage. Established in the 1920's, this facility has an integrated, multidisciplinary research program that is uniquely suited to provide scientific information and solutions to wildlife damage problems.

Here are a few examples of its current projects:

- Developing chemosensory repellants and attractants for birds and mammals,
- Finding methods to reduce threats to human safety when birds collide with airplanes,
- Finding ways to control the brown tree snake in Guam,
- Engineering an immunocontraceptive vaccine and delivery system to help resolve problems caused by wildlife overpopulation,
- Reducing bird damage to fish hatcheries and cereal crops,
- Studying coyote biology and behavior to develop techniques for protecting livestock from these predators, and
- Looking at ways to solve wildlife problems in urban areas, such as deer in backyards, raccoons in gardens, squirrels in attics, and geese on golf courses.

More than half of U.S. farmers experience economic loss from animal damage. In 1990, sheep and goat producers lost an estimated \$27.4 million due to predation. In 1991, cattle producers' losses to predators were worth \$41.5 million. Coyotes

alone caused \$13.5 million in sheep losses, \$5.6 million in goat losses, and \$24.3 million in cattle losses nationwide.

Additionally, beavers in the Southeastern United States cause an estimated \$100 million in damage each year to public and private property, while Mississippi catfish farmers lose nearly \$6 million worth of fingerlings to fish-eating birds. During 1 year

- *APHIS deals with a wide variety of problems, ranging from coyote attacks on lambs to protecting endangered species from predation by other wildlife. Animal Damage Control efforts include these:*
 - *A farmer in Washington requested assistance after thousands of Canada geese congregated on his 43-acre field of carrots and began eating his crop, which had a potential market value of more than \$7,000 an acre. Noise-making devices and other scare tactics recommended by APHIS were successful in frightening the geese and keeping them out of his field.*
 - *A mountain lion that killed a dog and attacked another dog and a mule in Colorado was captured by an APHIS specialist and officials from the Colorado Division of Wildlife. The lion was released unharmed in a remote site about 165 miles from the community where the attacks occurred.*
 - *In 1991, a plane carrying 350 passengers aborted takeoff at JFK International Airport after gulls were drawn into one of its engines. Although no one was seriously injured, the aircraft lost its brakes and 10 tires in the accident. Between 1988 and 1990, there were an average of 170 bird strikes against airplanes per year at this airport. After APHIS became involved in managing bird populations at the airport in 1990, laughing gull strikes were reduced by 66 percent in 1991, and by 89 percent in 1992 compared with the previous 2-year period.*
 - *Livestock guarding dogs, predator-proof fencing, and the "Electronic Guard" (a device developed by APHIS that combines a flashing strobe light and a siren to scare coyotes) are examples of nonlethal ways to minimize damage from predators.*
 - *ADC helps protect many threatened or endangered species from predation, including the California least tern and lightfooted clapper rail, the San Joaquin kit fox, the Aleutian Canada goose, the Louisiana pearlshell (mussel), and two species of endangered sea turtles.*
 - *In 1995, APHIS cooperated with Texas officials to help combat a rabies epidemic in the southern part of that State. Coyote baits laced with a genetically engineered rabies vaccine approved by APHIS for use in the project were dropped over a 14,400-square-mile area stretching from Maverick County, at the Mexican border, to Calhoun County, on the Gulf Coast. The goal of the project is to create a buffer zone of immunized coyotes to help prevent the further spread of canine rabies across Texas into more heavily populated areas.*

in Pennsylvania, white-tailed deer caused crop losses totalling \$30 million. Overall bird populations cause an estimated annual loss to U.S. agriculture of \$100 million. In total, the annual dollar loss to agriculture in the United States from wildlife exceeds \$500 million.

Humane Care of Animals

A number of local, State, and Federal laws deal with the humane treatment and care of animals.

An important Federal law in this area is the Animal Welfare Act, which regulates the care and treatment of animals that are used for research or exhibition or are sold as pets at the wholesale level. This Act, which APHIS administers, does not cover retail pet stores. The Act also specifically excludes animals raised for food or fiber (including fur-bearing animals).

USDA has long had a concern for the health and well-being of animals. The first Federal humane law, which mandated feed and water for farm animals being transported by barge or rail, was passed in 1873. In 1966, responding to complaints about suffering and neglected dogs and cats supplied to research institutions and focusing on the problem of “petnapping,” Congress passed the Laboratory Animal Welfare Act.

Four years later, a much more comprehensive piece of legislation—the Animal Welfare Act—was enacted. This law expanded coverage to most other warmblooded animals used in research, animals in zoos and circuses, marine mammals in sea life shows and exhibits, and animals sold in the wholesale pet trade. The law does not cover retail pet shops, game ranches, livestock shows, rodeos, State or county fairs, or dog and cat shows.

The Animal Welfare Act has been amended three times. A 1976 amendment extended the scope of the Act to include care and treatment while animals are being transported via common carriers. It also outlawed animal fighting ventures, such as dog or cock fights, unless specifically allowed by State law.

A 1985 amendment focused on research animals. It called for establishment of special committees at every research facility to oversee animal use and for regulations to provide for exercise of dogs and the psychological well-being of nonhuman primates.

In 1993, the act was further amended to help prevent the use of lost and stolen pets in research by giving pet owners more time to find their pets and by requiring more documentation from dealers who sell animals to researchers. Under the newest regulations, pounds and animal shelters must hold dogs and cats for at least 5 days, including a Saturday, before releasing them to dealers.

The following table shows some animal welfare statistics for FY 1994.

Table 12-4.

Animal welfare accomplishments, FY 1994:

Animals used in research:	1,618,194
Registered research facilities:	1,380
Licensed animal dealers:	4,238
Licensed and registered exhibitors:	1,896
Compliance inspections:	14,778

Regulatory Enforcement and Animal Care officials in APHIS enforce the Animal Welfare Act through a system of licensing and registering regulated businesses. Inspectors check to make sure that licensees and registrants are complying with the standards for proper care and handling of animals covered by the Act.

If violations are noted, inspectors set deadlines for correcting the situation. In extreme situations, APHIS can seize and take custody of animals whose safety is in imminent danger. If the problem isn't corrected, the person responsible may be charged with a violation and prosecuted through civil procedures. Penalties include fines, suspension or revocation of licenses, and cease-and-desist orders to prevent future violations. The table below summarizes penalties over the past 3 fiscal years.

Table 12-5.

Animal welfare sanctions imposed, FY 1992-94

	1992	1993	1994
Fines imposed	\$286,450	\$165,250	\$345,900
License revocations,suspensions, and refusals	20	13	23

Here are some examples of APHIS enforcement actions in 1994:

- A commercial airline was fined \$60,000 for inhumane transportation of dogs when 32 puppies died because of faulty ventilation on a flight from St. Louis to Salt Lake City.
- A Mississippi dog dealer was fined \$5,000 and had his dealer's license revoked for failing to properly identify animals and several other violations of the Act.
- In April 1995, two Iowa dog dealers had their license permanently revoked and were fined \$200,000 for failing to maintain proper records, identify animals properly, maintain structurally sound and sanitary housing facilities, and several other violations of the Act.

APHIS also enforces the Horse Protection Act, which prohibits the cruel practice of "soring" show horses. The primary enforcement tool is inspection of horses at

shows by APHIS personnel and by “Designated Qualified Persons” who are licensed by industry organizations and certified and monitored by APHIS.