

Wildlife Services

Protecting People
Protecting Agriculture
Protecting Wildlife

Protecting People

FY 2012

Protection from Predators, Wildlife Collisions and Wildlife-Borne Diseases



Contact Information:

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www.aphis.usda.gov/wildlife_damage

Overview

Wildlife Services (WS), a program within the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, provides Federal leadership and expertise to resolve wildlife conflicts that threaten public health and safety. WS works to reduce wildlife collisions with aircraft and vehicles, and to protect the public from attacks by mountain lions, bears, and other animals. Additionally, as concerns regarding the potential for human illness caused or carried by wildlife steadily increase, preventing or minimizing the spread of wildlife-borne diseases is growing in importance in the wildlife damage management field. WS plays a major role in identifying wildlife diseases through nationwide surveillance.

Protecting People from Predators and Overabundant Populations

As a result of conservation efforts, wildlife populations are thriving across much of the United States. This has led to an increase in encounters between people and predators, including mountain lions, coyotes, and bears, sometimes with life threatening results. WS specialists are increasingly called upon to locate and capture dangerous animals that have attacked people or that are located in residential areas and campgrounds. WS has both the expertise and the equipment to respond to these threats and restore public safety. WS has trained other Federal and State agencies in how to respond to wildlife attacks on people and advice is offered to citizens on how to discourage wildlife away from populated locations. When required, WS removes wildlife that poses immediate and direct danger to human safety.

From feral swine on Texas prairies to deer on Pennsylvania mountain roads, wildlife collisions with motor vehicles pose risks to people. When requested by local authorities, WS provides assistance to limit the danger to motorists.

Overabundant and/or concentrated populations of some species represent health and safety risks to people, as well as sources of property damage. Vultures roosting on power plant walkways, flocks of gulls at public beaches, or substantial congregations of European starlings can pose safety risks or act as catalysts for diseases such as *E. coli* infection and histoplasmosis. WS recommends an integrated wildlife damage management approach to each situation depending on circumstances. For example, for Canada geese, WS recommends nest and egg treatment, habitat modification, exclusion and dispersal. WS' National Wildlife Research Center (NWRC) developed a contraceptive-type product, which reduces the hatchability of eggs. Sometimes WS recommends removal as the most effective and appropriate management technique when conducted humanely with all appropriate permits. In 2012, WS dispersed, or scattered, more than 18 million animals, over 5 times more than it removed.

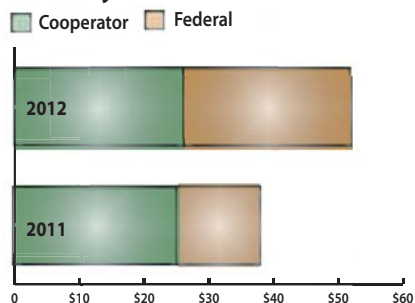
Protecting Air Passengers

Wildlife collisions with aircraft cost U.S. civil and military aviation more than \$700 million annually and pose a serious safety hazard. Nearly 10,000 wildlife collisions with civil aircraft were reported in FY 2012, with nearly 6,000 strikes reported by military aviation.

Increased air traffic, urban sprawl, enhanced noise suppression on aircraft, and more concentrated populations of birds and other wildlife at or near airports contribute to wildlife strikes.

These incidents are cataloged in the National Wildlife Strike Database maintained by WS for the Federal Aviation Administration. More than 130,000 wildlife strikes with civil aviation have been reported since WS began keeping records in 1990. WS has provided assistance to the Nation's civil and military airports for several decades. Providing technical information and other assistance began in the 1950's when elements of today's WS program were based in the Department of Interior. The program is internationally recognized for its scientific expertise in reducing wildlife hazards at airports and airbases throughout the

Expenditures for Human Health & Safety (Millions)



United States Department of Agriculture
Animal and Plant Health Inspection Service

United States and around the world. Through a balanced effort involving research and wildlife management, WS is reducing the risk to passengers and crews posed by wildlife.

Wildlife hazard management assistance is offered to airports and airbases through the WS Airport Wildlife Hazards Program, made up of wildlife biologists who specialize in bird identification, airport management, and wildlife control techniques. WS provides service at more than half of all U.S. airports that are Federally certificated for passenger traffic. WS' NWRC complements WS field work by conducting research to develop better wildlife damage management techniques and equipment for airports. For more details, see the separate report "*Protecting Commercial and Military Aircraft and Passengers.*"

Looking to the Future

If not treated, rabies is a fatal disease, spread through direct contact with an infected mammal. Once associated with dogs (still the primary reservoir worldwide), rabies in the United States also occurs in bats and wild carnivores, such as raccoons, coyotes, and skunks. Rabies-associated costs range from \$300 to \$450 million annually in the United States, primarily for pet vaccinations, education, diagnostics, post-exposure treatment, and case investigations. Costs are expected to increase if rabies strains in terrestrial wildlife are not contained.

To combat its spread, WS has implemented a Cooperative Rabies Management Program, focused on coordinated oral rabies vaccination (ORV) projects targeting raccoon rabies in 14 Eastern States, coyote and gray fox variants in Texas, bat-variant rabies in Arizona skunks, and other rabies-related projects. WS collaborates with a variety of organizations to carry out ORV projects in which oral bait, containing the rabies vaccine, is distributed within targeted areas to immunize specific wildlife populations against the disease. Currently, ORV is the only available technology to strategically contain and eliminate specific strains of rabies in the United States. This innovative program will benefit the American public, livestock producers, pet owners, and wildlife.

The North American Rabies Management Plan was officially signed in 2008 to facilitate closer working relationships on border rabies issues, an important rabies management challenge. In the Eastern United States, WS is focusing on preventing the westward spread of a raccoon variant of rabies by establishing an ORV barrier along the Appalachian Mountains. WS works in Texas with numerous partners on an ORV program to prevent the spread of two separate rabies variants (canine strain in coyotes and a gray fox strain). More than 138 million baits have been distributed since 1992. Through efforts to contain the canine rabies variant in coyotes at the international border, reported cases of the disease in south Texas dropped from 166 in 1994 to no cases since 2006. For more details, see the separate report "*National Rabies Management Program.*"

Protecting People from Wildlife-Borne Diseases

Increasingly, wildlife diseases, such as West Nile virus, *E. coli*, and plague, are being transmitted to people, pets, and livestock. The spread of such diseases can be controlled more effectively if control is integrated with wildlife management. WS plays a crucial role in the area of wildlife disease surveillance, prevention, and eradication. The goal of WS' National Wildlife Disease Program (NWDP) is the development and implementation of a nationwide system to survey for wildlife diseases and respond to emergencies, including natural disasters and disease outbreaks. WS assists Federal, tribal, and State agencies with wildlife disease threats and partners with other APHIS units and Federal agencies through the program. A nationally coordinated wildlife disease surveillance system supports existing programs with

sample collection, information exchange, and additional laboratory infrastructure. WS' NWRC provides research on disease organisms, their reservoirs, transmission cycles, and ways to block transmission.

Wildlife disease biologists in the Surveillance and Emergency Response System are available to respond quickly to assist with disease outbreaks and other emergencies requiring WS expertise. In an emergency, biologists are required to mobilize immediately and arrive at the emergency site within 24-48 hours.

Feral swine are considered an invasive species in the United States and are estimated to cause millions of dollars in damage each year. They are currently known to exist in 38 States with a population estimate of 5 million. Each year they expand into new territory. Wildlife Services' personnel remove approximately 30,000 feral swine each year for wildlife damage management purposes. The NWDP takes advantage of these removal activities to collect samples for disease surveillance. WS anticipates increased interest in the risk that feral swine pose to people, as well as the domestic swine industry, due to several diseases such as brucellosis and influenza.

Swine brucellosis—Feral swine carry a number of endemic diseases that can pose a risk to people, as well as to free range cattle and domestic swine operations. One such disease is swine brucellosis, caused by the bacterium *Brucella suis*. There are several recognized species of *Brucella*, and each is associated with a specific animal host. While *B. suis* primarily infects pigs, it also can cause disease in cattle, horses, dogs, and humans.

Influenza—Swine play a unique role in the epidemiology of influenza A viruses. They have similar cellular receptors to both birds and humans and, consequently, can become infected with subtypes of influenza A viruses associated with people and birds. If different influenza A subtypes are present within an individual, there is an opportunity for genetic reassortment to occur between subtypes. This sort of mutation, known as antigenic shift, causes a sudden and significant change in the genetic make-up of a virus, which may lead to the creation of a potentially more infectious subtype. WS is working with several Federal agencies to establish surveillance programs that will detect influenza viruses in feral swine, which pose a threat to domestic livestock and human health.

In addition to monitoring wildlife populations for disease exposure, WS provided cooperative assistance including educational assistance and data management to a number of State and tribal health agencies, universities, and the Centers for Disease Control and Prevention. A variety of wildlife diseases are of interest in terms of human impacts including leptospirosis, bovine tuberculosis, plague, and a host of others.

Leptospirosis—Leptospirosis is a bacterial infection caused by one of many *Leptospira spp.* serovars. Most mammals, including people, can become infected. People typically become infected after exposure to water contaminated with animal urine that comes in contact with the skin, eyes, or mucous membrane, and disease can range from asymptomatic infections to more serious illness, involving kidney damage, meningitis, liver failure, etc. The bacterial disease has been reported in feral swine in a few cases in the United States, but little is known about the geographic distribution or apparent prevalence of leptospirosis in feral swine or other wildlife species throughout the country. Consequently, the NWDP utilized a subset of the feral swine samples stored in its feral swine serum archive to screen approximately 2,000 serum samples with a microagglutination test at Colorado State University. Due to the relatively high apparent prevalence

of *Leptospira* in feral swine, the NWDP expanded surveillance to include testing of samples from raccoons and coyotes. In addition, as an extension of the original project, feral swine kidney samples are being collected from counties previously identified as positive in the first phase of the project. The kidneys are being analyzed using an rRT-PCR assay to determine whether active shedding of *Leptospira* is occurring. In addition, serum samples collected from feral swine in counties of States that have not previously been tested for antibodies to leptospirosis will also be analyzed.

Bovine tuberculosis—Tuberculosis (TB) is a contagious respiratory disease of both animals and humans. Bovine TB can be transmitted among livestock, people, and other animals. Wildlife and cattle can pass the infection to each other under certain circumstances. Unless eradicated, it will continue to impact human health, animal health, and livestock production. Traditional control strategies greatly reduced bovine TB in the United States but eradication has been complicated due to discovery of bovine TB in white-tailed deer in Michigan and Minnesota.

WS has been involved in bovine TB eradication in several ways. At Michigan's request, WS employees depopulated TB positive captive cervid herds. WS wildlife disease biologists test for the disease in wild deer, remove wild deer that threaten livestock with infection, observe wildlife patterns on farms with TB-positive cattle, provide fencing to farms to exclude deer from feed storage areas to prevent transmission, and provide assistance in sampling and monitoring the disease.

WS' NWRC has undertaken studies to understand the movement of bovine TB, methods to detect bovine TB, and techniques to prevent transmission between deer and cattle.

Plague—*Yersinia pestis* is a flea-borne bacterium that causes plague. The pathogen is traditionally described as cycling through small mammal populations, with an enzootic cycle and an epizootic cycle. The enzootic cycle of plague is maintained among rodent hosts and their fleas; however, transmission to humans and other mammals can occur through flea bite or direct contact and, in some cases, results in severe illness and/or death. The majority of human plague cases in the United States are associated with peridomestic transmission in non-urban areas, often involving bites from rodent fleas or even pneumonic transmission from contact with domestic pets.

As in other areas in the world, plague activity in the United States is often difficult to detect for extended periods of time. Monitoring plague exposure through active surveillance of other animals that can act as sentinel species is a viable option for monitoring plague dynamics. The NWDP has directed a long-term plague surveillance program, in cooperation with the CDC, the Washington State Health Department, the Texas Department of Health, and other local and tribal agencies in the United States. The objective of WS' surveillance projects is to determine plague exposure in wildlife, on a national scale, to better understand transmission dynamics and risk of human exposure.

Yersinia pestis has not colonized the eastern half of the United States since its introduction to the country at the beginning of the 20th century. Surveillance efforts are primarily restricted to areas of the West. Plague surveillance by the NWDP is conducted through opportunistic sampling of wildlife species, with a focus on sentinel species, such as coyotes. To date, 53,295 samples have been collected during 2005-2012 as part of the surveillance program.

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Protecting Property, Infrastructure and Transportation



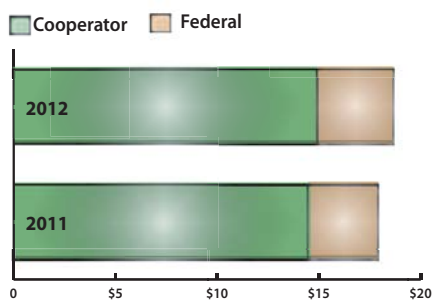
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Wildlife Population and Property Protection

- Wildlife Services (WS) conducts research on contraceptive vaccines for mammals and birds
- WS conducts beaver damage management programs in more than 40 States
- Currently for every \$1 spent in managing beaver damage by WS, \$15 in resources was saved on roads, bridges, dikes and dams, sewer and water treatment facilities, and landscapes
- WS currently has 86 trained explosive experts operating in 19 States to protect property and agriculture from beaver damage
- Approximately 80% of funding for property protection is provided by cooperators

Expenditures for Property Protection (Millions)



Wildlife Services (WS), a program within the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, provides Federal leadership and expertise to resolve wildlife conflicts that threaten public and private resources. WS works in every State to prevent wildlife damage to property, roads and bridges, aircraft, and other resources.

Protecting Property in Urban and Suburban Areas

Each year, wildlife cost property owners millions of dollars in damage, underscoring the need for responsible wildlife damage management. WS protects homes, lawns, landscaping, golf courses, parks, pets, equipment and machinery, industrial facilities, and other property against wildlife damage.

In FY 2012, WS conducted more than 67,800 technical assistance projects to reduce wildlife damage to property in urban, suburban, and rural locations as well as at airports across the country. Technical assistance enables property owners to work on their own to resolve wildlife conflicts. WS provides information, guidance, and, sometimes, equipment to assist property owners in their efforts. When the conflict is more significant, however, WS specialists employ direct assistance, using their knowledge and expertise to disperse, remove, or relocate problem wildlife, such as vultures, raccoons, and bears.

WS expended more than \$18.6 million to protect property from wildlife damage in FY 2012. Damage may be relatively minor or it may result in significant economic loss and inconvenience. Wildlife can damage foundations, structures, and even internal wiring as it attempts to gain entry. The excrement from roosting birds or bats is not only foul, but also can corrode machinery and vehicle paint, and can create a slipping hazard on walkways. Grazing wildlife, such as geese, deer and feral swine, can destroy golf course greens, fruiting plants, lawns, and other landscaped areas.

In addition to causing damage, overabundant wildlife populations can reduce the quality of life for people in the community. The excrement and noise from a roost of vultures or crows can be so severe that backyard swing sets, grills, lawn furniture, and outdoor business properties become useless.

Protecting Infrastructure in Urban and Rural Areas

Roads, bridges, airport runways, dams, water drainage systems, and utilities are also vulnerable to wildlife damage. WS is frequently called upon to relocate or remove wildlife that threaten urban and rural infrastructure. Aquatic and burrowing animals, such as beaver, ground hogs, gophers, ground squirrels, and armadillos, often weaken foundations and accelerate erosion damage, causing structures to crack and collapse. Birds and other wildlife are frequently responsible for electrical power outages that can result in thousands of dollars in damage and lost revenue. Monk parakeets, hawks, and vultures are well known for causing damage to urban infrastructure when they nest, roost, and perch on telephone poles and electrical and communication towers.

Brown treesnakes in Guam regularly cause electrical shortages and power outages that result in more than \$1 million in damage each year. WS conducts a successful damage management program to prevent large scale outages with cost savings of more than \$500,000 annually to the local power authority.

Resolving Beaver Damage—Beaver cause extensive damage to roads, bridges, dikes and dams, sewer and water treatment facilities, and landscape plants. Many experts believe the cost of beaver damage is greater than that caused by any other wildlife species in the United States. In Mississippi and North Carolina, the problem's severity led State agencies to provide major funding for WS to conduct statewide beaver damage management programs. WS also provides large-scale programs in more than a dozen



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additional States, and responds to individual requests for assistance on a case-by-case basis nationwide.

For years, WS has collected beaver damage data reported by private individuals and State agencies; the economic damage caused by beavers in the southeastern United States alone is estimated to have exceeded \$3 billion over a 40-year period. Currently for every \$1 spent in managing beaver damage by WS, \$15 in resources was saved on roads, bridges, dikes and dams, sewer and water treatment facilities, and landscapes. Even though WS provides beaver management assistance to about half of the State's counties in Mississippi, the aquatic rodent still causes an estimated \$100 million in damages to public and private property.

To prevent beaver damage, WS specialists remove beaver dams that clog waterways and flood roads and timber resources. WS has identified multiple research needs relevant to beaver damage management: information on attractants, search dogs, electronic frightening and detection devices, habitat modification, mechanical barriers, "natural/home-made" remedies, non-target concerns, repellants, toxicants, trap development, and basic biology. WS' National Wildlife Research Center (NWRC) is currently conducting research on a number of methods to prevent beaver damage.

Safeguarding Transportation

Deer Collisions with Automobiles—As wildlife populations increase and adapt to more urban settings, wildlife-vehicle collisions also increase. Deer are the largest wild animal most often involved in such accidents; other wildlife associated with vehicular collisions are elk, antelope, bear, feral swine, and moose.

The U.S. deer population is at an all-time high, having increased from 300,000 animals in 1900 to 30 million in 2012. Overabundant deer populations lead to countless vehicle collisions each year. Although difficult to quantify because many accidents go unreported, one study estimates more than 1.23 million deer collisions with vehicles occur annually, resulting in repair costs of more than \$4 billion. WS works to reduce deer populations in heavily populated areas in order to increase public safety.

Scientists at WS' National Wildlife Research Center (NWRC) have successfully tested contraceptive vaccines on white tailed deer. Research data shows the contraceptive is safe for the vaccinated animals, with no associated danger to people or wildlife. Not intended to replace other management tools, the contraceptive vaccine is a tool for use in conjunction with other management methods. The vaccine can be used to help manage deer reproduction in urban and residential areas where other methods, such as hunting, are not an option.

Wildlife/Aircraft Collisions—Wildlife can pose a serious threat to public safety at airports across the United States. The majority of wildlife strikes are caused by birds, although large mammals are also involved. Through a balanced effort involving research and wildlife management, WS helps airports reduce wildlife hazards. WS is internationally recognized for its scientific expertise in reducing such hazards at airports and military bases across the Nation and around the world. In FY 2012, WS provided assistance to 772 airports and military airbases, an 18 fold increase from 1990. In FY 2010, WS provided services to mitigate wildlife hazards to aviation at over 77% of the Nation's airports that are Federally certificated for public service. For more details, see

the separate report "*Protecting the Flying Public and Minimizing Economic Losses with the Aviation Industry.*"

Wildlife Population and Property Protection

- More than 1.23 million collisions occur annually between vehicles and deer.
- The direct cost of a deer-motor vehicle strike averages \$3,305 per collision in insurance claims.
- WS provided wildlife damage management assistance to 772 commercial and military airports in FY 2012.
- Highly successful conservation and environmental programs have resulted in population increases for almost all species of large flocking birds in recent decades.
- In all, 462 different species of birds have been reported struck by civil aircraft during 1990-2011.
- Each year, wildlife/aircraft strikes cost the Nation's civil and military aviation sectors approximately \$700 million.

Wildlife Services

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Protecting Commercial and Military Aircraft and Passengers



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Major Cooperators

- Federal Aviation Administration
- Department of Defense
- National Association of State Aviation Officials (NASAO)
- National Transportation Safety Board
- Smithsonian Institution Bird Identification Lab
- More than 700 airports and airbases
- BirdStrike Committee USA
- U.S. Fish and Wildlife Service
- State wildlife agencies
- Universities and private industry concerned with aviation and air safety

Accomplishments in FY 2012

- 772 airports and airbases received assistance to mitigate wildlife hazards to aviation compared to 42 airports in 1990.
- WS staff provided a total of 232 staff years of assistance at requesting airports
- Presented technical training in identification and management of wildlife hazards to aviation to 4,619 airport personnel, up from 1,133 in FY 2002.

In January 2009, the country watched the national news amazed at the skill and professionalism of the crew of U.S. Airways Flight 1549 as it safely landed a jetliner on a river in New York City and evacuated all aboard. The "Miracle on the Hudson" was a striking example of the serious threat that wildlife can pose at airports across the United States. While large mammals are responsible for some collisions, the vast majority (97%) of wildlife strikes involve birds. During this event, Wildlife Services (WS) was invited by the National Transportation Safety Board (NTSB) to participate in the "Miracle on the Hudson" investigation. WS recovered materials from the engines and examined the aircraft itself for signs of possible bird-strike damage. The recovered matter was identified as the remains of Canada geese.

Wildlife/aircraft strikes cost the Nation's civil and military aviation sectors approximately \$700 million per year (1990-2011). At least 250 people died and 229 aircraft were destroyed worldwide as a result of bird strikes with civil and military aircraft during 1988-2012. WS, a program within the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, provides Federal leadership and expertise to resolve wildlife conflicts that threaten public and private resources. WS works in all 50 States and U.S. Territories. Providing technical information and other assistance to safeguard airports and aviation began in the 1950's when elements of today's WS program were based in the Department of Interior. Wildlife and other natural resources are key components of the wildlife hazard and safety issues that impact airports and aviation. Because these resources are held in trust for the American public, WS and other local, State, and Federal programs are responsible to assist the public when necessary. The program is internationally recognized for research and management programs in wildlife damage control.

More Air Traffic, More Wildlife

Although it may seem like a bird could not cause much damage, a single bird has the potential to take down a major jetliner, threatening the lives of passengers and destroying the aircraft. In September 1995, the U.S. Air Force lost 24 airmen and a \$190 million AWACS aircraft which collided with Canada geese on takeoff in Alaska. In 2011, an Airbus 320 ingested a herring gull, resulting in an emergency being declared and the aircraft returning to the airport. The aircraft was out of service for 3 days and the engine was subsequently replaced.

Smaller flocking birds also pose hazards to aircraft safety. In 2011 after striking multiple eastern meadowlarks during take-off, an MD-82 experienced engine vibration and the aircraft returned to the airport in Tennessee. The engine had severe damage to all fan blades in the number 1 engine. Mammals, from coyote to deer, also can find their way onto airport runways. In November 2012, an aircraft registered with U.S. Customs and Border Protection struck a deer on landing. The strike caused a fuel tank to rupture on the wing and the aircraft was consumed by a fire and destroyed. The aircrew was able to successfully exit the plane with no injuries. At least 18 civil aircraft have been destroyed by deer strikes in the United States since 1983.

A combination of expanding wildlife populations and increasing numbers of aircraft movement contributed to increased wildlife/aircraft strikes in the past 30 years. Certain North American bird species are recognized hazards to aviation, including Canada geese, brown pelicans, bald eagles, vultures, and cormorants. Populations of these birds have increased dramatically; for example, Canada goose populations have more than tripled. Many species have adapted to urban environments. Commercial aircraft movements in the United States have increased from approximately 18 million in 1980 to 25 million through 2012. Simultaneously, turbofan-powered aircraft currently in use prove quieter than older aircraft, so birds are less likely to detect and avoid them.

Mitigation of aircraft wildlife strike hazards are focused around airports because more than 72% of reported bird strikes occur in the airport environment at less than 500 feet above ground level.



United States Department of Agriculture
Animal and Plant Health Inspection Service

WS Provides Consultation and Direct Services

Through a balance of research and wildlife management, WS provides solutions for the public to help reduce wildlife-caused damage to aviation. In 2006, a Memorandum of Understanding (MOU) between WS and the National Association of State Aviation Officials (NASAO) was signed, fostering cooperation between WS and NASAO to reduce wildlife hazards at airports in every State. The Federal Aviation Administration (FAA) and Department of Defense (DOD) executed similar MOU relationships to address wildlife conflict issues at civil and military airports.

The number of civil and military airports assisted by WS has steadily grown since 1990 when 42 airports requested assistance. In 2012, 772 airports sought WS assistance and WS biologists provided 232 staff-years of assistance at airports and airbases in every State as well as 3 U.S. territories and 6 foreign countries. Of the 544 U.S. airports certified for passenger traffic by the FAA (i.e., via 14 CFR Part 139), WS assisted 65% of these airports (354) which served 553 million commercial passengers.

In the United States, airports initially assess wildlife hazards. Based on the assessment, the airport may need to develop a wildlife hazard management plan to minimize the likelihood of catastrophic or major-damage strikes. WS staff can provide an assessment and/or a management plan to airports, or assist an airport completing those.

WS provided direct services at 374 airports in FY 2012, including population management through harassment, habitat modification, or wildlife removal. Technical assistance, such as initial consultations and wildlife hazard assessments, was provided at 762 airports. These efforts to reduce wildlife hazards at airports is valued and effective. WS programs at airports not only reduce hazards but raise overall awareness. Airports often experience an increase in strike reporting which further helps to identify problems. For example, the U.S. Air Force Central Command reports an increase of approximately 30% in strike reports and nearly a 65% reduction in strike events at overseas air bases where WS implements a full-time program. These programs resulted in a reduction of approximately \$2.6 million in damage repair costs from 2010-2012.

Providing airport staff with mandated training remains an integral part of WS' airport work. WS provides training to raise awareness on the identification and management of certain wildlife hazards. In FY 2012, the training was provided at 335 airports involving 4,619 personnel. WS possesses employees in each WS State program that are certified per FAA Advisory Circular requirements for Qualified Airport Wildlife Biologists. The work undertaken by WS at airports is conducted under cooperative service agreements with the airports or their managing agencies.

WS, in partnership with the FAA, began to manage the National Wildlife Strike Database in 1995. The database, internationally recognized as a benchmark information source, contains more than 130,000 reports of wildlife strikes with civil aircraft in the United States during 1990-2010. The database provides the foundation for Federal safety regulations, specific airport information to make objective assessments of the nature and magnitude of wildlife strikes, and provides aircraft and engine manufacturers with critical information to improve aircraft components.

Solutions to Problems Depend Upon Knowledge, Which Only Research Can Provide

The WS National Wildlife Research Center (NWRC) conducts research to improve wildlife damage management at airports. For example, as the importance of water as a wildlife attractant at airports has been defined, scientists continue to study exclusion devices to prevent wildlife use of airport storm water retention areas. Additionally, in conjunction with State aviation depart-

ments, NWRC scientists help to develop information for best management practices that guide storm water retention pond construction.

Other groundbreaking NWRC experiments resulted in development and commercial marketing of a hand-held laser for dispersing birds from airport environments. Research on exclusionary devices for use on airfield buildings and equipment as well as determining which types of grass and other vegetation can deter wildlife use of airfields provides valuable information for airport managers and the WS personnel who assist them.

The NTSB final report about the US Airways Flight 1549 "Miracle on the Hudson" event contained a specific safety recommendation requesting that USDA continue its research focus on aircraft lighting systems. As a result, experimental work continues on the use of lighting systems to help birds detect and avoid aircraft. Concurrently, NWRC is collaborating with university research partners to conduct research on avian vision and how this sensory pathway can be further harnessed to decrease the risk of wildlife strikes. In collaboration with the FAA, NWRC researchers also are examining different vegetation cover types that can be used by airports for agriculture revenue generation or biofuel production while not contributing as a wildlife attractant to wildlife at the airport. Also under study are the movement and migration of vultures, relocated ospreys, and bald eagles. Increased knowledge of these bird species' basic ecology can help aviation experts potentially alter flight schedules and training requirements, especially at DOD installations.

Technical and operational (direct management) assistance provided by USDA/APHIS/Wildlife Services biologists to reduce wildlife hazards at airports, FY 2012		
Category and Type of assistance to reduce wildlife hazards	Number of airports	% of total airports assisted (n = 772)
Technical		
Consultation regarding wildlife issues	745	97
Training of airport personnel	335 ^a	43
Wildlife Hazard Assessment	212	27
Wildlife Hazard Management Plan	158	20
Environmental Assessment	59	8
Total Technical Assistance	762	99
Direct management		
Lethal control of hazardous wildlife	321	42
Non-lethal dispersal of hazardous wildlife	287	37
Habitat modification	222	29
Live-trap/ translocation of wildlife from airport	100	13
Total Direct Management	374	48
^a Number of airports where training took place; personnel from additional airports attended some of these training courses		