

CHOICES & CONSEQUENCES

Living With Wildlife



Teacher's Guide

STRIKE ONE, YOU'RE OUT

Airports, Aircraft, Safety & Wildlife

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in cooperation with
Colorado Foundation for Agriculture
and
USDA-APHIS Wildlife Services

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Though out this guide you will find comments, like this, in blue. These are to provide you with additional information, like answers to problems, suggestions or questions you may want to ask your students.

This guide has the information your students will see on the web site.

This activity is part of a program that asks students to use their problem-solving abilities to evaluate, plan and design a solution to real life dilemmas. This dilemma focuses on airports, aircraft, safety and wildlife. It is one of a series of dilemmas that allows students to learn about natural resource and environmental issues by developing solutions to complex and actual problems being faced.

As your students discuss and work to develop a solution to the dilemma, they are able to ask questions of professionals working in the area. Wildlife biologists, airport safety managers, university and government agency personnel and others on the advisory panel have agreed to answer your students' e-mailed questions. The questions your class e-mails are sent to everyone on the advisory panel. Different panel members will respond and their responses are sent to everyone participating. This is to prevent duplication of answers. You will find that not all the advisory panel agree on how problems should be handled. It is up to your students to weigh the pro and con of each idea.

Science standard addressed:

- Students will know and understand interrelationship among science, technology and human activity and how they affect the world.

Benchmarks addressed:

- Design and make a solution that addresses an everyday problem, and communicate the problem, design and solution. (K-4)
- Describe the advantages and disadvantages that might accompany the introduction of new technology. (5-8)
- Analyze benefits, limitations, costs and consequences involved in using technology. (9-12)

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Often decisions are made based upon the emotion of an issue versus the science of an issue. Discuss with your students the emotional side of this dilemma. Do your students feel emotion or science be used to make decisions involving wildlife?

Getting started . . .

Read the overview of the problem with them. Using a web or other form of problem-solving/brainstorming organizational tool, list the problems that are stated in the scenario. This can be done on the chalkboard, chart paper or using an overhead projector. When you feel the students have a clear understanding of the problem and the areas that may be affected, divide the students into groups of 4-5. Assign each group the task of researching and developing possible solutions to the problem.

Encourage the students to use a wide variety of resources. These may include talking with parents, local experts on a subject, visiting local airports or wildlife management facility, researching topic using local libraries and Internet sources. Encourage the students to study the list of possible consequences when planning their solutions.

Have the students present their solution to the class giving their reasons for their decisions. Discuss possible consequences of their solution. You may want to ask the advisory panel to provide the consequences for the students' solution.

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Ideas to consider:

You may want to divide your class into groups. With each group representing a different set of people involved in the dilemma. Have them ask questions and argue the position of their group.

For example:

FaA group would want a solution that would protect the lives of people.

Homeowners around the airport want to keep noise to a minimum and want to be able to watch the wildlife that comes to the airport.

Farmers want to farm the ground.

Airport employees want to keep their picnic areas.

Airport officials want to keep everyone happy and safe.

Over-view:

You have been invited part of team



have in-to be the that

will make recommendations on how to handle wildlife conflicts at your local airport. Your airport contacted you because it has experienced a variety of wildlife problems. They want ideas on how to deal with the problems. Last month an airliner carrying 235 people had to abort its flight because it struck a Canada goose. The accident took out an engine, but the plane was able to circle and safely land back at the airport. A coyote was also struck and killed earlier in the week by an airliner landing on the runway. If it had been struck by one of the many small planes that use the airport, the collision could have broken the landing gear of the small plane and could have easily killed everyone on board.



Duck



Strike

Gull

Strike

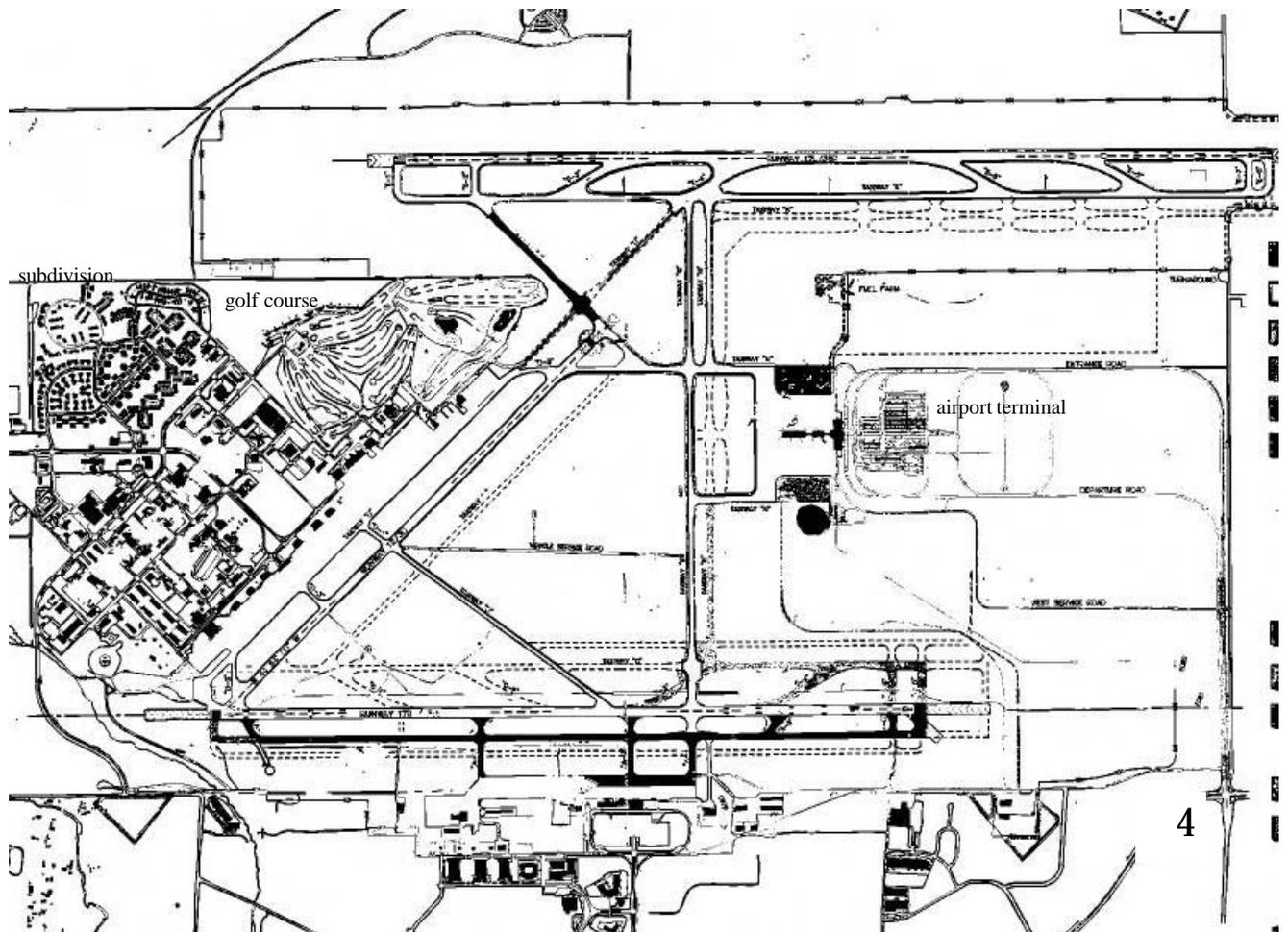
Strikes are when birds or other animals collide with an airplane. This may occur when the airplane is taking off or landing or while it is in the air. Birds and other wildlife strikes to aircraft annually cause over \$380 million in damage to U.S. civil and military aviation. These strikes put the lives of the aircraft crew and passengers at risk. Over 300 people have been killed as a result of bird strikes with airplanes.

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To develop mapping skills, have your student redesign this airport or draw a map of their local airport. Analyze the airport for potential wildlife hazards.

The airport is on 3840 acres of ground (six sections - 2 x 3 sections or 2 miles by 3 miles -- a section is 640 acres and is 1 mile square). There are several lakes on airport property as well as on a nearby golf course ([click here to see map](#)). The geese fly back and forth from lakes on the airport to those on the golf course. The airport officials have also leased the ground around runways to a farmer who grows winter wheat. The extra money the airport receives from this lease has allowed them to build a small park, picnic area and make other improvements. The geese eat the winter wheat and the grasses they find on the airport. It is a good food source for them. When the farmer cultivates or harvests the ground, gulls and other birds show up to eat the insects and rodents made available by the cultivating or harvesting process. Working the fields at night does not seem to attract the flocks of birds, however, some of the people living close to the airport complain about the noise of the tractors and equipment at night. Next to one of the airport lakes is a small park used as a picnic area by the people who work at the airport. Many of these people like to observe and feed the geese.



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Questions to consider:

Do the strikes take place more frequently at a specific time of the day? If so, when?

Does it make any difference if it is an east-west or north-south runway?

Which came first, the houses or the airport?

How big are the lakes? Can the lakes be eliminated on the airport or do they provided a vital function?

What will happen to the airport if wildlife run-ins aren't reduced? What is the cost of doing nothing?

In terms of run-ins, which problems cause the most damage and would be the best to solve?

What are pro's and con's of geese, coyotes and prairie dogs living on the airport?

What is the interrelationship between these species?

Could another crop be planted other than wheat that would be less attractive to the geese? What crop?

Another problem the airport is facing involves black-tailed prairie dogs. The prairie dogs have established a colony in the grassy areas between the runways. The colony has grown and expanded rapidly. Coyotes have been hunting these animals resulting in more coyote/airplane mishaps. The tunnels the prairie dogs dig are also causing problems by undermining foundations of the runways. As they dig, the prairie dogs often throw rocks and dirt up on the runways. This material, called FOD (foreign object debris), can also cause problems for aircraft. The powerful airliner engines can pull this material into them. A rock the size of a dime can destroy a jet engine. In addition, prairie dogs carry plague. There is concern that this colony has been infected. The coyote that was killed when it was hit by the jet tested positive for the disease. Coyotes are not carriers of the plague, but if they eat rodents that do carry the disease they will test positive for antibodies to the disease. The expanding prairie dog colony attracts a variety of predators in addition to the coyotes. Raptors (birds of prey) hunting prairie dogs, can also collide with the airplanes.

Airport officials are being pressured by the FAA to eliminate these run-ins with wildlife. Safety inspectors are afraid that an airplane will crash because it may hit a goose or coyote. Coyotes, in many ways, are beneficial because they eat rodents around the airport. With the coyotes there, there are fewer birds of prey hunting in the area. The coyotes also eat young goslings and the geese eggs. This helps to control the goose population.

Like other airports, your airport encourages airlines to use airplanes that have quieter engines. This pleases the people who live around airport and the people who play golf at the golf course. However, the quieter engines make it harder for the geese to hear the airplanes. Thus there have been more run-ins with these birds.

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Solutions to the math problems:

- $300 \text{ acres} \times \$50 = \$15,000$
 $15,000 \times 5 \text{ applications} =$
 $\$75,000 \text{ per season}$
- Possible solutions:* $\$15,000 \times$
 $16 = \$240,000 \text{ per}$
- $3.$
Line: $16,000 \text{ feet} \times 0.11 = \$1,760;$
Sleeves: $2,000 \times 0.12 = \$240$
Thimbles: $700 \times 0.45 = \$315$
Labor: $32 \times \$25 = \800
Shipping: $\$50$
Crimping tool: $\$82$
Cost per grid: $\$3,165 + \$82 =$
 $\$3,165$
Cost to cover all three lakes:
 $\$3,165 \times 6 = \$18,990 + \$82 =$
 $\$19,072.$

There are several things that can be done to manage the problem with the geese:

1. Chemical repellents can be sprayed on the plant material around the airport. For example, methyl anthranilate, similar to the grape flavoring in soda pop, is unpleasant to the geese causing them to stop eating the plants. It is estimated that about 300 acres of ground will need to be treated with the repellents. It costs on average \$50 an acre to spray the repellents. The repellents will need to be sprayed on the grass and plant material every two weeks for a 10-week period of time while the geese are migrating. How much will it cost to spray repellents to keep the geese off the area? Sometimes the geese just move next door giving the problem to the neighbor.
2. This spraying of methyl anthranilate helps with the geese that are migrating or traveling through an area; however, many geese have stopped migrating and have become resident geese. This means they live in the area year-round. While the methyl anthranilate keeps them away from the area for the 10 weeks it is sprayed on the plant material, they quickly return when the chemical has dissolved away.
3. To keep the geese from landing on the lakes, it is possible to cover the lakes with wire grids. It will take 6 grids of wire to cover the three lakes. The grids are made of kevlar line. The cost for the line is 11 cents per foot and 16,000 ft of line are needed per grid. In addition, 2,000 sleeves at 12 cents each, and 700 thimbles at 45 cents each are needed to build one grid. It takes two eight-hour people two days to build a grid at a rate of \$25 per hour. It cost \$50 to ship the material for one grid. And they need to have a \$82 crimping tool. What will it cost to install grids on all the lakes?

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- \$7,400 x 12 months = \$88,800 per year thus using the dogs would be less expensive than using the falcons.*
 - \$40,000 x 3 = \$120,000 to fill in the lakes. Other costs have not been entered into the figure.*
 - Minimum cost of 6 devices = \$1680 and the maximum cost of 6 devices = \$2700.*
- Extended math problem:**
- If using the formula:
- energy equals _
mass times ve-
locity squared.
 $E = 1/2M \times V^2$
- Translated means: the heavier the animal or the more biomass, the more damage will be done. A starling that weighs 80 grams imparts 1/50 of the energy into an aircraft than does a goose that weighs 4000 grams. So, compared to a single 4000 gram goose, how much energy would be imparted if the plane ran into flock of 100 starlings?
- Another option is to hire someone to scare the geese away from lakes. There have been attempts to use dogs or falcons to chase birds away from airports. These methods are labor intensive and often not very effective. It costs \$7,400 per month to use dogs to frighten birds from an area. Using falcons costs \$350,000 per year.
 - The lakes could also be drained and filled in with soil. However, the lakes help to catch rain runoff during heavy thunderstorms. Without the lakes, this water will flood a neighboring subdivision. Also the area around the lakes is classified as wetlands. The Environmental Protection Agency has rules that need to be followed when eliminating wetland areas. The Army Corp of Engineers would also need to be consulted to make changes to the lakes. The Corp might require that the airport build another wetland if any are destroyed on airport property. This could be very costly. The cost to drain and fill the lakes is \$40,000 per lake. There are three lakes on the airport property.
 - Another option is to set up frightening devices that will make loud noises to scare the geese away. These frightening devices remain effective as long as an occasional goose is shot. Shooting adult geese reinforces that the frightening devices are dangerous and should be avoided. The costs to set up and maintain frightening devices range between \$280 and \$450 per device. A minimum of six devices will be needed. However, people who live around the airport dislike the sound these devices make.

*80 grams x 100 starlings
= 8000 grams which is
twice as much as one
goose.*

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Other options for dealing with the geese problem:

1. Shoot the geese -- to do this, the airport would need to get a permit from the US Fish & Wildlife Service and if the airport falls within city limits, it might be necessary to get permission from city officials. The meat harvested from shooting the geese could be given to food charity.
2. Capture the geese — this is often done in the summer months when geese are molting. During the molting process the geese lose their feathers and cannot fly. A permit from the US Fish and Wildlife Service is needed before any geese can be captured. Rounding up the geese, killing them and donating the meat to charity costs about \$6.00 per goose.
3. Relocate the geese — another option is to live trap the geese. Because of the success of past goose relocation projects and the expanding goose population, it is difficult to find any place that wants to take the geese after they have been captured.
4. Change the flight pattern of planes taking off and landing at the airport. The FAA would have to approve these changes. Sometimes it is not possible to change the flight path, because of prevailing wind patterns, objects or buildings that might prevent safe landing.
5. Prevent the geese from successfully nesting. This is done by destroying nesting sites, egg addling (shaking eggs so they don't hatch) or oiling eggs so they don't hatch. A permit from the US Fish and Wildlife Service is needed before using any of these techniques. All lakes are potential nesting sites for geese and other waterfowl.
6. Promote more hunting (during the fall and winter) of geese in the area around the airport. However, if the airport has been annexed by the city, no hunting is allowed within the city limits. Being located in the city limits provides the geese with an area protected from hunting and their population increases. There is also less predation of geese in this environment as predators tend to hunt in areas with fewer people. Hunting in the surrounding areas can cause geese to move onto the airport ground because no hunting is allowed on the airport.
7. Do nothing and hope for the best.
8. Do some variation of all of the above.
9. Find a completely new solution.

Other control methods:

1. Remove picnic areas and prohibit the feeding of geese on airport property. Stop wheat farming on the airport.
2. Plant vegetation that is unappealing to geese. Cultivating of the fields for farming discourages prairie dogs from expanding their colony.

What would be the most cost-effective way of making the area less desirable to the geese?

Solution: Frightening devices

What would be the advantages and disadvantage of each method?

Solution: Accept any reasonable answer.

What would you recommend to the airport officials as a way to solve the geese problem?

Solution: Accept any reasonable answer.

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1. Solution:

Airport is 2 miles x 3 miles, the perimeter would be 10 miles. There are 5280 feet per mile so $5280 \times 10 = 52,800$ x \$6.00 per foot = \$316,800.00 to build a fence around the airport.

Coyote part of the dilemma:

Over the last few years the coyote population around the airport has been increasing. The coyotes kill and eat many of the small rodents around the lakes and buildings of the airport. They have also been seen cleaning up food around the picnic areas and around the trash bins. Some of the people who live near the airport say the coyotes are killing their cats. Most of the people at the airport enjoy watching the coyotes catch mice and small rodents. However, their hunting, especially of prairie dogs, often takes them across the runways. The open area of the airport allows the coyotes to see a long way in all directions. It is also a protected environment. There aren't very many people to harass or hunt them.

Methods for managing the coyotes:

1. Build a fence all around the airport. This is very expensive and there hasn't been a fence designed that will keep coyotes completely out. It costs \$6.00 per foot to build an 8-foot fence with buried apron. How much fence is needed to completely enclose the airport?
2. Kill the coyotes. Calling and shooting coyotes at night using red filtered light is one effective method for removing the coyotes. The coyotes could also be captured in leghold traps or snares then euthanized.
3. Capture and relocate coyotes. Some state wildlife laws prohibit capturing and relocating coyotes. Permission must be obtained from the state wildlife agency. Capturing the coyotes can be difficult. Some places do not allow trapping of animals. Coyotes are often too smart to be caught in padded leg-hold traps or neck snares. Coyotes will come back to an area unless they are relocated a long ways away. Coyotes can carry diseases that might be introduced into the new area. Also, studies have shown that when coyotes and other animals are relocated into a new area conflicts often arise between the resident animals and the relocated animals. Because the relocated animals are unfamiliar with the territory, they often come in conflict with humans. The most common problem is that they are run over by cars.

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4. Eliminating the coyote's food source is another possibility. But it would be impossible and extremely expensive to remove all the rabbits, rodents, birds, and prairie dogs in an area. This would need to be permitted by the state wildlife agency and if it involved migratory birds then a permit from the US Fish & Wildlife Service would be required.
5. Scare the coyotes away using frightening devices. Coyotes commonly get accustomed to most scaring devices and fail to react after the devices have been in place for a while. Harassing them with vehicles is labor intensive and often results in the coyotes running across areas where problems result.
6. Do nothing and hope for the best.
7. Do some variation of all of the above.
8. Find a completely new solution.

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Have your students research plague and how it is transmitted. Discuss how it could be of concern to humans.

Black-tailed Prairie Dog part of the Dilemma

Black-tailed prairie dogs are found in grasslands or short shrubland habitats. They prefer open areas of low vegetation. The areas around the runways provide ideal prairie dog habitat. Prairie dogs are active during the day and spend most of their time foraging for grasses and forbs. They are social animals that live in colonies. Predators of the prairie dog include badgers, weasels, black-footed ferrets, coyotes, bobcats, foxes, hawks, eagles, rattlesnakes and bull snakes.

Remember that the airport officials explained the problems created by the prairie dog colony: The prairie dogs have established a colony in the grassy areas between the runways. The colony has grown and expanded rapidly. The tunnels the prairie dogs dig are also causing problems by undermining foundations of the runways. As they dig, the prairie dogs often throw rocks and dirt up on the runways. This material, called FOD (foreign object debris), can also cause problems for aircraft. The powerful engines can pull this material into them. A rock the size of a dime can destroy a jet engine. In addition, prairie dogs can carry plague. There is concern that this colony has been infected. The coyote that was killed when it was hit by the jet tested positive for the disease. Coyotes are not carriers of the plague, but if they eat rodents that do carry the disease they will test positive for antibodies to the disease. The expanding prairie dog colony attracts a variety of predators in addition to the coyotes. Raptors (birds of prey) hunting prairie dogs can collide with the airplane. The black-tailed prairie dog is being considered to be listed as a threatened species by the U.S. Fish & Wildlife Service. If they do become listed as a threatened species, it will make it more difficult to control them in many situations.

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Methods for managing prairie dogs:

1. Fencing may discourage prairie dogs from entering an area. It is limited in its effectiveness and costs \$6.00 per foot to install.
2. Building visual barriers that block the prairie dogs views can help prevent them from expanding into new areas.
3. Using frightening devices or repellents are not a practical means of control. There are no repellents registered for use with prairie dogs. Cultivation and planting tall grain crops can reduce prairie dog habitat. However, this might attract other species that would cause problems. Flooding the colony may discourage prairie dogs.
4. Using pesticides and fumigants to kill prairie dogs is another management option. The person using these chemicals must obtain a license and permit from state agencies.
5. Trapping the prairie dogs and relocating them is expensive. Also finding release sites for prairie dogs is difficult. If they are released into an area that already has a colony it causes increased stress on the resident animals and there is risk of introducing diseases into the colony.
6. Shooting some of the dogs can stabilize colony population.
7. Vacuuming the prairie dogs is a method of capture. The dogs can then be euthanized or relocated if a site can be found. Cost to run the vacuum is \$1,000 per day.
8. Do nothing and hope for the best.
9. Do some variation of all of the above.
10. Create a completely new solution.

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Additional Information:

- Over 400 people have been killed worldwide as a result of bird strikes.
- Wildlife strikes cost U.S. aviation over \$380 million per year, 1990-1998.
- There have been 81 recorded coyote/airplane strikes from 1990-2000.
- The U.S. Air Force reports over 3,500 bird strikes each year.
- Over 2,500 bird strikes each year were reported for U.S. civil aircraft.
- An estimated 80 percent of the bird strikes to U.S. aircraft go unreported.
- Gulls (31%), waterfowl (31%) and raptors (15%) were the most commonly reported birds struck by civil aircraft in the U.S., 1990-1999.
- Over 430 civil aircraft collisions with deer were reported, 1990-1999 in U.S.
- A 12-lb Canada goose struck by a 150-mph aircraft at lift-off generates the force of a 1,000 lb weight dropped from a height of 10 feet.
- Starlings are "feathered bullets," having a body density 27% higher than herring gulls.
- The North American non-migratory Canada goose population tripled from 1987 to 1997.
- The Great Lakes cormorant population increased from about 200 nesting adults in 1970 to 186,000 nesting adults in 1997 — a 900% increase.
- The North American white pelican population has grown at an average annual rate of 2.9% from 1966 to 1999.
- About 90% of all bird strikes in the U.S. are by species federally protected under the Migratory Bird Treaty Act.

Suggested Airport & Wildlife Links

- <http://www.tc.gc.ca/aviation/aerodrme/birdstke/manual/c/c2.htm> The Bird Strike Information System (IBIS) of the International Civil Aviation Organization (ICAO)
- www.birdstrike.org
- www.lrbq.com/nwrcsandusky/strike.html
- www.faa.gov/arp/hazard.htm
- www.faa.gov/arp/pdf/manfin.pdf
- www.bcrescue.org/birdstrike.html
- www.tc.gc.ca/aviation/aerodrme/birdstke/manual/c/c2/htm
- www.geo-marine.com/page10.html
- www.afsc.saia.af.mil/AFSC/Bash/home.html
- <http://abcnews.go.com/sections/science/DyeHard/dye991020.html> http://llairsafe.com/events/us_ten.htm

Print resources:

- Living with Wildlife Canada Geese Activity Sheet
- CFA's Living with Wildlife Coyote Activity Sheet
- Prevention and Control of Wildlife Damage CD ROM or Handbook