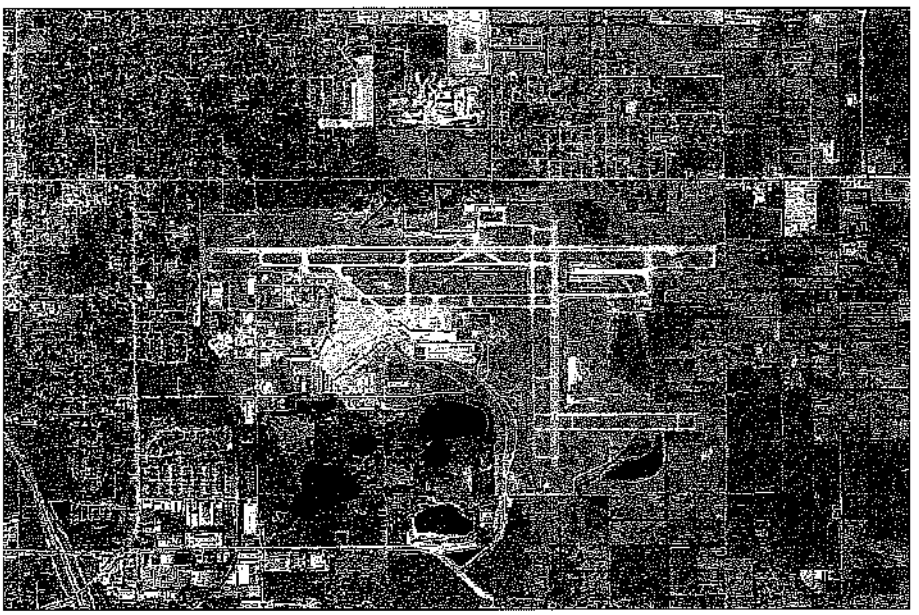
Wildlife Hazard Assessment

For

Orlando Sanford International Airport

Sanford, Florida

December 2007 – November 2008



Prepared by:

Henry N. Curry
United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services
2820 East University Ave.
Gainesville, Florida 32641

Preface

The following document is a Final Report written to fulfill a contractual requirement agreed upon by the Orlando Sanford International Airport Authority and the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services. This report is submitted to fulfill requirements of Title 14, Code of Federal Regulations, Part 139.337 (Wildlife Hazard Management) addressing a Wildlife Hazard Assessment for the Orlando Sanford International Airport (SFB). The scope of this report is to present findings of the Wildlife Hazard Assessment, and to present sound wildlife management recommendations for alleviating wildlife hazards at SFB.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Figures and Tables Quick Reference Guide

1.0 INTRODUCTION

By the Animal Damage Control Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-462b) and The Rural Development, Agriculture, and Related Agencies Act 1988 (P.L. 100-202) Congress has authorized and directed the Secretary of Agriculture to cooperate with states, individuals, public and private agencies, organizations, and institutions in the control of nuisance mammals and birds deemed injurious to the public. Since 1989, the United States Department of Agriculture and the Federal Aviation Administration (FAA) have an acting Memorandum of Understanding directing a cooperative relationship between the two agencies to alleviate wildlife hazards at airports.

Wildlife damage management programs recommended by Wildlife Services (WS) are based on Integrated Wildlife Damage Management (IWDM). In selecting damage management methods consideration is given to the responsible species, potential nontarget species, environmental conditions and impacts, social and legal ramifications, and relative costs of management options. Cost may sometimes be a secondary concern because of overriding human safety, environmental, legal, or animal welfare considerations

On June 29, 2007, the Orlando Sanford International Airport (SFB) and the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services initiated a one year Wildlife Hazard Assessment (WHA) to identify the wildlife species hazardous to aviation, determine wildlife population numbers and fluctuations, and develop recommendations for alleviating wildlife hazards within the airport environment. This study was initiated as a result of a wildlife strike caused by a bald eagle (*Haliaeetus leucocephalus*) on November 17, 2006.

2.0 BACKGROUND

The State of Florida has a long history of high biological diversity, both in plant and animal life. As a result of the state of Florida's diversity, it is not surprising that SFB supports an equally diverse plant and animal assemblage. SFB is positioned between Lake Jessup, Lake Monroe, and the St. John's River, completely surrounding the airport with water on all but one side (Figure 2). The rural, undeveloped, and natural areas surrounding SFB contain a wide variety of habitats and associated wildlife species. This is of significance because birds using coastal areas during the summer migrate inland to areas of milder conditions during the winter. Several species that migrate inland for the winter utilize SFB [i.e. double-crested cormorants (*Phalacrocorax auritus*), anhingas (*Anhinga anhinga*), and shore birds]. Additionally, migrating birds from northern states migrate south for the winter, and many overwinter in central Florida [i.e. ring-billed gulls (*Larus delawarensis*), double-crested cormorants, shore birds, sandhill cranes (*Grus canadensis*), vultures, hawks and eagles, swallows and waterfowl]. SFB has reported 132 wildlife strikes since 1991.

3.0 LEGAL STATUS

3.1 State and Federal Regulations Applicable to Wildlife at Orlando Sanford International Airport

3.1.1 Federal Aviation Administration

Title 14, CFR, Part 139.337 states that airports experiencing one or more of the following events involving wildlife must conduct a Wildlife Hazard Assessment: 1) multiple wildlife strike or engine ingestion, or 2) damaging collision with wildlife other than birds, or 3) hazardous wildlife have access to the aircraft movement area.

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. 1531 et seq.) states, in part, that each Federal agency shall, in consultation with and with the assistance of the Secretary of Interior, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any Federally-listed or proposed endangered or threatened species, or result in the destruction or adverse modification of designated or proposed critical habitat.

The FAA's action in requiring an airport operator to develop, submit for approval, and implement a wildlife hazard management plan is considered a Federal action, as defined in the ESA, and, therefore, subject to Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS).

3.1.2 State of Florida Wildlife Code

By Specific Authority Art. IV, Sec. 9, Fla. Const., Law Implemented Art. IV, Sec. 9, Fla. Const., laws regulating specific activities involving wildlife at airports have been modified to alleviate some permit requirements for airport operators conducting wildlife hazard work. The initiative for this legislation came about as a result of efforts set forth by the WS and FAA. These modifications became effective September 21, 1998. Some changes in wildlife regulations involving airport hazard work are as follows:

3.1.2.1 Rule 68A-9.010 (Formerly 68A-12.009(6) and 39-12.009), Florida Administrative Code (F.A.C.):

Any person owning property may take nuisance wildlife or they may authorize another person to take nuisance wildlife on their behalf except those species listed in subsection (1) below on their property by any method except those methods listed in subsection (2) below. Persons responsible for government owned property are considered "landowners" for the purpose of this rule. The executive director or a designee may authorize the take of additional species of wildlife or additional methods of take for justifiable purposes by permit issued pursuant to Rule 68A-9.002, F.A.C.

(1) Wildlife that may not be taken as nuisance wildlife:

(a) Species listed in Chapter 68A-27, F.A.C.

(b) The following mammals:

1. Black bear.

2. Deer.

3. Bats – Except that bats may be taken either when:

a. That take is incidental to the use of an exclusion device, a device which allows escape from and blocks re-entry into a roost site located within a structure (including chemical repellants), at any time from August 15 to April 15 or

b. That take is incidental to permanent repairs which prohibit the egress of bats from a roost site located within a structure provided an exclusion device as described in sub-subparagraph a. above is used for a minimum of four consecutive days/nights for which the low temperature is forecasted by the U.S. National Weather Service to remain above 50° F prior to repairs and during the time-period specified.

(c) The following birds:

1. All birds listed in 50 C.F.R. §10.13 as protected by the Migratory Bird Treaty Act unless the take is authorized by the U. S. Fish and Wildlife Service by a permit or depredation order.

2. Bobwhite quail.

3. Wild turkey.

(2) Methods that may not be used to take nuisance wildlife:

(a) Gun and light, except as provided in paragraph (4)(b) below.

(b) Steel traps.

(c) Poison, other than those pesticides that are registered by the Florida Department of Agriculture and Consumer Services without additional authorizations and are only used in a manner consistent with the product labeling.

(d) Bat exclusion devices or any other intentional use of a device or material at a roost site which may prevent or inhibit the free ingress and/or egress of bats from April 16 through August 14.

(e) Any method prohibited pursuant to Section 828.12, F.S

Note: To take or remove any migratory bird species, a permit must first be obtained from the USFWS. Lethal removal by shooting of blackbirds, cowbirds, grackles, or crows does not require a permit from USFWS (50 CFR Ch. 1 § 21.43) or the Florida Fish and Wildlife Conservation Commission (FWC).

3.1.2.2 Rule 68A-9.010(3)(a), F.A.C.

Live captured nuisance wildlife transported under authority of this section may be done only for the purpose of euthanizing the nuisance wildlife, provided any euthanasia shall be humane as defined by the American Association of Zoo Veterinarians. Euthanasia of those species listed in subsection 68A-6.0022(2), F.A.C., is not required.

3.1.2.3 Rule 68A-9.010(3)(b), F.A.C.
Live captured nuisance wildlife may be released on the property of the landowner provided the release site and capture site are located on one contiguous piece of property.

3.1.2.4 Rule 68A-9.010(4)(a), F.A.C.

Wildlife listed in Chapter 68A-27, F.A.C., that pose an imminent jeopardy to aircraft safety and human life, may be harassed by persistent, non-injurious disturbance without physical capture or direct handling to disperse wildlife by airport operators or their agents on airport property in order to prevent collisions between aircraft and wildlife.

Note: This rule involves dispersals of state listed species only; in order to lethally remove any of these species, a permit must first be obtained from the FWC and/or the USFWS depending on species involved.

3.1.2.5 Rule 68A-9.010(4)(b), F.A.C. (Formerly 68A-12.009(7)(c)):

Airport personnel may take deer or wild turkey on airport property if their presence poses a potential threat to aircraft safety and human life. Deer may be taken by the use of a gun and light at night. Carcasses of deer or wild turkey taken under this rule shall be buried, incinerated on-site or donated to a charitable, non-profit institution or agency. No deer or wild turkey carcasses taken under this rule shall be retained for use by airport personnel.

3.1.3 Other State of Florida Wildlife Codes

3.1.3.1 Rule 68A-24.005, F.A.C.--Transporting and Shipping Live Raccoons:
No person shall transport within, into, or from the state any wild-trapped, live raccoon, except as authorized by Rule 68A-9.010, F.A.C.

3.1.3.2 Rule 68A-4.001 F.A.C. (formerly 39.4.01)—General Prohibitions.
(1) No wildlife or freshwater fish or their nests, eggs, young, homes or dens shall be taken, transported, stored, served, bought, sold, or possessed in any manner or quantity at any time except as specifically permitted by these rules nor shall anyone take, poison, store, buy, sell, possess or wantonly or willfully waste the same except as specifically permitted by these rules.
(2) The use of gasoline or any other chemical or gaseous substances to drive wildlife from their retreats is prohibited.
(3) Intentionally placing food or garbage, allowing the placement of food or garbage, or offering food or garbage in such a manner that it attracts black bears, foxes or raccoons and in a manner that is likely to create or creates a public nuisance is prohibited.

(4) The intentional feeding or the placement of food that attracts pelicans and modifies the natural behavior of the pelican so as to be detrimental to the survival or health of a local population is prohibited.
(5) The intentional feeding of sandhill cranes is prohibited.
(6) No person shall take or assist in taking wildlife using a method that involves remote control aiming and discharging of a gun when that person is not physically present at the location of that gun.

3.1.4 Federal Regulations

Six acts form the basis for wildlife protection at the federal level - Migratory Bird Treaty Act (1918), Lacey Act (1900), ESA (1972), Eagle Protection Act (1962), National Environmental Policy Act (1970), and Federal Insecticide, Fungicide, and Rodenticide Act (1947). Permits required for migratory wildlife control at airports are regulated and issued by the USFWS.

Migratory birds can be harassed without a federal permit but not taken. Harassment of eagles and threatened and endangered species require additional permits. Protected groups, specifically eagles and endangered and threatened species, require a separate federal permit to carryout dispersals and removals. **(Note: It is extremely rare for the USFWS to grant a permit for such actions to non-wildlife agencies.)** Migratory Bird Permit CFR 50, Part 13 is required for taking migratory birds (Form 3-200, Department of the Interior, U. S. Fish and Wildlife Service, Federal Fish and Wildlife License/Permit Application, P.O. Box 49208, Atlanta, GA 30359 Phone: 404-679-7049; Fax: 404-679-7285)

4.0 OBJECTIVES

The objectives of the WHA were to:

1) Identify wildlife species having the potential to cause aircraft strikes at SFB.

2) Identify areas, habitats, environmental factors, and human activities that are attracting species hazardous to aviation to the SFB environment.

3) Provide sound wildlife management recommendations based on observations and data collected during the study to help alleviate wildlife hazards at SFB and surrounding areas in the flight paths of aircraft.

5.0 METHODS

5.1 Wildlife Hazard Data Collection by WS

5.1.1 Fixed-Point Surveys

Fixed-Point Surveys were conducted two or three times a week, for a period of one year. Points were assigned 0.5 miles apart around the perimeter of the airfield and then adjusted for best coverage and safety. The final assignment of fixed-points resulted in 29 locations distributed as can be seen in Figure 1. Observations were made at each point for 3 minutes. All wildlife observed within a 0.25-mile radius during this time and their behaviors were recorded. Weather conditions were recorded for each survey. When applicable, additional wildlife data such as direction of movement, food source, and age class were also recorded. Surveys were systematically assigned times to allow full coverage of daylight hours within a month. The order of assigned times was randomly given to different days throughout each month. Surveys were conducted from a starting location on the ramp by the main terminal and preceded in a clockwise or counter-clockwise direction around the perimeter of the airfield stopping at each point along the way. Time randomization for survey days and variation in survey direction were implemented to lessen the bias caused by creating a pattern. A full list of all species observed during fixed point surveys can be found in Appendix A.

5.1.2 General Observations

Observations of bird use and movements around and within structures and other unique areas of the airport environment that were not covered in the standardized bird survey were recorded as general observations. These observations were made during surveys in between points, as well as during random spot checks and reconnaissance routes from within a vehicle and on foot. General observations were limited to a 5-mile radius of the airport (Figure 2) and were intended to identify any offsite attractants outside of the Airports Operation Area (AOA). Offsite areas were determined to be an attractant if wildlife were observed on multiple occasions and in numbers greater than that of the surrounding areas.

5.1.3 Night Spotlight Surveys

Spotlight surveys were conducted along a predetermined route (Figure 3) one half-hour after sunset. Spotlight surveys were conducted on seven different occasions semi-monthly. All wildlife species observed were recorded as well as numbers and locations on the airfield. Usage of spotlights was done with caution to allow for safe movements of aircraft operating at night. Wildlife observed during spotlight surveys can be found in Appendix B.

5.1.4 Small Mammal Survey

Small mammal (rodent) surveys were conducted twice, once during the summer and once during the fall. Two transects with 50 snap traps spaced 10 meters apart were set up in two different locations on the airfield (Figure 4). Traps were set for two consecutive nights and checked 24 hrs after being set. Peanut butter mixed with oats was used as bait.

Data collection included status of trap (sprung or unsprung) and species captured (Appendix C). Capture rate was defined as the number of animals caught per 100 trap nights. Trap nights were defined as 0.5 nights for traps that were missing, sprung, or held an animal, and 1.0 night for unsprung traps.

5.2 Data Collection by Other Sources

5.2.1 Wildlife Strike Reports

The FAA National Wildlife Aircraft Strike Database was used to gather a history and analysis of wildlife strikes at SFB. The FAA strike summary and risk analysis report can be seen in Appendix D.

6.0 RESULTS

6.1 Analysis of Events Prompting WHA - FAR 139.337(b) (1) & (b)(2)

6.1.1 SFB Air Traffic

The Orlando Sanford International Airport provides service to transient general and local general aviation, and averages 720 operations/day (or 262,800 operations/year). Air traffic statistics for 2008 have been divided into five categories: transient general aviation, local general aviation, commercial, air taxi, and military operations. Transient general aviation accounts for 43% of the total operations at SFB, local general aviation accounts for 53%, commercial 4%, air taxi <1%, and military aviation accounts for < 1%.

6.1.2 FAA Wildlife Strike Reports

The FAA strike reports for SFB are listed from November 22, 1991, to November 13, 2008. As of November 13, 2008, SFB reported 132 wildlife strikes since 1991. The birds and other wildlife struck during this time period can be seen in Figure 5. Seventeen strikes were reported in 2007, and 18 were reported in 2008. A comparison of types of birds struck can be seen in Figure 6. The FAA wildlife strike database includes an analysis and ranking of strikes for a five year period from 2003 to 2007. The wildlife strike analysis and ranking report from the FAA strike database can be seen in Appendix D.

6.1.3 Top Ten Hazardous Bird Groups at SFB

The most hazardous bird groups at SFB are determined from the FAA damage ranking (Appendix E, page iii), strike history (Table 1), and number observed during fixed point surveys. Birds and other wildlife not considered to be in the top hazardous bird groups should not be ignored or considered not to be a hazard. The Table 2 shows the 10 most hazardous bird groups and corresponding abundance and damage threat.

1) Unknown are unidentified birds reported in the strike record.

2) Cattle egrets (*Bubulcus ibis*) are wading birds but present a significant hazard by their unique behavior and numbers.

3) Vultures at SFB were represented by two species: black vultures (*Coragyps atratus*) and turkey vultures (*Cathartes aura*).

4) Sandhill cranes are wading birds but present a significant hazard by their unique behavior and size

5) Wading birds were represented by eight species at SFB: great blue heron (*Ardea Herodias*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), glossy ibis (*Plegadis falcinellus*), white ibis (*Eudocimus albus*), and wood stork (*Mycteria Americana*).

6) Birds of prey were represented by fourteen species at SFB: American kestrel (*Falco sparverius*), bald eagle, coopers hawk (*Accipiter cooperii*), merlin (*Falco columbarius*), Northern harrier (*Circus cyaneus*), peregrine falcon (*Falco peregrinus*), crested caracara (*Caracara cheriway*), swallow tailed kite (*Elanoides forficatus*), osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), barred owl (*Stix varia*), great horned owl (*Bubo virginianus*), and Eastern screech owl (*Megascops asio*).

7) Shorebirds were represented by seven species at SFB: killdeer (*Charadrius vociferous)*, lesser yellowlegs (*Tringa flavipes*), greater yellowlegs (*Tringa melanoleuca*), black-necked stilts (*Himantopus mexicanus*), sanderlings (*Calidris alba*), spotted sandpiper (*Actitis macularius*), wilson's snipe (*Gallinago delicate*).

8) Blackbirds and starlings included five species at SFB: Boat-tailed grackle (*Quiscalus major*), common grackle (*Quiscalus quiscula*), red-winged blackbird (*Agelaius phoeniceus*), Eastern meadowlark (*Sturnella magna*), and European starling (*Sturnus vulgaris*).

9) Doves were represented by two species at SFB: mourning doves (*Zenaida macroura*) and rock pigeons (*Columba livia*).

10) Swallows included 2 species at SFB: barn swallows (*Hirundo rustica*) and tree swallows (*Tachycineta bicolor*).

6.1.4 Airside Operations Wildlife Control

The Orlando Sanford International Airport Operations Staff take a proactive approach to wildlife control. Birds are harassed with pyrotechnics, horns, sirens, lethal control, and chasing when identified to present a threat to aviation. Mammals are trapped and euthanized or removed from the property depending upon status of species caught. Gopher tortoises are caught and relocated to a site outside of the AOA. When road kill or other carcasses are detected in the nearby area they are removed to prevent attractiveness to vultures and other carrion eaters.

Wildlife strikes are being reported and unidentified remains are sent to the Smithsonian lab, in Washington, D.C., for identification. Wildlife logs are kept for harassment efforts, eagle sightings, and to meet conditions of depredation permits.

6.2 Summary of Data Collected During WHA - FAR 139.337(b)(2)

6.2.1 Wildlife Survey

Over a 1-year period, 77 species of wildlife were observed at SFB during fixed point surveys. Bird species accounted for 87% of the 77 wildlife species observed. Twelve of these 77 species are listed as endangered, threatened, or species of special concern by the State of Florida (Table 3). Four of the 12 protected species are recorded in SFB's strike history and one protected species (snowy egret) was struck in 2008.Wood storks and crested caracara are the only species occurring at SFB listed as threatened or endangered by the Federal Government. Bald eagles are protected by the Bald and Golden Eagle Protection Act, and are responsible for 6 strikes in the airport's strike history, 3 of which occurred in 2008.

The most commonly observed species were cattle egrets accounting for 29.7% of all observations. The top 10 hazardous bird groups accounted for 87% of all observations. Crows accounted for 6.2% of all observations, but one day accounts for over half of that. Sparrows made up 1.5%, and gallinules made up 1.3% of all observations. Waterfowl accounted for 0.8%, gulls accounted for 0.7%, and anhingas/cormorants accounted for 0.6%. The remaining 1.9% of observations are made up of : American alligator (*Alligator mississippiensis)*, American robin (*Turdus migratorius*), belted kingfisher (*Ceryle alcyon*), blue-gray gnatcatcher (*Polioptila caerulea*), blue jay (*Cyanocitta cristata*), bobolink (*Dolichonyx oryzivorus*), Carolina wren (*Thryothorus ludovicianus*), snapping turtle (*Chelydra serpentine*), eastern kingbird (*Tyrannus tyrannus*), feral cat (*Felis catus*), Florida redbelly turtle (*Pseudemys nelsoni*), Florida softshell turtle (*Apalone ferox*), loggerhead shrike (*Lanius ludovicianus*), northern cardinal (*Cardinalis cardinalis*), northern mocking bird (*Mimus polyglottos*), gopher tortoise (*Gopherus*

polyphemus), gray catbird (*Dumetella carolinensis*), warblers, and wild turkey (*Meleagris gallopavo*).

Wildlife activity was highest December through January and lowest in September through October. Although the species present on the airport varies throughout the year, wildlife activity remains relatively constant February through August. Observations for all species of wildlife can be seen in Figure 7.

The bird groups were analyzed over 12 months. The top ten bird groups are discussed individually and in order of hazard ranking.

6.2.1.1 Unknown

Description. Unknown birds are any unidentified bird reported in the strike record.

Unknown birds at SFB. The strike record for SFB reported 6 unknown bird strikes in 2007, and 5 in 2008. From 2003-2007 there were six damaging strikes reported at SFB, one of which was unknown. Unknown birds are ranked first in the top ten bird groups because unknown birds present a unique hazard by not providing the information necessary to have an effective management strategy.

6.2.1.2 Cattle Egrets

Description. Cattle egrets are white wading birds (19 – 21 inches in length) with yellow bills, legs, and feet. Breeding adults have patches of buff-orange on crown, nape, lower foreneck, and back.

These birds associate themselves with horses, cattle, or other livestock in moist or dry pastures, where they feed primarily on large insects disturbed by feeding livestock. They also follow tractors plowing fields or mowing large tracts of land to feed on the exposed insects and grubs.

Cattle Egrets at SFB. Cattle egrets were the most frequently observed birds during fixed point surveys and accounted for 1 bird strike in 2008. Cattle egrets were observed in all grassy areas of the AOA and frequently observed in the horse pasture near the east end of Runway 9L-27R. Cattle egrets were in greatest abundance between April and August. The strike in 2008 was in June during the period where observed cattle egret numbers were at their peak. The graph in Figure 8 shows cattle egrets were often seen in flocks evident by having a greater % observation than % frequency. Cattle egrets were seen at 30% of the observation points. The graph also shows that cattle egrets at SFB are primarily residents and increase in number as a result of births from the breeding season and then decline as deaths and emigration occur. The cattle egrets observed at the airfield are believed to be roosting on Bird Island (see section 7.2.1)

Legal Status. Cattle egrets are protected by Federal law. A depredation permit from the USFWS is required for lethal control.

6.2.1.3 Vultures

Description. Vultures are scavengers that have hooked beaks and talons for feeding on carrion. Their heads are devoid of feathers. Black vultures tend to be slightly smaller (range: 23-27 inches) than turkey vultures, have black heads, and a short, squared tail. Turkey vultures, also known as "buzzards," range in length from 26 – 32 inches, have red heads, and a long slim tail. Black vultures have white wingtips, while turkey vultures have brown wings on top, but gray underneath. Soaring turkey vultures hold their wings in a shallow V.

Vultures at SFB. Vultures are among the top ten bird groups because they present a very high damage threat. Of the six damaging strikes reported from 2003-2007, three were vultures. There was one vulture strike reported in 2007 and one reported in 2008 as of November 13. Vultures are likely to be seen at SFB at any time of the year, as individuals or in large groups. Vultures were often observed soaring in circular patterns in the thermals created by the heat reflected by the runways and taxiways. Figure 9 shows that vultures are often seen in groups as opposed to one or two individual by having a % observation much greater than their % frequency. Vultures were seen at less than 10% of the observation points. The graph also shows that vultures migrating from the north arrive in September and stay until March. Vultures present their greatest threat during this time, but a smaller resident population remains after the migrants leave making vultures a threat year round.

Legal Status. Vultures are protected by Federal law. A depredation permit from the USFWS is required for lethal control.

6.2.1.4 Sandhill Cranes

Description. Sandhill cranes are large wading birds that nest around marshes and marsh like areas, but may feed in open fields. They grow to 42" and are omnivorous, feeding on a wide variety of food sources.

Sandhill Cranes at SFB. Sandhill cranes are among the top ten bird groups because of the high damage threat they present due to their large size and abundant presence at SFB. A sandhill crane was reported in the strike record for 2007. Sandhill cranes were most frequently seen in the grassy areas along Runway 9R-27L, but were occasionally seen in grassy areas through the rest of the AOA. Figure 10 shows that sandhill cranes consist of both migratory and resident populations. From September through February migrants

from the north appear at SFB making sandhill cranes an increased threat. Resident sandhill cranes present an increased threat outside of the migration season; during nesting season (February-April), they may be more difficult to disperse as they are unlikely to leave behind nests or young.

Legal Status. Sandhill Cranes are protected by federal and state law. Sandhill Cranes are listed as threatened by the State of Florida. Depredation permits from both the USFWS and FWC are required for use of lethal control.

6.2.1.5 Wading birds

Description. Wading birds are long-legged and tend to be found primarily near standing water. Wading birds belonging to the family Ardeidae (Egrets and Herons) often nest close together in mixed colonies. These birds are sometimes confused with cranes or storks. One easy way to tell them apart is that in flight cranes and storks leave their long necks outstretched, while egrets and herons do not.

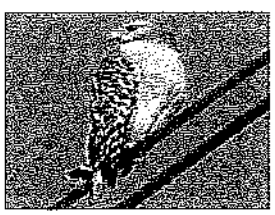
Little blue herons are small birds reaching 24 inches in length with blue body and blue head except in breeding season where its head takes on a more purple color. Juvenile little blue herons are white and easily confused with snowy egrets. These birds are most easily told apart by the dullish green legs of the juvenile little blue herons compared with the snowy egrets black legs with yellow feet. Tricolor herons have blue upperparts with white under belly and stripe up foreneck. Their heads are yellow most of the year and bright blue during breeding season. Tricolor herons reach a length of 26 inches. Snowy egrets are small egrets similar in appearance to cattle egrets. Snowy egrets are most easily distinguished by their black bill and black legs with yellow feet compared to the cattle egrets yellow bill and same colored feet and legs. Cattle egret legs vary in color from yellow in summer to black in winter. White ibis are small wading birds white in color with pink facial skin. Juveniles have brown upper parts with white underside. Bill is long, slender, and curved downward. White ibis reach 25 inches in length. Wood storks are large birds reaching sizes of 40 inches in length. They are white with black flight feathers and tail. Their heads are grey and featherless with a heavy bill.

Wading birds at SFB. Wading birds are among the top ten hazardous bird groups at SFB due to their high abundance and high damage threat. There was one wading bird (snowy egret) reported in the strike record for 2008 as of November 13. Wading birds were most frequently observed in the ditches in between Runway 9C-27C and Runway 9L-27R. After the introduction of the pond at the southeast end of Runway 9R-27L as part of the runway extension project, wading birds frequently began to be observed along the edges of the pond. After periods of heavy rain, the field at the east end of Runway 9L-27R holds water which attracts numerous wading birds. Figure 11 shows that most wading birds at SFB

are residents. This is evident by the decrease in numbers observed during the months of September through February when migrants from the north would arrive in Florida. The increase in wading bird observations from March through August is likely due to increased population size as a result of new births from the breeding season.

Legal Status All species of wading birds are protected by federal law and require a depredation permit from USFWS. Some herons and egrets are also protected by state law. Little blue herons, tricolor herons, snowy egrets, and white ibis are listed as a species of special concern by the state of Florida. Wood storks are listed as endangered by both the federal government and state of Florida. These species also require a depredation permit from FWC for lethal control.

6.2.1.6 Birds of Prey



Description. Birds of prey are predatory birds and scavengers that have hooked beaks and talons for capturing and feeding on prey. Raptors vary in size and food habits. Raptors are a threat to aircraft because of their large size and flight behavior.

Birds of Prey at SFB. Birds of prey are among the top ten hazardous bird groups because of their abundance and high damage threat. Of the six damaging strikes reported from 2003-2007, two were birds of prey. Bald eagles were the most frequently observed bird of prey during fixed point surveys and general observations. Bald eagle numbers were at their highest between October and May. Three eagle nests were detected by WS personnel during aerial surveys conducted in cooperation with Seminole County Sheriff's Department. One nest was located on the airport property and two others were just outside the airport's property boundary. In 2008, eagles were the most frequently struck bird at SFB. Juvenile bald eagles and sometimes mature bald eagles were often seen loafing on the runways and taxiways.

Osprey were frequently seen outside of the AOA, but rarely seen inside. One osprey attempted to build a nest on a signal beacon tower, but was detected in the construction stages and orange netting was placed around the platform of the tower to exclude the osprey.

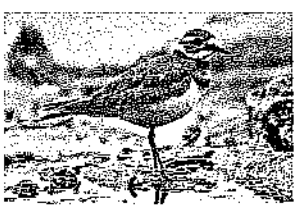
American Kestrels were observed hunting within the AOA and frequently using airport signs and occasionally taxiway and runway lights as perches.

Although most other birds of prey were seen around the perimeter of the airfield where the best hunting perches were present, they were also observed hunting the grassy fields in the AOA. Perches most frequently used were perimeter fences, power lines, telephone poles, airport signs and trees. Figure 12 shows that birds of prey were often seen individually or in small groups by having a percent

frequency greater than the percent observation. The graph also shows that most birds of prey are migrants from the north occurring primarily from September through April. Some birds of prey were present year round, but the threat to aviation posed by birds of prey is greatest when migrants are present.

Legal Status. All birds of prey are protected by federal law. A permit from USFWS is required for lethal control of all birds of prey species. The Bald and Golden Eagle Protection Act provides protection for the bald eagle. Bald eagles, osprey, and the Southeastern American kestrel are also protected by state law, therefore requiring a depredation permit from FWC for lethal control.

6.2.1.7 Shorebirds



Description. Shorebirds are long-legged birds typically found running or walking along the edges of ponds or lakes these birds are represented at SFB by killdeer, lesser yellowlegs, greater yellowlegs, black-necked stilts, sanderlings, and spotted sandpiper. The most abundant of these are killdeer.

Shorebirds at SFB. Shorebirds are among the top ten hazardous bird groups because of the damage threat they present and their high abundance. Shorebirds were frequently observed in the shallow ditches along the east end of Runway 9R-27L. Killdeer were frequently seen loafing on all taxiways. Figure 13 shows that shorebirds at SFB are migrants from the north evident by their large numbers from October through April. Shorebirds were also seen in flocks (by the high percent observation) and at less than 25% of observation points.

Legal Status. Shorebirds are migratory birds and are protected by Federal law. A depredation permit from the USFWS is required for lethal control

6.2.1.8 Blackbirds, Starlings, and Other Icterids

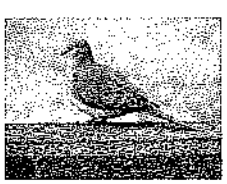
Description. Blackbirds are a family of birds that are primarily black, but not all are black such as the eastern meadowlark. Those observed at SFB are the boat-tailed grackle, common grackle, red-winged blackbird, and eastern meadowlark. European starlings are medium-sized, chunky birds that have iridescent, speckled feathers. Starlings have short tails and a triangular shape when flying. During the breeding season, the bills of both male and female birds are yellow.

Starlings and blackbirds can be a major hazard to aircraft because of their dense body composition and flocking behavior. Aircraft strikes with these species usually involve multiple birds.

Blackbirds, starlings, and other icterids at SFB. Blackbirds are among the top ten hazardous bird groups because of their damage threat and high abundance. Grackles and Eastern meadowlarks were most frequently observed in grassy areas of short height, which included all grassy areas throughout the AOA. Red-winged blackbirds were observed using the shrub-like vegetation surrounding the pond to the west of the Southeast Ramp. European starlings were most frequently observed perched on the terminal building's light structures and on the power lines surrounding the outside of the airport.

Legal Status. Starlings are an exotic species that were introduced from Europe in 1890; therefore, they are not protected by Federal law. Blackbirds (common grackles, boat-tailed grackles, brown-headed cowbirds, and red-winged blackbirds) are migratory species and are protected by Federal law. However, blackbirds can be taken without a Federal permit when they are "found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance..." (50 CFR Ch. 1 § 21.43). Eastern meadowlarks are a migratory species and are protected by Federal law. A depredation permit from the USFWS is required for lethal control of meadowlarks

6.2.1.9 Doves

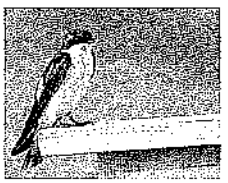


Description. Doves have small round heads and short straight bills. They typically eat grain, seeds, and fruit. Doves prefer food on relatively open ground. Doves require grit to help grind food which is usually small bits of sand or gravel that are ingested to help with the physical breakdown of foods to be digested. Rock doves, or pigeons, usually have a gray body, two black bars on the secondary wing feathers, a broad black band on the tail, and red feet. Body color may vary from gray to white, and black. SFB has both mourning doves and rock doves (pigeons).

Doves at SFB: Doves are among the top ten hazardous bird groups because of their damage threat and high abundance. As of November 13, 2008, both 1 mourning dove and 1 rock dove (pigeon) were reported as a bird strikes at SFB. Mourning doves were frequently observed in the patchy grass areas around the base of the tower and along the southwest side of Runway 18-36. Pigeons were most frequently observed on the terminal ramp and terminal building. Figure 15 shows that doves are present year round.

Legal Status. Doves are migratory birds and are protected by Federal law. A depredation permit from the USFWS is required for lethal control of mourning doves. Rock doves are an exotic species that were introduced from Europe to replace the homing pigeons. They are not protected by federal law and can be lethally removed anytime.

6.2.1.10 Swallows



Description. Swallows are slender aerialists with long, pointed wings. They feed on insects while flying. Tree swallows occur at SFB during winter months, and barn swallows occur during summer months. Barn swallows accounted for three bird strikes during 2008.

Swallows at SFB. Swallows are among the top hazardous birds groups because of the damage threat they present and their high abundance. Swallows were observed everywhere in the AOA at SFB. Figure 16 shows the two groups of swallows and when they occur. Tree swallows fly down from the north and arrive at SFB in October and stay till the beginning of April. Barn swallows fly from the south to SFB and stay from June through August.

Legal Status. Swallows are migratory birds and are protected by Federal law. A depredation permit from the USFWS is required for lethal control

6.2.2 Spotlight Survey

Seven spotlight surveys were conducted, during which eighteen species were observed. The most frequently seen species during spotlight surveys were alligators, feral cats, and sandhill cranes. Locations of the species observed were distributed throughout the AOA, with the exception being the terminal ramp where no species were observed. Alligators were observed in or near ditches, canals, or ponds. No white-tailed deer (*Odocoileus virginianus)* or feral hogs (*Sus scrofus)* were observed during spotlight surveys. A complete list of species observed during spotlight surveys can be found in Appendix B.

6.2.3 Small mammal trapping

Transects were set in two separate areas. The first area was along a wood line and into a meadow of wildflowers and weeds. The second area was a grassy field. These locations can be seen on the map in Figure 4. A total of 5 small mammals were caught during summer and fall trapping. One wood rat and three marsh rice rats were caught during the summer. One marsh rice rat was caught during the winter. When analyzed the results were 0.021 per 100 adjusted trap nights for summer. For fall the results were 0.0051 per adjusted trap night. This suggests the numbers of small mammals are not in excess and that there are more small mammals present in summer than in the fall. Results are of questionable value due to problems with fire ants removing the bait. This was evident from the high number of traps unsprung without bait, and an additional check made on a separate night where a majority of set traps were covered in fire ants within one hour of baiting.

6.2.4 Wildlife Habitat

Wildlife habitat requirements are traditionally broken down into four things: food, cover, water, and space. The habitat within the AOA of SFB provides all of these basic needs for many species of wildlife. While it is impossible to completely eliminate all of these components of wildlife habitat, making them unusable by wildlife is the next closest thing. When used properly the techniques used to harass and devices used to exclude wildlife serve the purpose of making resources unavailable. Wildlife are adaptive and, therefore, methods of making resources unusable must also be adaptive. Making resources unavailable is more difficult than removal of the resources and efforts should be made to remove and reduce all wildlife habitat on and surrounding SFB.

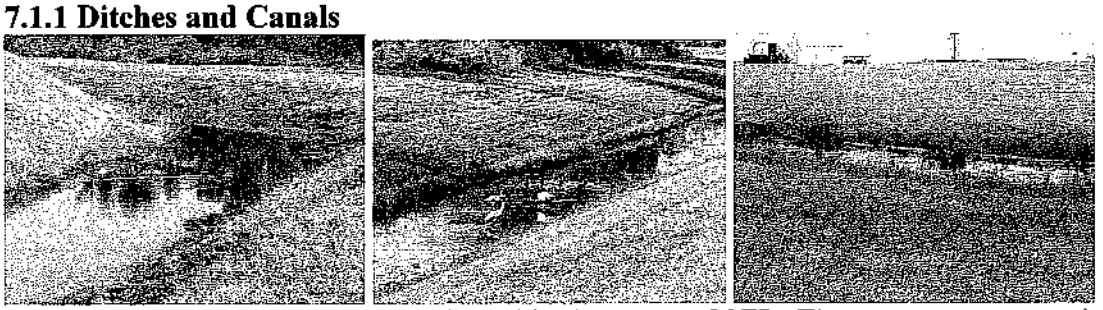
6.2.5 Climate

The weather at SFB has varied over the last 10 years. The weather change from year to year that is likely to have the greatest effect is rainfall (Table 4). The average yearly rainfall over the last 10 years was 45.17 inches. The WHA was conducted following a period where rainfall was less than the average amount (32.34 inches). During the assessment the rainfall was greater than the average amount (58.1 inches). Temperatures fluctuate throughout the year, but the average temperature in any month has not varied by more than 10 degrees since 1999. The average monthly highs and lows, and overall average monthly temperatures for the last 10 years can be seen in Table 5.

7.0 RECOMMENDATIONS - FAR 139.337(b)(3)

7.1 On Site - Airport Property - FAR 139.337(b)(3)

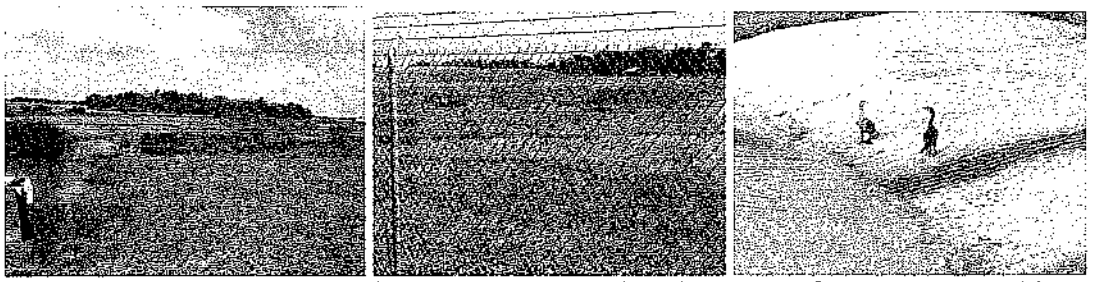
7.1.1 Ditches and Canals



There are several ditches and canals within the AOA of SFB. These areas are attractive to many species of wading birds, waterfowl, shorebirds, blackbirds, birds of prey and other species of wildlife. Wading birds, waterfowl, and shorebirds were frequently observed using the ditches between Runway 9L-27R and 9C-27C as a feeding ground. These ditches are shallow and do not drain completely. Shorebirds were frequently observed in the ditches along Runway 9R-27L. These ditches are shallow, drain well, and present exposed sandy areas that are moist. These ditches present preferable feeding and loafing areas for shorebirds. See Figure 17 for locations of ditches and canals.

Ditches and canals should be kept free of vegetation and have steep side slopes maintained with a 2:1 slope. Exposed sand and soil should be replaced with a grass cover or other material such as rip-rap, large rocks, or artificial turf. Where possible ditches and canals should be made to drain within 24 hrs and/or be covered in such a way to discourage and exclude usage by bird species.

7.1.2 Lakes and Ponds



There are 2 large permanent bodies of water within the AOA of SFB. One pond is to the west of the Southeast Ramp, and one is on the southeast end of Runway 9R-27L (Figure 17). The pond to the west of the Southeast Ramp is heavily surrounded by vegetation and filled with submergent aquatic vegetation. This vegetation is utilized by blackbirds and gallinules for roosting and nesting. The pond on the Southeast end of Runway 9R-27L is heavily used by wading birds, anhingas, cormorants, and shorebirds. These bodies of water are attractive to wading birds, waterfowl, blackbirds, birds of prey and other species of wildlife. These areas should be kept free of vegetation and have steep banks with 2:1 slopes. Birds should not be allowed to sit on the water's surface and be forced to leave immediately upon detection. Where possible these bodies of water should be covered in such a way to discourage and exclude usage by bird species.

Several areas are prone to flooding producing ephemeral ponds or temporary wetlands. The two most prevalent areas are the area adjacent to the pond near the Southeast Ramp and the field at the east end of Runway 9L-27R (Figure 17). Both of these ephemeral wetlands are attractive to wading birds, shorebirds, and blackbirds. These areas should have drainage improved to prevent standing water.

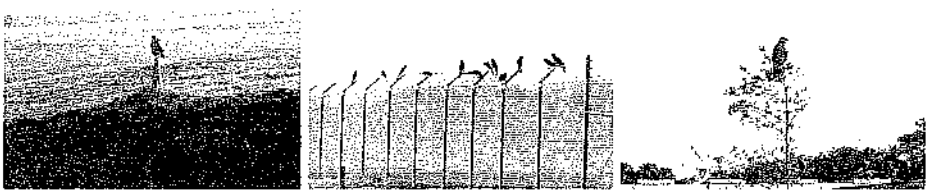
To control vegetation in these environments, it is necessary to chemically treat and/or mechanically remove vegetation several times a year. If vegetation is managed properly each year, it is possible that chemical spraying several times a year will be all that is necessary. It is important to note that herbicide applications may be needed every 3 - 4 months (or if monitored regularly, herbicides should be applied only as needed). This is dependent on the plant species involved and the amount of growth observed since previous herbicide applications. The described management strategy would prove effective in obtaining long-term wildlife hazard control results.

It will also be important that all debris, silt, and vegetation dredged from ponds be removed from the AOA immediately (within 1 hour). If these materials are not removed from site, they will attract numerous birds hazardous to aviation (i.e. vultures, crows, grackles, and wading birds). It may be necessary to sod grass on disturbed banks following removal operations to avoid erosion.

7.1.3 Trees and Vegetation

All trees and other vegetation should be cleared from with in the AOA. These areas provide cover, nesting sites, and perches for many bird species and are also utilized by other species of wildlife. There are wooded areas to the west of the Starport Ramp, a wooded area behind the Aircraft Rescue and Fire Fighting Station, and a wooded area to the west of the Southeast Ramp (Figure 17). These areas should be clear cut and all remaining shrubs and vegetation removed.

7.1.4 Perches

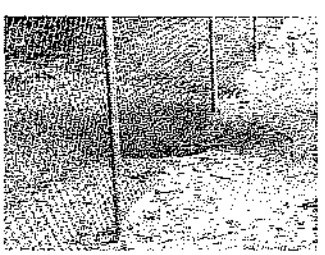


Signs, fences, power lines, building ledges, lights, trees, vegetation, vehicles, and any structure that sits above ground height may be used as a perch for birds. Minimizing the number of perch sites available and using exclusion devices (For example Nixalite, spiderwire, or spike strips) may help keep birds from using the area. No birds should be allowed to perch on structures within the AOA and harassed immediately upon detection.

7.1.5 Insects

Many species of birds frequently occurring at SFB are feeding on insects (primarily cattle egrets and swallows). The use of pesticides for insect control could reduce availability of this resource. SFB must not allow insect-eating birds to get their full daily energy requirement from within the AOA.

7.1.6 Security/Perimeter Fences



The perimeter fences have numerous holes caused by the burrowing of gopher tortoises. These holes provide easy access into the airfield for many species of mammals and large reptiles (alligators/exotics). These holes should be filled once gopher tortoise and any other animals are removed from burrow, and an apron that extends underground should be

7.1.9.15 All Other Birds

Any species of bird not discussed above should be harassed with pyrotechnics, vehicles, and other devices. The habitat alterations for the groups previously discussed should discourage use from almost all species of bird. Lethal control should be used as an integrated part of non lethal harassment. All migratory birds require a permit from USFWS for lethal control. State and Federal listed species require additional permits for lethal control. A list of all state and federally listed species observed at SFB can be found in Table 4.

Note: Protected species statuses change. The list included in the appendix is current for date of this report only. Check with USFWS and FWC to keep list of protected species current

7.1.9.16 Gopher tortoise

Gopher tortoise management consists of relocation and improvement to perimeter fencing. It is recommended that an intense effort to relocate and remove all gopher tortoises from within the AOA be undertaken. Gopher tortoises should be captured on sight and all burrows should be dug out and filled once any occupying animals (gopher tortoise and others) are removed. The perimeter fencing should be improved to include an apron that extends underground to prevent burrowing underneath the fence. Areas with multiple gopher tortoise and burrow sightings can be seen in Figure 17. Gopher tortoises are listed as threatened by the state of Florida and require a permit from FWC to relocate.

7.1.9.17 Alligators

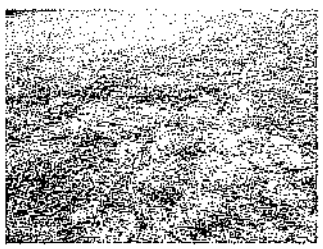
Alligator management generally consists of habitat removal, trapping, and lethal removal. Alligators are present in nearly every body of water on and around SFB and have an unusually high population density in Lake Jessup. They are commonly seen in ponds, lakes, canals, ditches, and temporary pools. It is recommended that all alligators within and in close proximity to the movement area be removed. Florida requires a licensed alligator trapper to remove alligators.

7.1.9.18 Raccoons

Raccoon populations are managed through habitat manipulation (removal of wooded areas and other vegetation), trapping followed by euthanasia, and lethal removal. Additionally all trash or refuse should be kept in secure containers.

added to help prevent and deter animals from digging under the fence. The section of fencing along the northwest perimeter of the airfield has multiple large holes caused by gopher tortoises creating burrows underneath it (Figure 17).

7.1.7 Grass Management



Grass should be kept as a uniformed monoculture at heights between 6 and 10 inches. A solid dense grass cover with moderate height will help to deter usage by doves, shorebirds, blackbirds, and many other grassland species. This grass height will be tall enough to obstruct the vision of these birds, making it unattractive to them and thereby reducing utilization. However, grass height should be short enough to avoid producing seed heads. Weeds, wildflowers, and cactus should be removed as these create food sources. Mowing should be conducted at night, or after the sun goes down and before the sun rises to prevent attractiveness to cattle egrets and other insect eating birds attracted to the insects disturbed by mowing. Bahia grass is recommended to be used as the primary grasses in and around the airfield. Establishing grass ground cover is preferred over broadcast seeding or tilling. See Figure 17 for grass areas most attractive to grassland birds. Fields and open areas should be cleared of all bushes, shrubs and trees. Any mast producing plants should be removed and a uniform monoculture grass cover should be the only vegetation type permitted. Weeds, wildflowers, and cacti should be removed. Open areas that are not covered with grass should be paved, sodded, or covered with rocks. Sandy and bare areas should not be exposed. There are areas in the AOA with patchy grass cover, weeds, exposed sand, and grass height less than 6 inches, such as the fields at the north end of Runway 18-36 and along the north side or Runway 9L-27R.

7.1.8 Wildlife Control and Removal

Wildlife control at an airport the size of SFB is a full-time endeavor. This work should be done with one or more airport personnel exclusively dealing with wildlife issues. If this work is not done by a qualified wildlife hazard biologist, it should be overseen and supported by a part-time wildlife hazard biologist. Wildlife personnel should be able to respond to wildlife hazards 24 hours a day, 7 days a week.

There are several reasons why SFB would benefit from a Wildlife Hazard Biologist. The biologist would:

1) Carryout and monitor the Wildlife Hazard Management Plan as needed.

2) Resolve wildlife related problems that negatively impact airport safety. The biologist will assist the airport as questions/concerns arise. The airport environment will be monitored weekly or as deemed necessary.

3) Have knowledge of wildlife, wildlife problems, what presents hazards; experience in locating problems (where they are coming from and how to

best resolve problems); and knowledge of the various wildlife control techniques available.

4) Have foresight in developing wildlife hazard control needs; have the ability to identify developing wildlife hazards and take preventative control measures before problem species become well established on the airport; and avoid or reduce crisis management (crisis management involves more costly measures than would be incurred had preventative approaches been used).

5) Monitor ongoing construction activities at SFB. These activities effect wildlife habitat, may result in wildlife displacement from known areas, and may inadvertently create other wildlife hazards. The biologist can monitor these activities to determine the affect on wildlife species on the airfield.

6) Monitor wildlife populations. Wildlife populations are highly dynamic. Feeding, roosting, nesting, and loafing areas may change - as a result of weather, human activity, seasonality, and other factors. It is important that these activities are monitored daily, weekly, seasonally, etc., because patterns of wildlife activity observed during the Wildlife Hazard Assessment will not remain static.

7) Monitor Federal and State listed species. It is necessary that a qualified biologist monitors the listed species present on the airport, and carries out control measures that comply with both state and federal regulations. This keeps the airport in compliance with wildlife regulations, reduces problems associated with private conservation groups (i.e. law suits), and provides a basis for sound ecological management of these species on airport property.

8) Improve the wildlife control program at SFB. The current program is a good effort, but could be made more efficient and effective by the inclusion of a qualified wildlife professional.

A full-time wildlife biologist should be considered if wildlife numbers get to such a point where part-time control is not reducing the hazards.

7.1.9 Control Measures Needed For Hazardous Wildlife at SFB

There are a number of wildlife species/groups that represent a substantial threat to safe air operations at SFB. In many cases, control measures are the same for all groups addressed below; however, some groups require additional measures. Also, not all groups are considered primary (direct) threats to aircraft; some create secondary hazards [i.e. gopher tortoises, raccoons (*Procyon lotor*), opossums (*Didelphis virginianus*), armadillos (*Dasypus novemcinctus*), etc., are not considered direct threats to aircraft, but create

situations where a strike involving one of these species can attract another species that subsequently is struck by an aircraft and causes direct damage]. Despite not being considered a direct threat, sometimes wildlife considered secondary threats can result in direct damage in rare and unusual circumstances. Control measures needed to alleviate hazards associated with 22 species and/or groups are outlined in detail in the following sections

7.1.9.1 Cattle Egrets

Cattle egret management should begin with restrictions on grazing livestock's proximity to the airport. Grazing livestock should not be located in approach zones or adjacent to airfield property. Mowing on the airfield should be planned for early-morning and late-evening hours when the birds are less likely to flock to the site. Cattle egrets should be dispersed anytime they are observed on the AOA. When it is determined that dispersals alone are not a deterrent, lethal removals should be conducted. Harassment and dispersal of cattle egrets at roost sites has been shown to be an effective means for reducing numbers of cattle egrets using airports. If permission can be granted from the landowner, dispersal of the roosting site at Bird Island could prove an effective part of a strategy to reduce numbers of cattle egrets occurring at SFB. See Figure 2 for location of Bird Island, and Figure 17 for grassy areas most attractive to cattle egrets.

7.1.9.2 Vultures

There are various tools at the disposal of SFB to disperse and reduce vulture hazards. Harassment with pyrotechnic devices, such as shell crackers and bird bangers or screamers, is the preferred technique to discourage vultures from using a given area. When vultures become accustomed to harassment and persist in using the area, they should be lethally removed. A permit is required to shoot offending vultures. When vulture roosts are located, the roost trees should be thinned to reduce the attractiveness of the site. Frequent dispersals/removals are the most commonly used forms of control; however, use of vulture effigies to disperse roosts and loafing sites would prove most effective in reducing strikes over the long run. Guidelines for using vulture effigies are stated in Appendix F. Dispersal of vultures from roosting and loafing sites has reduced or eliminated the associated nuisance, property damage, and depredation problems. The effect on vultures is rapid and durable, provided the carcass or effigy is suspended free from obstructions to visibility and movement. It should be stressed that both species of vulture are protected by Federal laws, and it is unlawful to possess them without a permit from the USFWS. Therefore, this technique can only be used under supervision of the appropriate authorities. The most important factors in reducing vulture hazards are frequent dispersals and the integration of several dispersal techniques into the control program. In addition, all animal carcasses found in the vicinity of the airport should be buried or disposed of to reduce vulture attraction to the area.

7.1.9.3 Sandhill Cranes

Sandhill crane management consists of habitat management, exclusion, and frequent dispersals. Habitat management should focus on wetlands found within the AOA and on food sources adjacent to the AOA (i.e. pastures). All wetland habitats need to be removed or excluded from the AOA. . The main form of exclusion involves having a fence around the entire wetland area. It is important to note that exclusion will only work when cranes have chicks that are too small to fly over a fence. Dispersals and habitat removal should be conducted prior to the nesting season (February-April). All available habitat should be removed prior to nesting and all known cranes should be dispersed from the AOA anytime they are observed. See Figure 17 for grassy areas most attractive to sandhill cranes.

It is important to note that dispersing young sandhill cranes during spring and summer months could lead to incidental take violations. This essentially means that by causing undue duress to the young cranes and causing them to die from heat exhaustion, pneumonia, etc., the airport may violate any permitting conditions stated by FWC allowing the airport to disperse sensitive species (State Listed Species). This is the reason for discouraging crane use of the airport prior to nesting season.

Harassment of sandhill cranes with pyrotechnics proves to be ineffective once they become habituated. The use of sirens and chasing with vehicles has proven to be an effective means of dispersal from an immediate area at SFB, but not from the AOA. Lethal control is recommended, but requires a depredation permit from the FWC as sandhill cranes are listed as Threatened by the State.

7.1.9.4 Wading Birds

Wading bird management is best approached through habitat manipulation, prey-base reduction, and frequent dispersal/removal operations. Habitat manipulation involves the removal of all aquatic vegetation from canals, ditches, and ponds; proper drainage of the airfield to facilitate rapid drainage; and moving all wetland mitigation projects off property. Prey-base reduction (fish and invertebrates) is needed to decrease the attractiveness and productivity of wetlands to wading birds. Wading birds should be dispersed anytime they are observed on the AOA. When it is determined that dispersals alone are not a deterrent, lethal removals should be conducted only if species are not listed as protected by the state or federal government, or after all the appropriate depredation permits have been issued by both the state and federal governments. See figure 17 for permanent bodies of water and areas of temporary standing water attractive to wading birds.

7.1.9.5 Birds of Prey

Several species of birds of prey are found on SFB. Most of these species present a serious hazard to aviation. Often this group of birds is not easily dispersed, especially once they have established a territory. Habitat manipulation involving removal of perches or hunting trees on the AOA will make it more difficult for hawks and owls to survey the area for prey. Harassment with pyrotechnic devices, such as shell crackers and bird bangers or screamers, is the preferred technique to discourage raptors from using the airfield. When particular raptors become accustomed to harassment and persist using the airfield, they should be removed. A permit is required to shoot offending raptors or to trap and relocate them. If a trapping and relocation project is conducted, great care must be taken when handling the raptor to protect the bird and the handler. The raptor should be relocated a minimum distance from the airport determined during the permitting process, and should have an approved identification leg band attached for future reference. If relocation fails and the raptor returns to SFB, then the bird should be lethally removed. Only professional wildlife biologists or falconers should conduct relocation activities.

Bald eagles at SFB often do not respond to harassment with pyrotechnic devices. Bald eagles in the air typically do not divert their flight path as a result of being harassed with pyrotechnics. Bald eagles on the ground, perched in trees, or on structures often refuse to move when harassed with pyrotechnics and require additional incentive to move, such as being approached by a vehicle or person. When bald eagles are dispersed in this manner, they often move just far enough to be out of range for additional harassment and still within the AOA. When approached a second time, the eagles often return to the original location they were harassed from. This method of harassment often causes eagles to cross runways repetitively before being dispersed to an acceptable location. Lethal control to reinforce pyrotechnics and a trapping and relocation program are recommended. Nests on airport property or near the AOA should be relocated and the nesting trees removed. See Figure 17 for locations of bald eagle nests. Bald eagles are protected by the Bald and Golden Eagle Protection Act, which currently has no provisions to permit the taking, trapping, possession, and nest removal of bald eagles. Previously permits were issued through the Endangered Species Act, but since the eagles were delisted, this means of permitting no longer exists.

7.1.9.6 Shorebirds

It is thought that shorebirds may be discouraged from feeding on the airfield by keeping grass height 6 to 10 inches. The theory is that this grass height will be over the birds' heads, thus obstructing their view and making them feel more vulnerable to predators. Shorebirds may be harassed from the airfield with pyrotechnic devices, such as screamers and bangers. Lethal control should be used when pyrotechnics prove ineffective. Shorebirds are also attracted to the

areas on the airfield with moist exposed soil or sand. These areas should be covered with grass or other material such as gravel to remove this attraction to the birds, but not impede drainage. Shorebirds like to forage and loaf in these exposed sandy areas which are similar to their traditional habitat of beaches and lake shores. See Figure 17 for locations of ditches and temporary standing water attractive to shorebirds.

7.1.9.7 Blackbirds

It is thought that blackbirds may be discouraged from feeding on the airfield by keeping grass height 6 to 10 inches. The theory is that this grass height will be over the birds' heads, thus obstructing their view and making them feel more vulnerable to predators.

Flocks of blackbirds can be harassed from the airfield with pyrotechnic devices, such as screamers and bangers. The wildlife biologist/airport personnel must be persistent with these methods. Lethal reinforcement may be necessary if the blackbirds become habituated to the pyrotechnics.

Blackbird management has several approaches with varying degrees of effectiveness. The most effective approaches are habitat removal and the use of Avitrol®. Dispersals, trapping, and nest removal can have a significant effect if used in combination with habitat removal and Avitrol®. Blackbirds and grackles roost in shrubs and wetland vegetation. It is recommended that all aquatic vegetation be removed on the AOA. When grackle and blackbird nests are located, they should be removed. Nest removals should be carried out every spring. Various forms of dispersal should be used to discourage blackbird use of the AOA. If all other approaches prove ineffective, it is recommended that Avitrol® be used to aid in the control of blackbirds on the airfield.

7.1.9.8 Doves

Weed removal and grass management is the best approach to managing dove numbers on the airport environment. Doves have been observed on perimeter fences and in open fields frequently. The most attractive of these areas are the areas next to the tower and along the perimeter fence south of the tower. Refer to Figure 17 for locations of grassy areas attractive to doves. The reasons for dove concentrations in these areas are the abundance of bare ground and prolific weed growth. It is recommended that these areas be fertilized to promote more uniform grass cover, and sprayed with herbicides to reduce weeds. When habitat modification is taking place and the ground cover is disturbed (i.e. construction projects), it is recommended that grass sod be placed over the exposed ground instead of broadcast seeding. The use of rye, rye grass, etc., should be strongly discouraged. Artificial turf approved for use at airports such as Avturf, is also recommended as an alternative method to reduce food sources and provide a uniform grass cover. Doves should be dispersed and/or lethally removed when

observed inside the AOA. In areas where shooting is not an option due to safety concerns, such as pigeons around the terminal an alternative removal method is live trapping.

7.1.9.9 Swallows

Swallows respond poorly to harassment and should be managed by reducing insect availability. This can be done by treating grass with insecticides or insect growth inhibitors. This can also be accomplished by replacing grass with artificial turf approved for airport use, such as Avturf. A combination of Avturf in safety areas and insecticides in other areas could provide best results. Lethal control may be effective, but requires skilled shooters as swallows fly fast and in irregular patterns.

7.1.9.10 Waterfowl

Waterfowl have been observed in the ditches near Runway 9L-27R.Waterfowl control consists of several management options (Figure 17). By far, the most important of these are habitat removal and dispersal/lethal removal. All aquatic vegetation on the AOA needs to be removed. This involves both emergent and submergent plant species. Habitat modification can reduce the number of waterfowl at SFB. Preventing access with exclusion devices to ponds, ditches, and canals on airport property can make the airport less attractive to waterfowl. Any standing water areas on the airport should be modified to facilitate proper drainage.

Dispersals and lethal removals need to be frequent and used in an integrated approach. Pyrotechnics (shell crackers, screamers, bangers, etc.) and lethal control should be used together for best results.

7.1.9.11 Anhingas/Cormorants

Anhingas and double-crested cormorants have been frequently observed at the ponds to the east of the Southeast Ramp, and the pond at the southeast end of Runway 9R-27L (Figure 17). Anhingas and cormorants are large birds with long necks that feed primarily on fish. The two can be most easily distinguished from one another by the long pointed bill of the anhinga, and the hooked bill of the cormorant. Anhingas are known for swimming with their body under the surface of the water and just their long neck protruding from the surface. This behavior has resulted in anhingas being called snakebirds because of the similarity their neck sticking out of the water has to a snake. Cormorants sit on the waters surface like a duck and only submerge when diving to feed. Both anhingas and cormorants perch with their wings expanded to dry after swimming. The size of these birds presents a significant damage threat to aviation. These birds should be harassed with pyrotechnics integrated with lethal control. While drying their wings anhingas and cormorants may be hesitant to leave as flight may be

impossible or difficult depending on how wet their feathers are. If unresponsive to harassment, giving time for feathers to dry may be necessary before further harassment results in dispersal. For this reason exclusion from water sources with grid wires, netting, or other physical barriers is preferred to harassment for these species. Anhingas and double-crested cormorants are protected by federal law and a depredation permit is required for lethal control.

7.1.9.12 Gallinules

Gallinules are a group of birds that consist of American coots and common moorhens at SFB. This group of birds is often mistaken for ducks due to their behavior of swimming on the waters surface. American coots and common moorhens are smaller than ducks and have a pointed beak as opposed to the flat bill of a duck. American coots and common moorhens look similar to each other being of similar size and having black feathers. American coots have a gray bill and common moorhens have a red bill with a red frontal shield extending up their head. Gallinules are attracted to the vegetation in and surrounding the pond to the west of the Southeast Ramp. Control for gallinules consists of removal of aquatic vegetation, harassment with pyrotechnics and lethal control. American coots and common moorhens are protected by federal law and require a depredation permit for lethal control.

7.1.9.13 Gulls

There are several management options available for alleviating hazards caused by gulls. Gulls are a primary hazard during fall, winter, and early spring. The most effective means of alleviating gull hazards is continual and persistent dispersals. This would involve an integrated management strategy using propane cannons, pyrotechnics, lethal removals, Avitrol®, and exclusion. When the birds are first observed, pyrotechnics and harassment from the area should be used. Reinforcement of pyrotechnics with lethal removal should be used when gulls become acclimated to harassment techniques. The most important factor with gull dispersal operations is to remain persistent the entire time gulls are present in the airport environment. In loafing areas, where it is difficult to disperse gulls for extended periods of time, the use of Avitrol® may prove effective. Gulls are a major hazard to aircraft because of their abundance, size, and flocking behavior. There are two reported strikes of gulls at SFB one in 2007 and one in 2008.

7.1.9.14 Wild Turkey

Wild turkeys are a hazard to planes taxiing around the airfield and those just landing or taking off. Wild turkeys may be discouraged from the airfield by removing their food and habitat. Relocation and/or release of turkeys is illegal without written permission and assistance from FWC. Pyrotechnics and vehicles should be used to harass the birds from the airfield. This will allow any persistent turkeys observed on the airfield to be lethally removed.

7.1.9.19 Opossums

Opossum populations are managed through habitat manipulation (removal of wooded areas and other vegetation), trapping, and lethal removal. Additionally all trash or refuse should be kept in secure containers.

7.1.9.20 Foxes

The most effective means of managing foxes (*Urocyon cinereoargenteus)* gray foxes on airport property are habitat manipulation, trapping with snares and padded leg hold traps, and lethal removal.

7.1.9.21 Coyotes

The most effective means of managing coyotes (*Canis latrans*) on airport property are habitat manipulation, trapping with snares and padded leg hold traps, and lethal removal

7.1.9.22 Armadillos

There are very few management strategies proven effective in controlling armadillo populations; however, numbers can be substantially reduced through shooting. Armadillos create secondary hazards, which attract birds to feed on the carcasses on the runways and taxiways. All armadillo holes and dens should be filled in, and all armadillos sighted around the movement area should be removed via lethal means. Shooting is the only effective means of reducing armadillo numbers in these areas; trapping has proven ineffective in reducing armadillo populations.

7.1.10 Fish and Aquatic Invertebrate Control

To assist in reducing fish-eating bird use of ponds, canals, and ditches on and around SFB, one option is that prey-base removal is conducted on a trial basis. Prey-base removal will consist of removing all size classes of fish and aquatic invertebrates from selected areas. Electroshocking could be used initially to remove the larger fish. To remove the remaining smaller fish (this group attracts more fish-eating birds than the larger sized fish) and invertebrates, the ponds should be treated with Rotenone and copper sulfate, respectively. Potassium permanganate can be used to neutralize rotenone to prevent it from spreading to other bodies of water. Personnel must be present to remove all fish that surface after the chemical has been applied. It is important to note that by removing the larger fish alone, an increase in the number of smaller fish in a water body will subsequently occur; increasing its attractiveness to birds. Seining, water drawdown/drainage, and vegetation removal are other methods that can be used to decrease fish numbers. Before prey-base removal is carried out, the appropriate permits

must be obtained through the state of Florida. The trial basis of this option would be to determine both effectiveness and frequency of treatments. It is known that this option would require on-going treatments, but how often is not currently known. Any necessary permits should be acquired before application.

7.1.11 Wildlife Control Permits

All state and federal permits needed to disperse and lethally remove wildlife on airport property should be obtained and kept current. The State of Florida has passed a ruling [Rule 68A-27.002, F.A.C.] allowing airports to disperse State Listed Species that are on airport property

7.2 Off Site - Off Airport Property - FAR 139.337(b)(3)

7.2.1 Bird Island

Bird Island is an island in Lake Jessup located approximately 2.7 miles south of SFB. Most of the wading birds using the airfield as a feeding ground, including cattle egrets, are believed to use this island as a roost and nesting ground. The separation from the mainland offers protection from land based predators creating a very attractive site for use by birds.

7.2.2 Natural Areas

The area surrounding SFB is surrounded by natural habitat that is capable of supporting numerous species of wildlife. These areas act as a source to repopulate the airport once current residents are removed, or new space or food sources are made available.

7.2.3 Pond and Ditch Network

Numerous retention ponds, detention ponds, drainage ditches and canals surround the airport. Additionally the St. John's River, Lake Monroe, and Lake Jessup make the land mass SFB is located on surrounded by large natural bodies of water. This network of ponds and ditches creates a stepping-stone-like network of feeding and resting areas connecting the bodies of water on and around the airport to the natural bodies of water surrounding them. Together these ponds create a very large wildlife attractant.

7.2.4 Neighboring Properties and Local Community

An effort should be made to inform other businesses and residents of the dangers that attracting wildlife can cause to aviation. This information should ask neighbors of the airport to keep their outside areas free of trash and to keep all garbage in closed containers. Feeding of any wildlife should be greatly discouraged. Neighbors of the airport should also be encouraged to report roosting sites of vultures and other birds and allow these roosts to be dispersed by trained professionals.

7.3 Wildlife Hazards to Air Carriers - FAR 139.337(b) (4)

All air carriers using SFB should be made aware of wildlife hazards present at and around the airport. It will also be important that air carriers are encouraged to report wildlife strikes or hazards to the appropriate airport personnel, and report all strikes on FAA Wildlife Strike Form 5200-7. Air carriers should be made aware of the importance in reporting wildlife strikes and/or hazards; otherwise, without specific information identifying the species creating hazards at SFB, it is virtually impossible to manage for an unknown hazard.

ACKNOWLEDGEMENTS

We offer our sincere thanks to all of the Orlando Sanford International Airport staff who provided so much assistance in the completion of this project. Everyone was very supportive and cooperative, but special tribute is due the airport operations personnel.

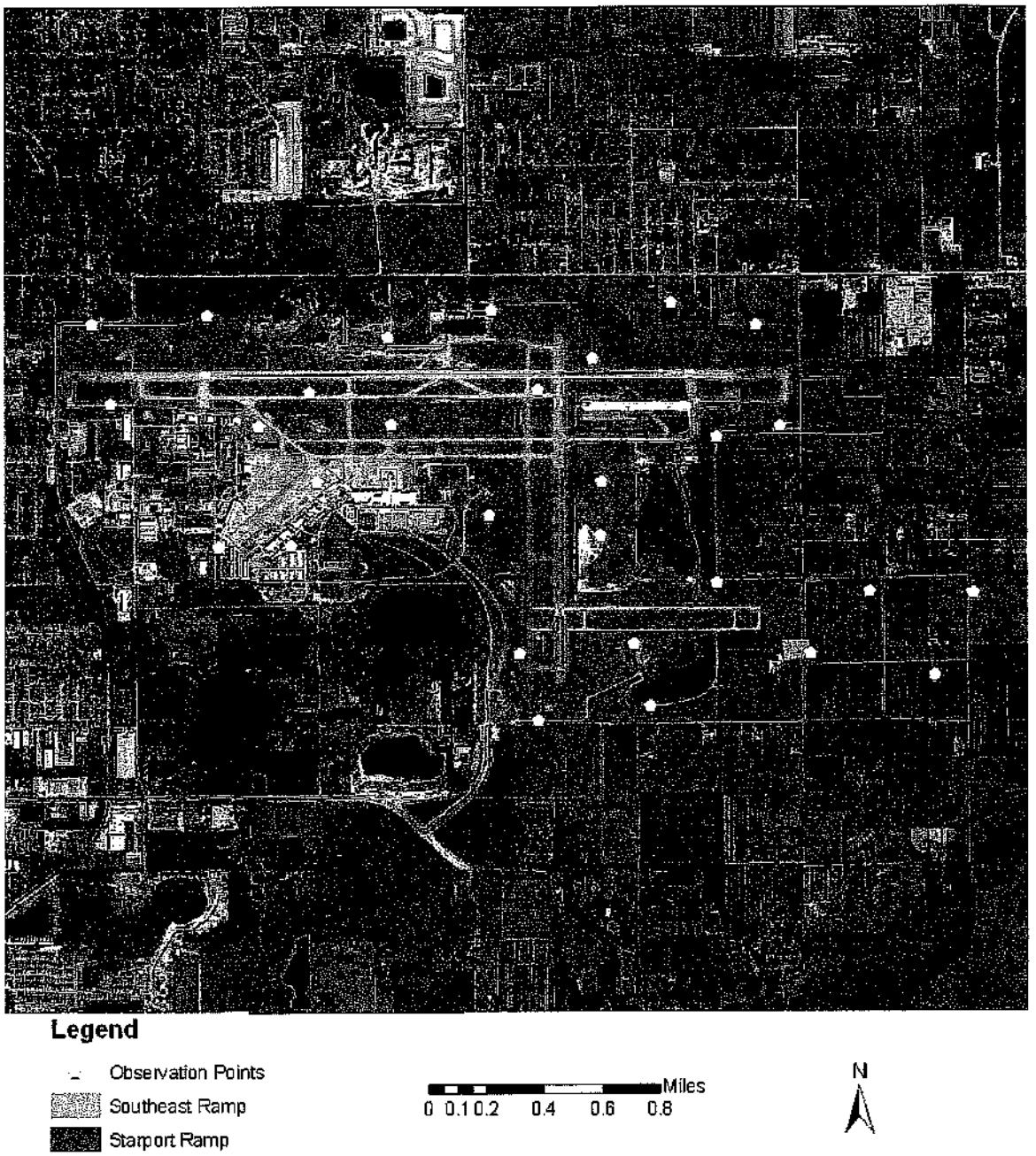


Figure 1. Location of fixed points on survey route at Orlando Sanford International Airport.

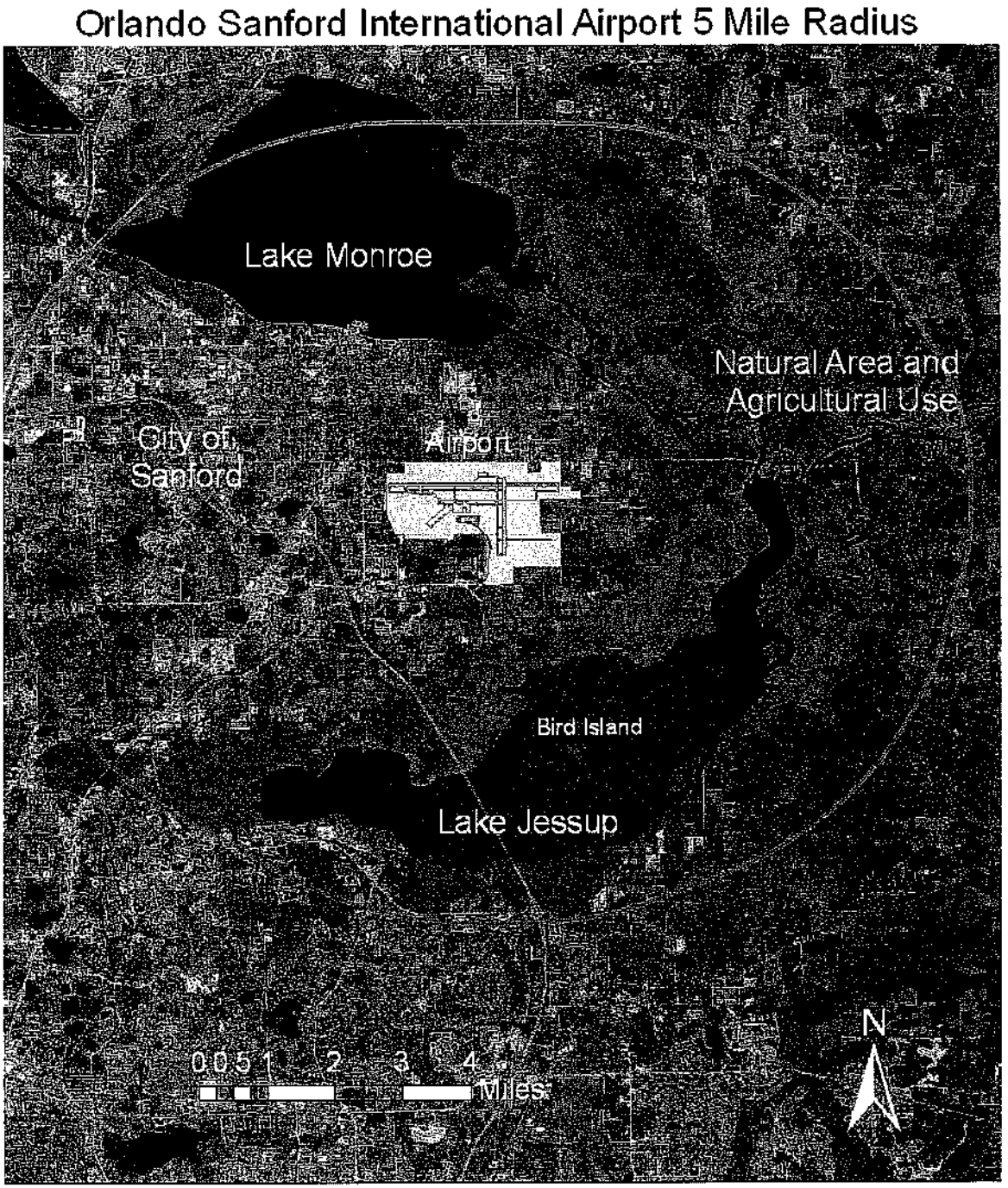


Figure 2. Five mile radius for general observations of Orlando Sanford International Airport.

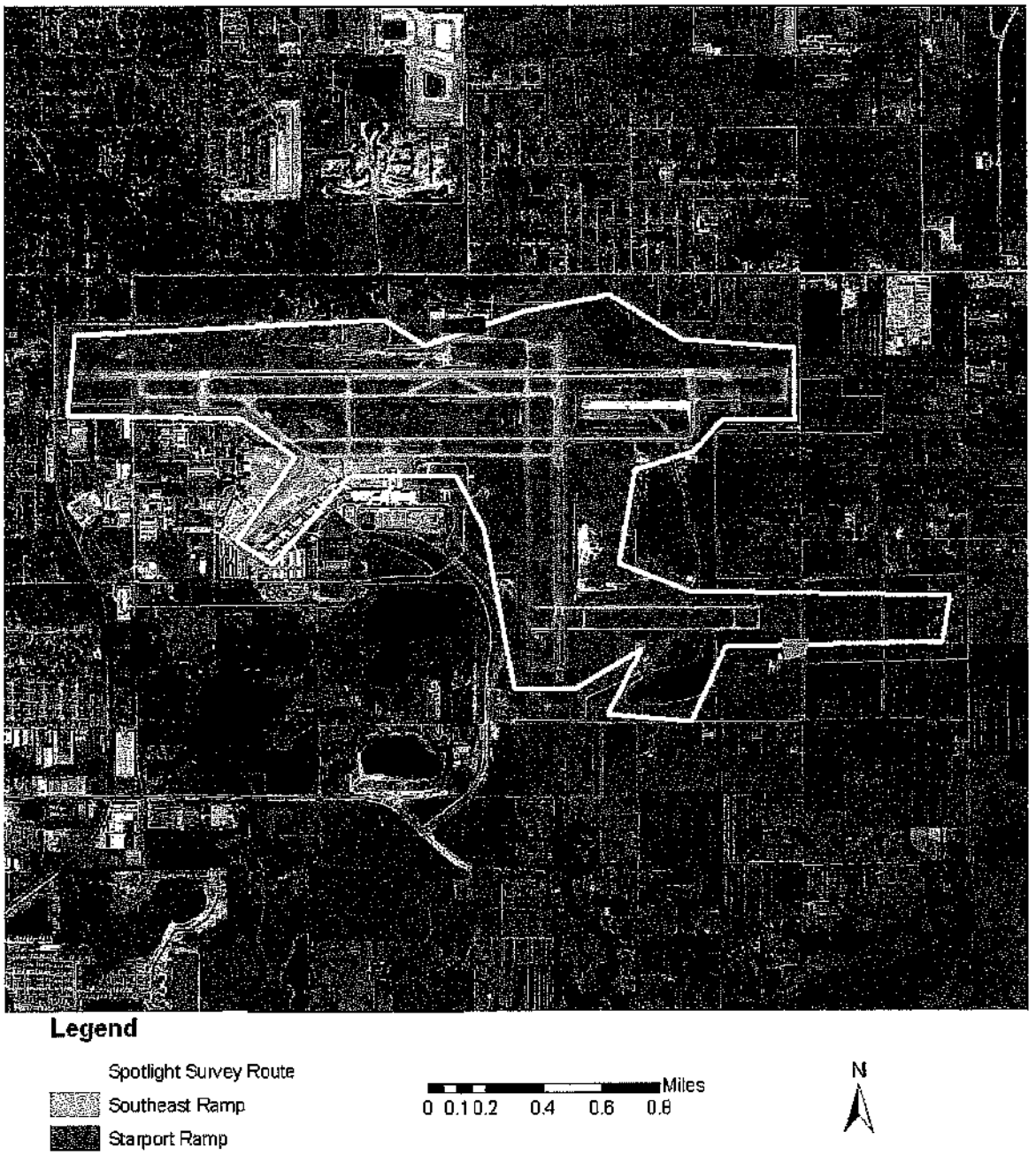


Figure 3. Spotlight survey route at Orlando Sanford International Airport.

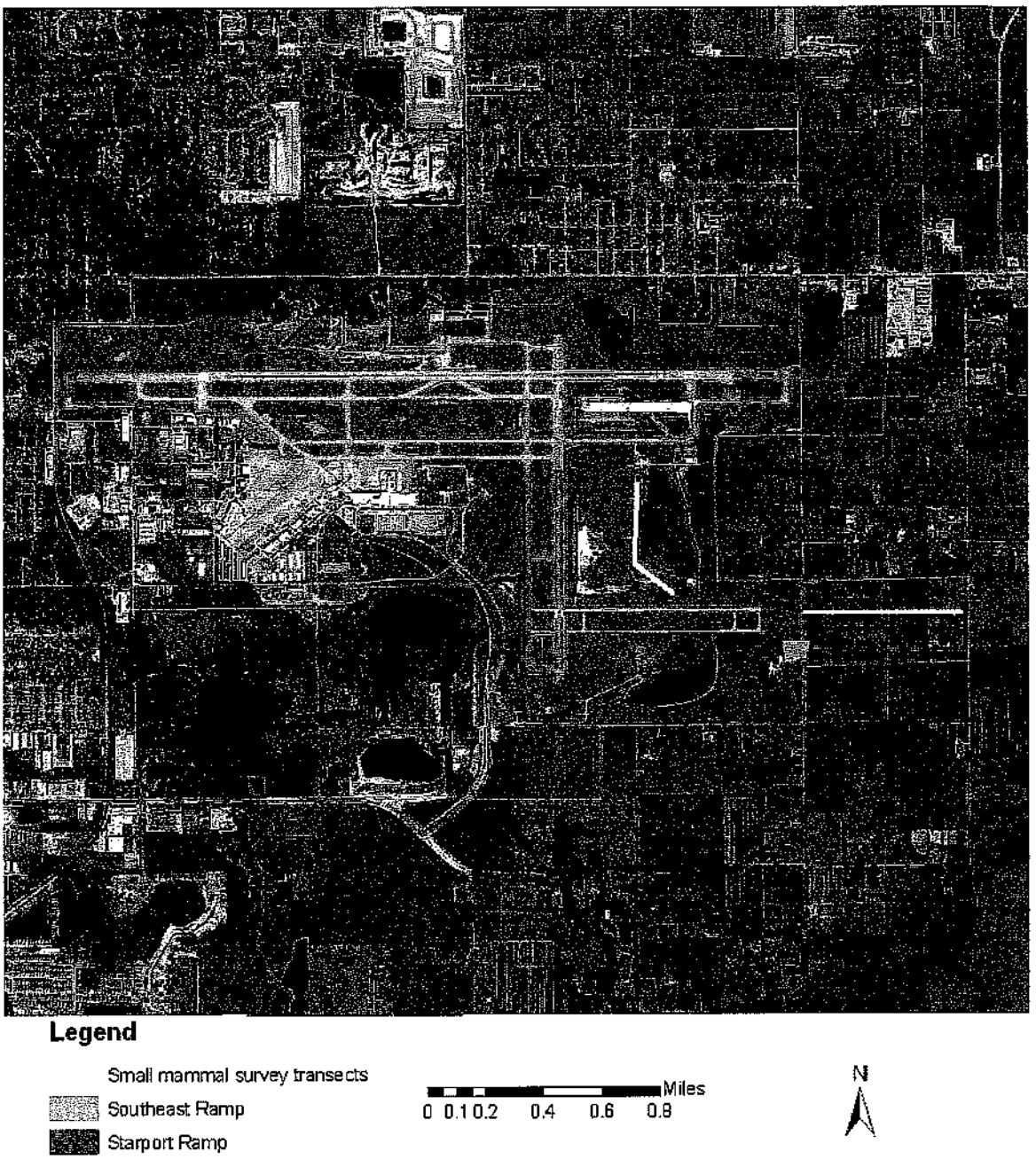


Figure 4. Small mammal survey transect locations at Orlando Sanford International Airport.

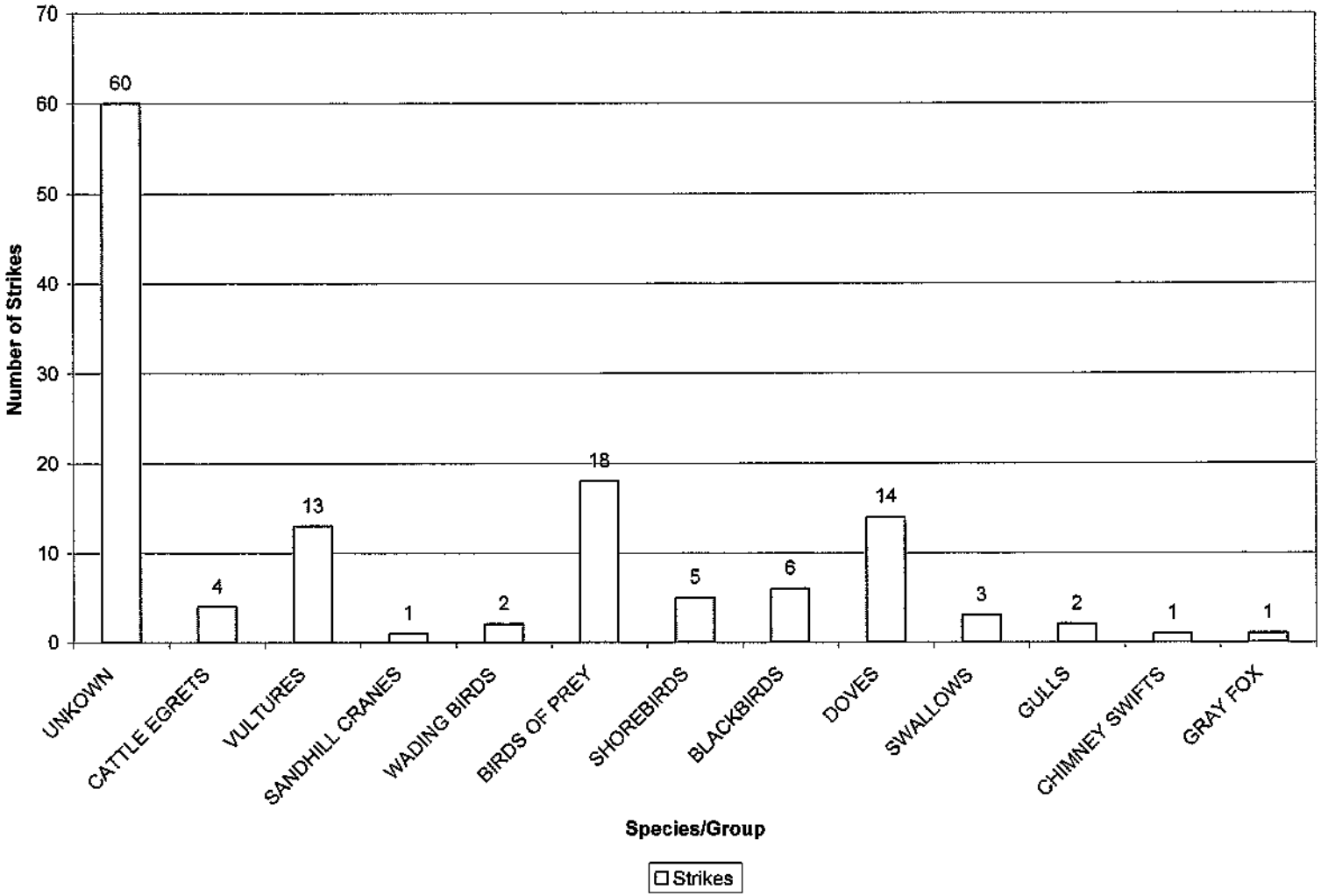


Figure 5. Bird groups/species reported in strike record at Orlando Sanford International Airport between November 22, 1991 through November 13, 2008.

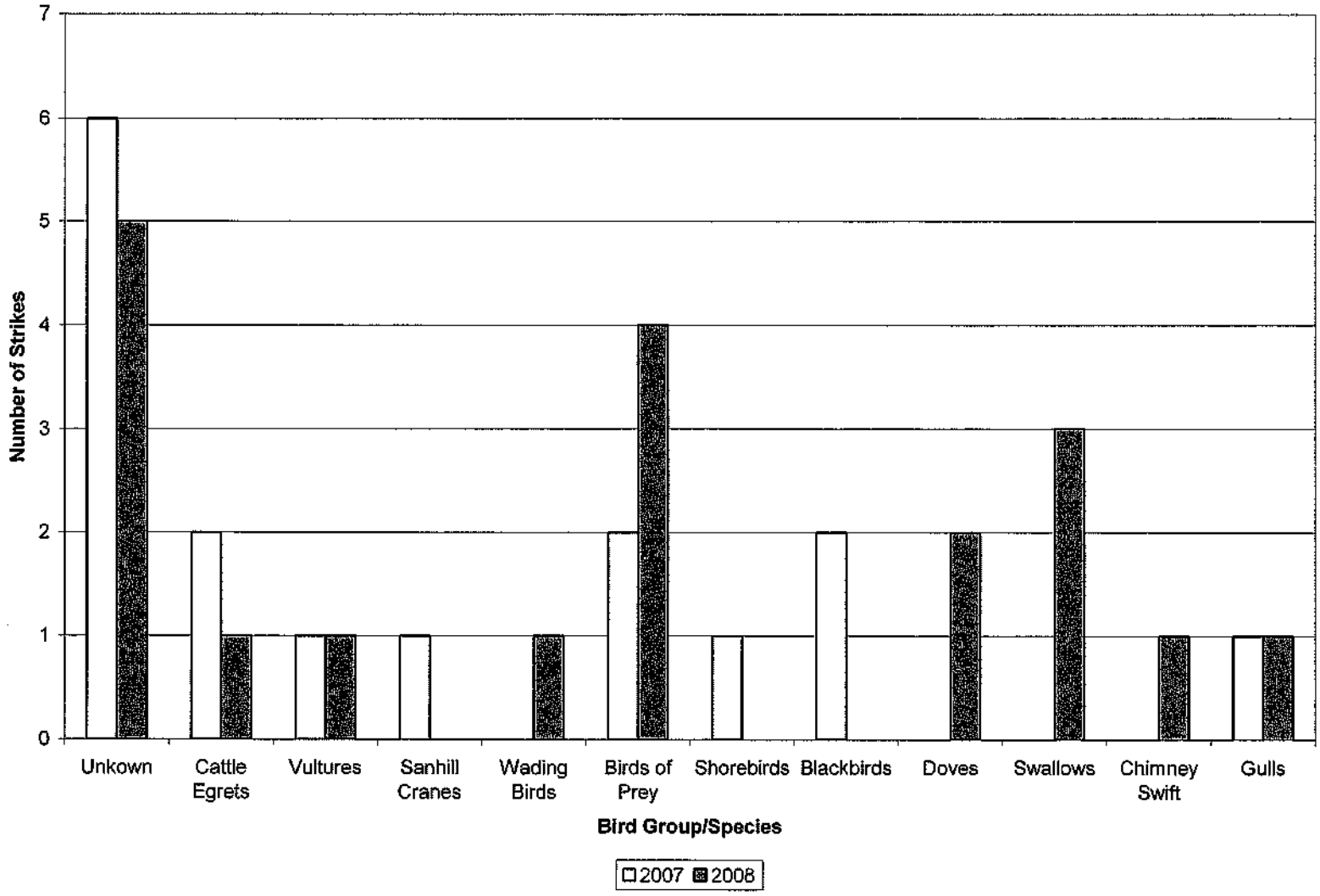


Figure 6. Bird group/species reported in strike record in 2007 compared with 2008 as of November 13, 2008

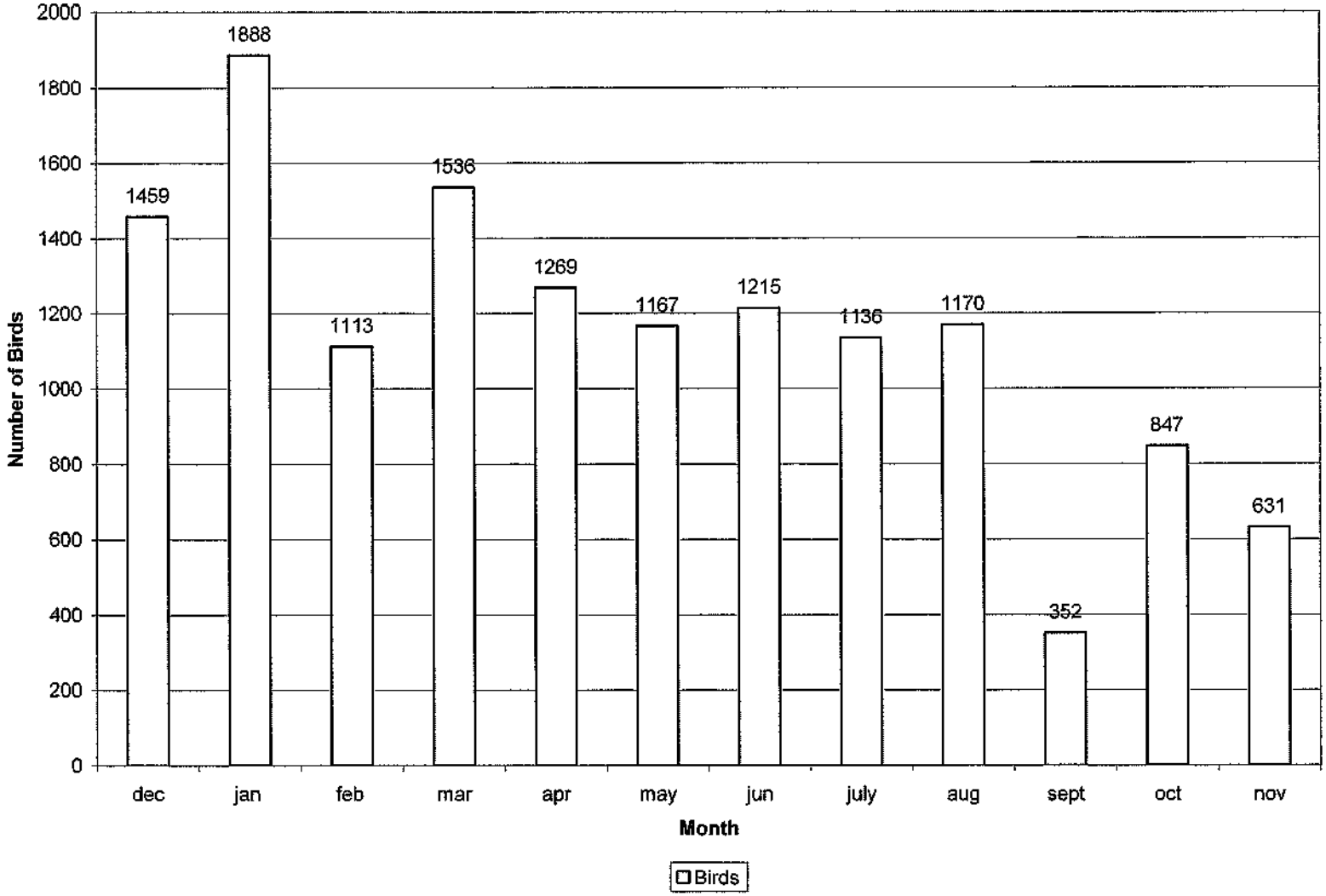


Figure 7. Total wildlife observed at Orlando Sanford International Airport from December 2007-November 2008.

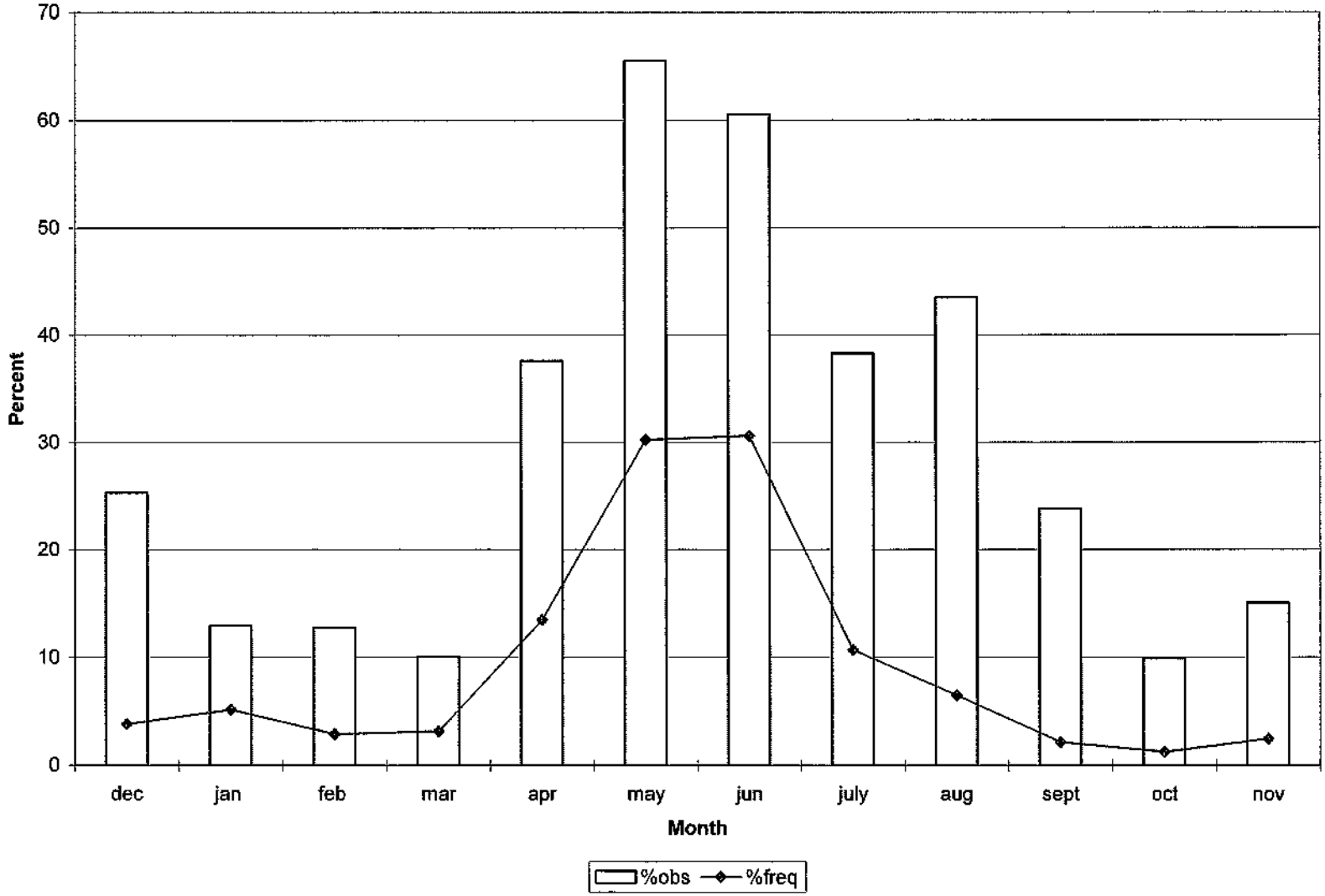


Figure 8. Monthly cattle egret percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

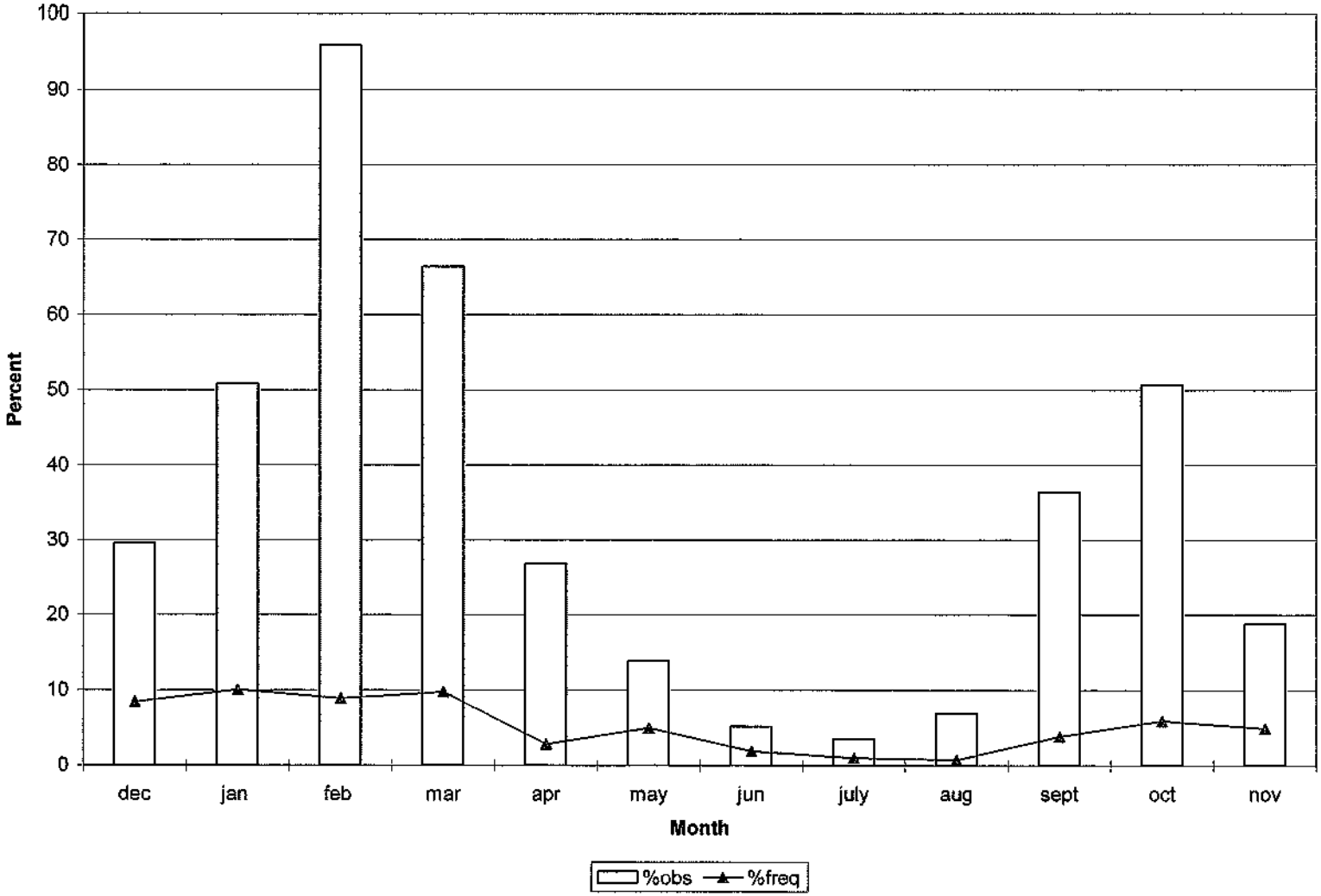


Figure 9. Monthly vulture percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

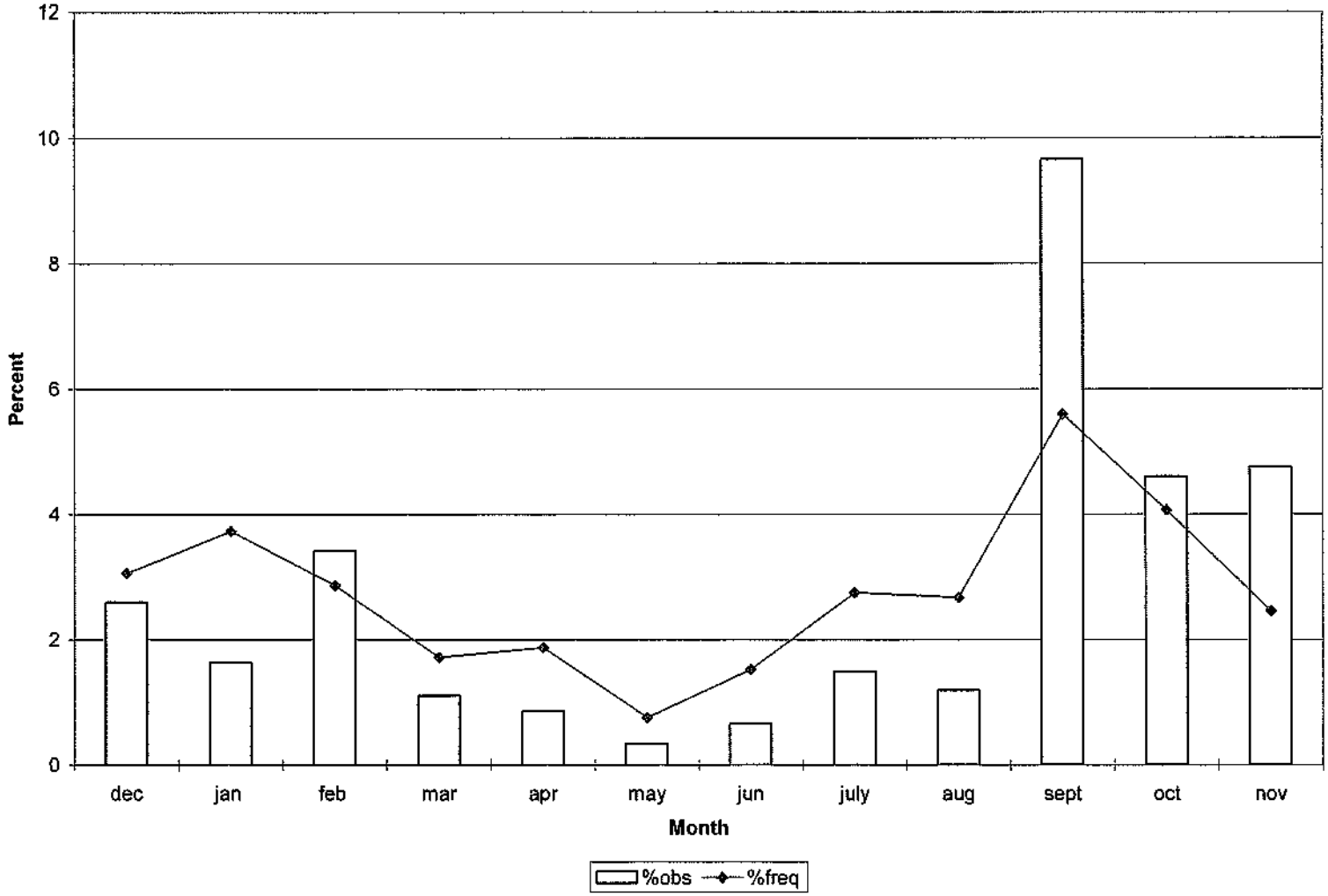


Figure 10. Monthly sandhill crane percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

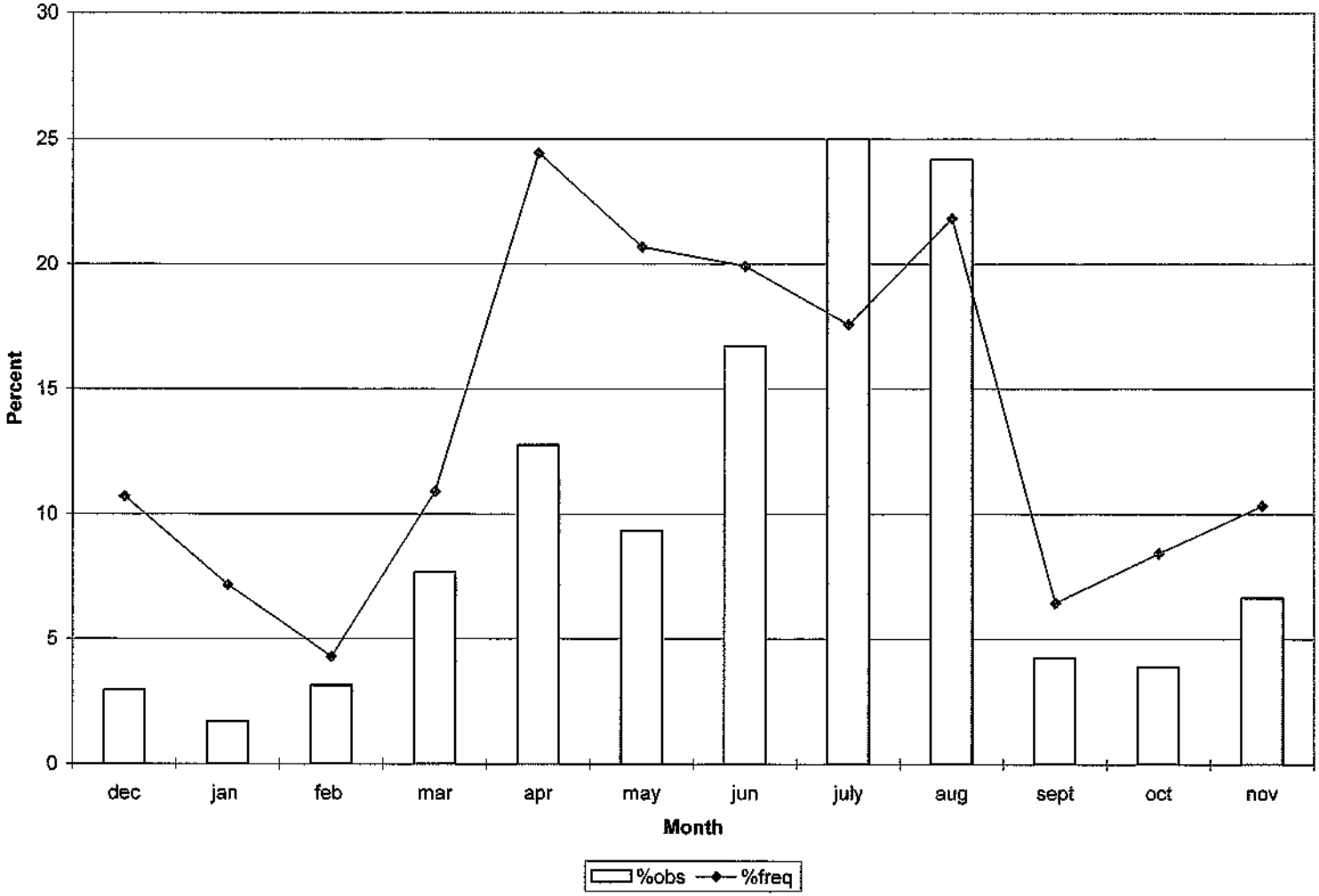


Figure 11. Monthly wading bird percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

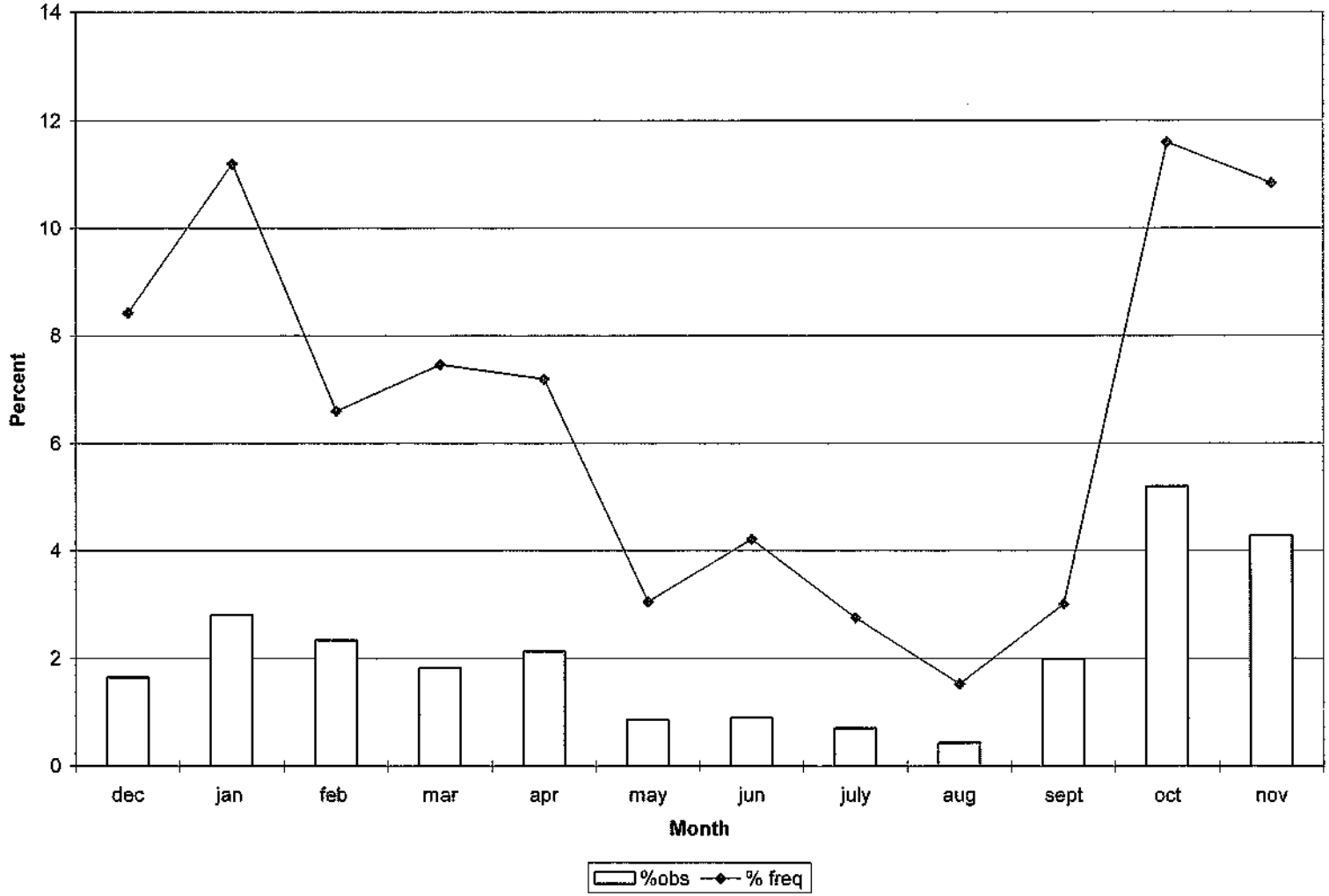


Figure 12. Monthly birds of prey percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

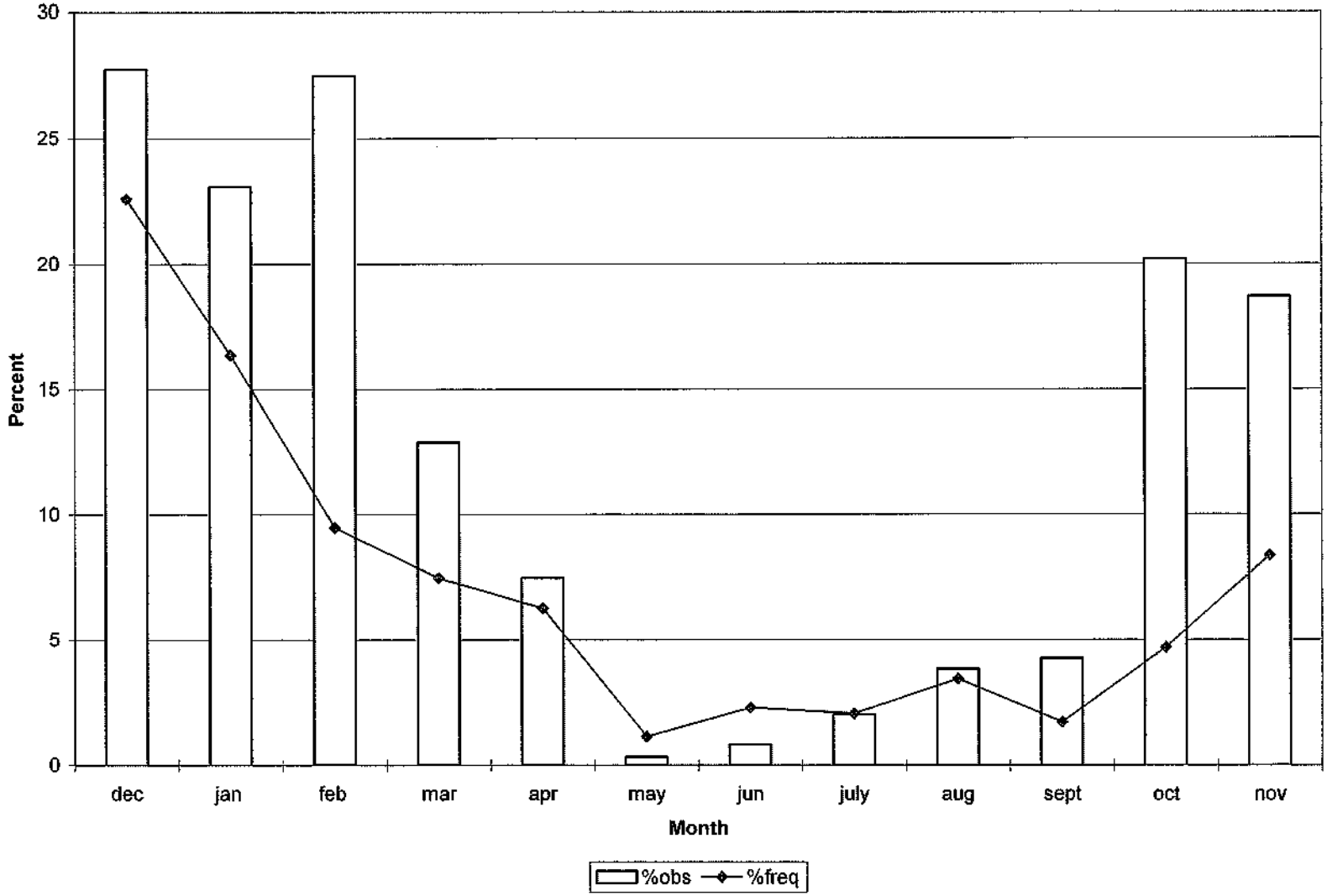


Figure 13. Monthly shorebird percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

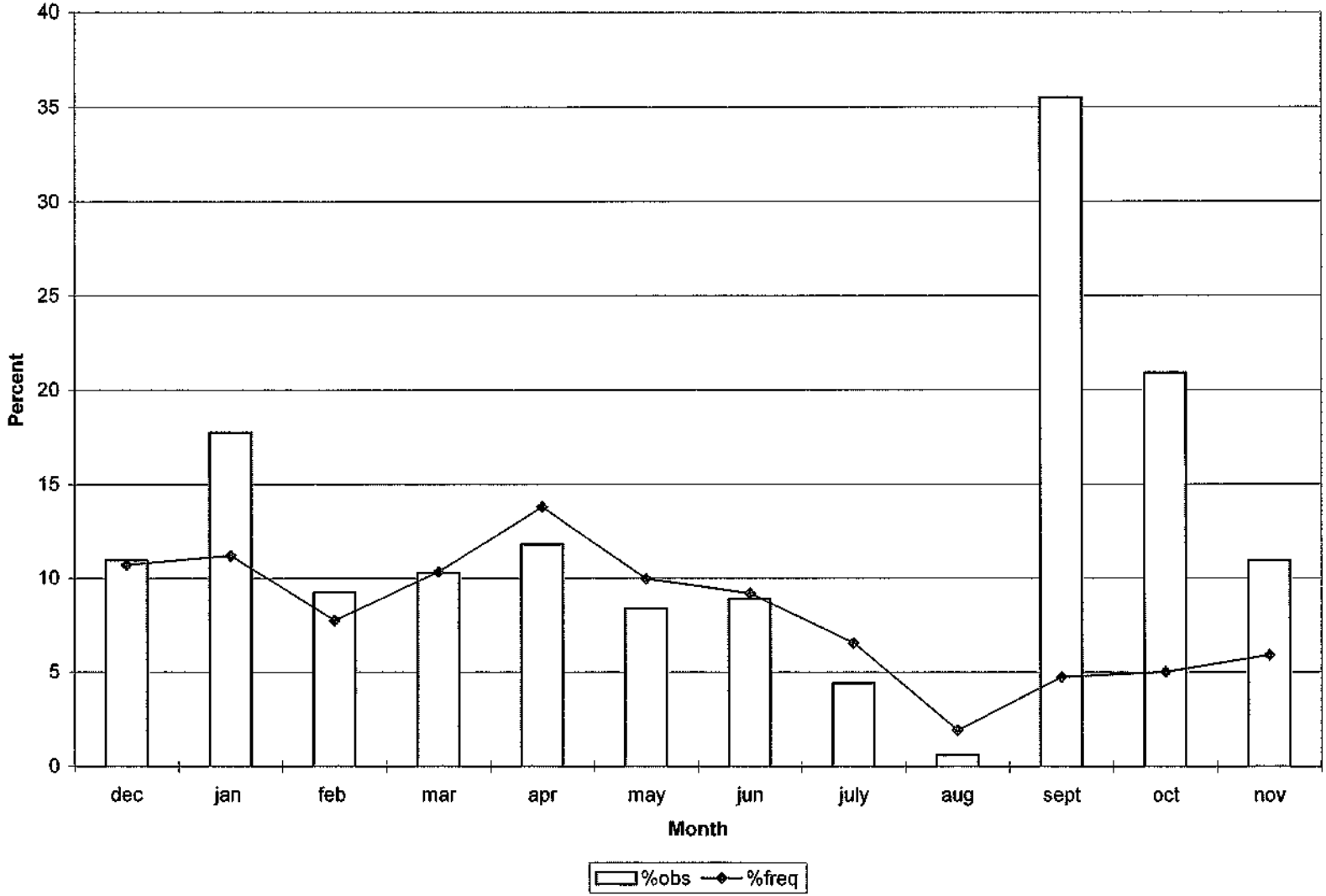


Figure 14. Monthly blackbird percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

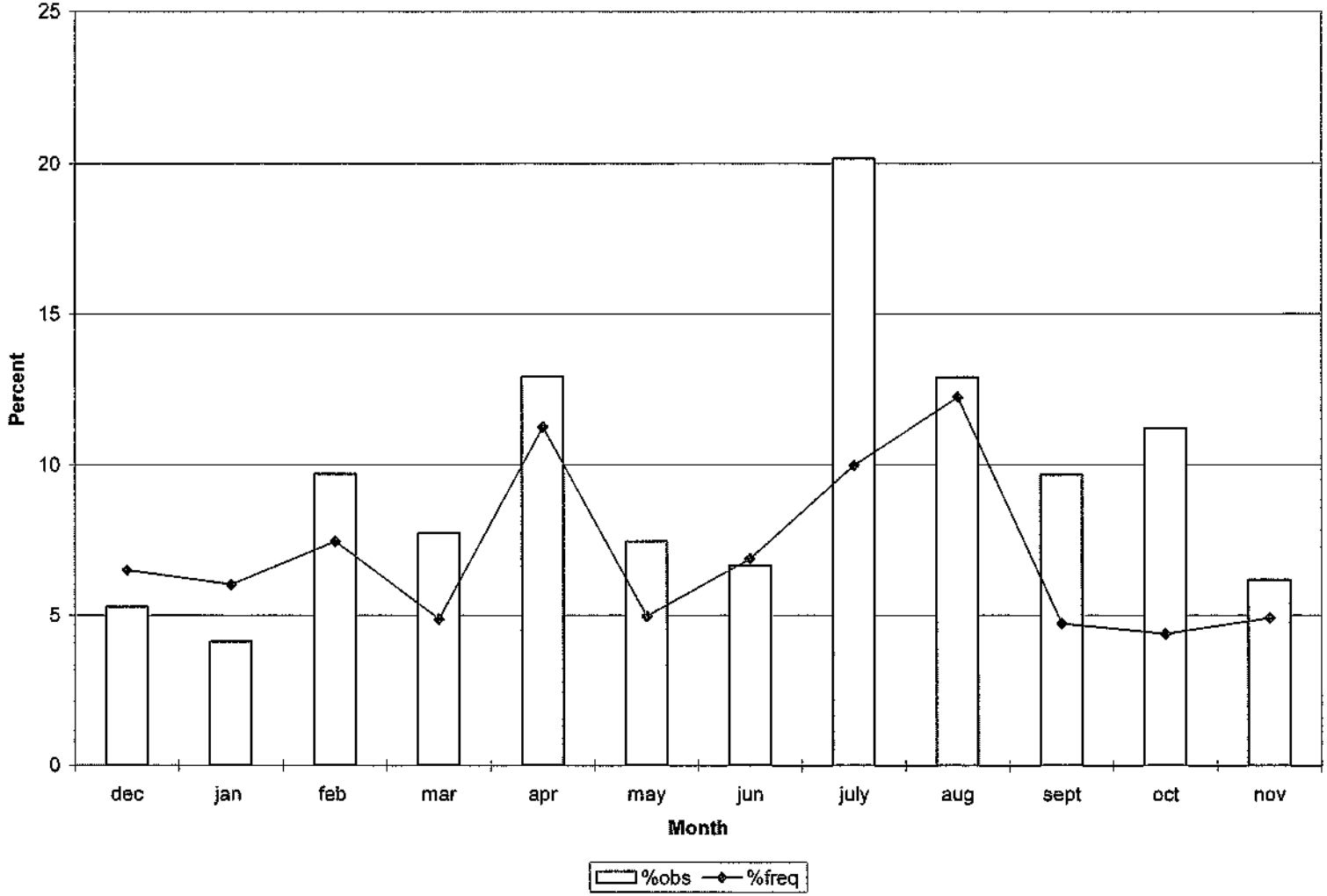


Figure 15. Monthly dove percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

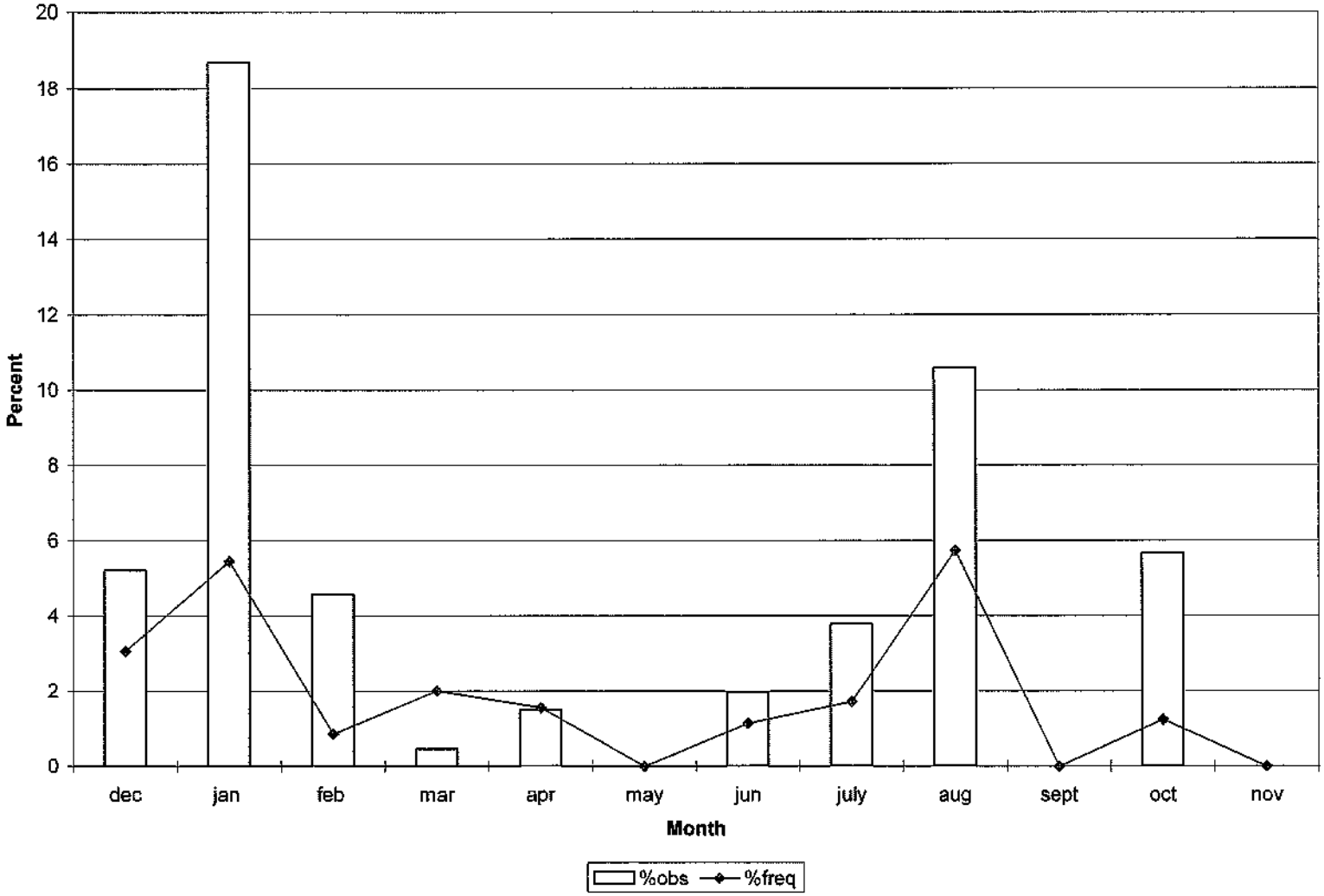


Figure 16. Monthly swallow percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

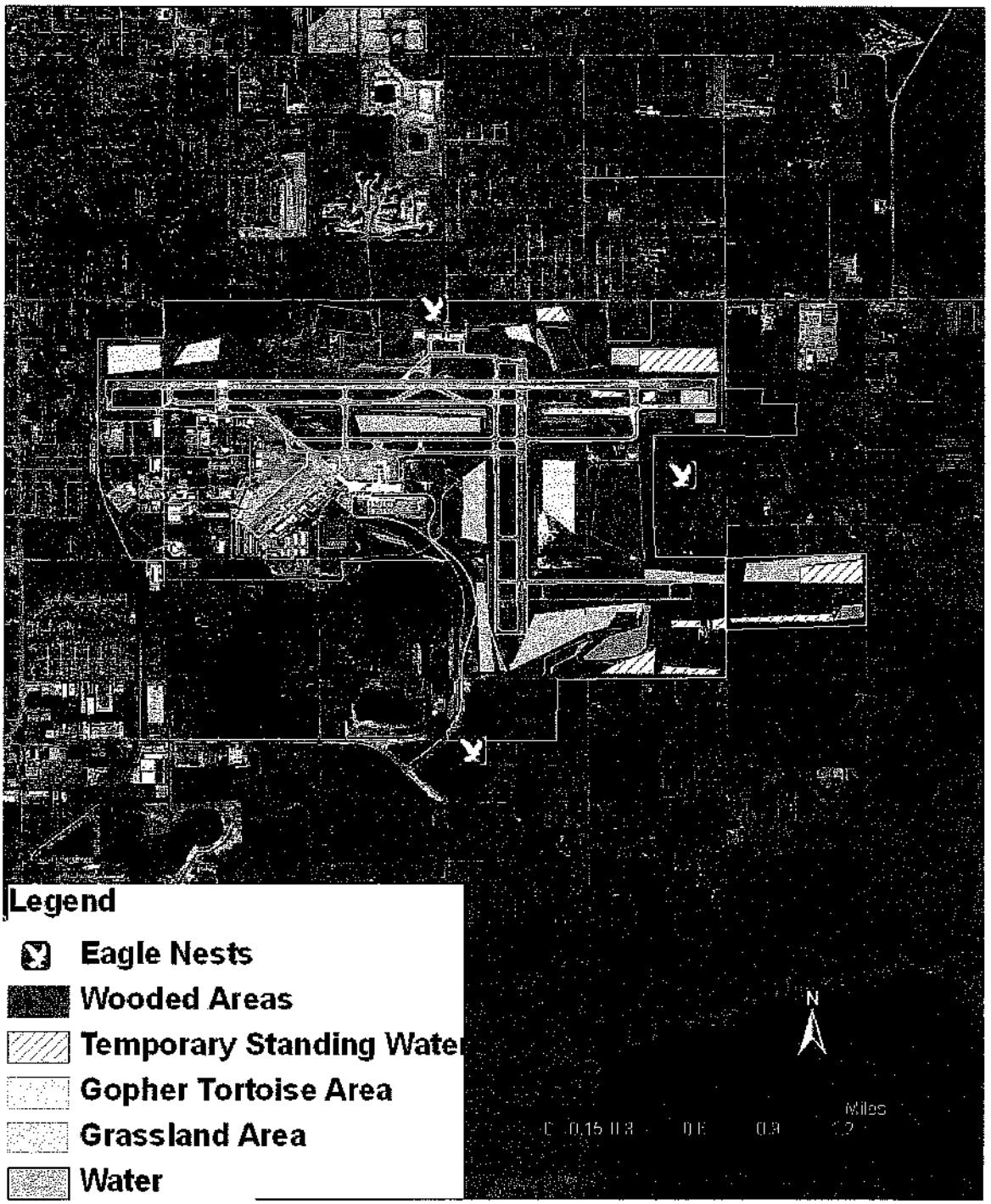


Figure 17. Wildlife hazards within or near the AOA at Orlando Sanford International Airport.

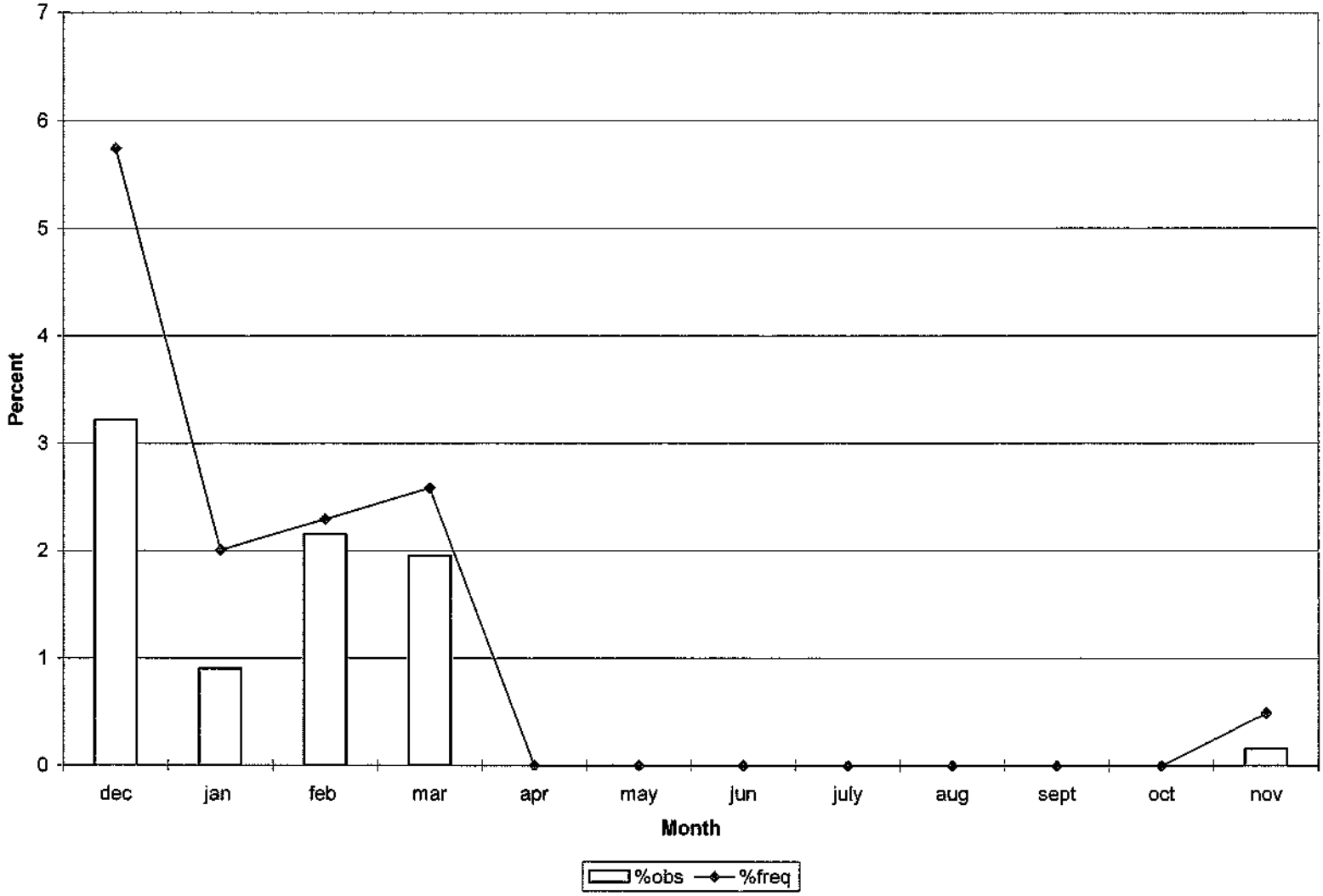


Figure 18. Monthly waterfowl percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

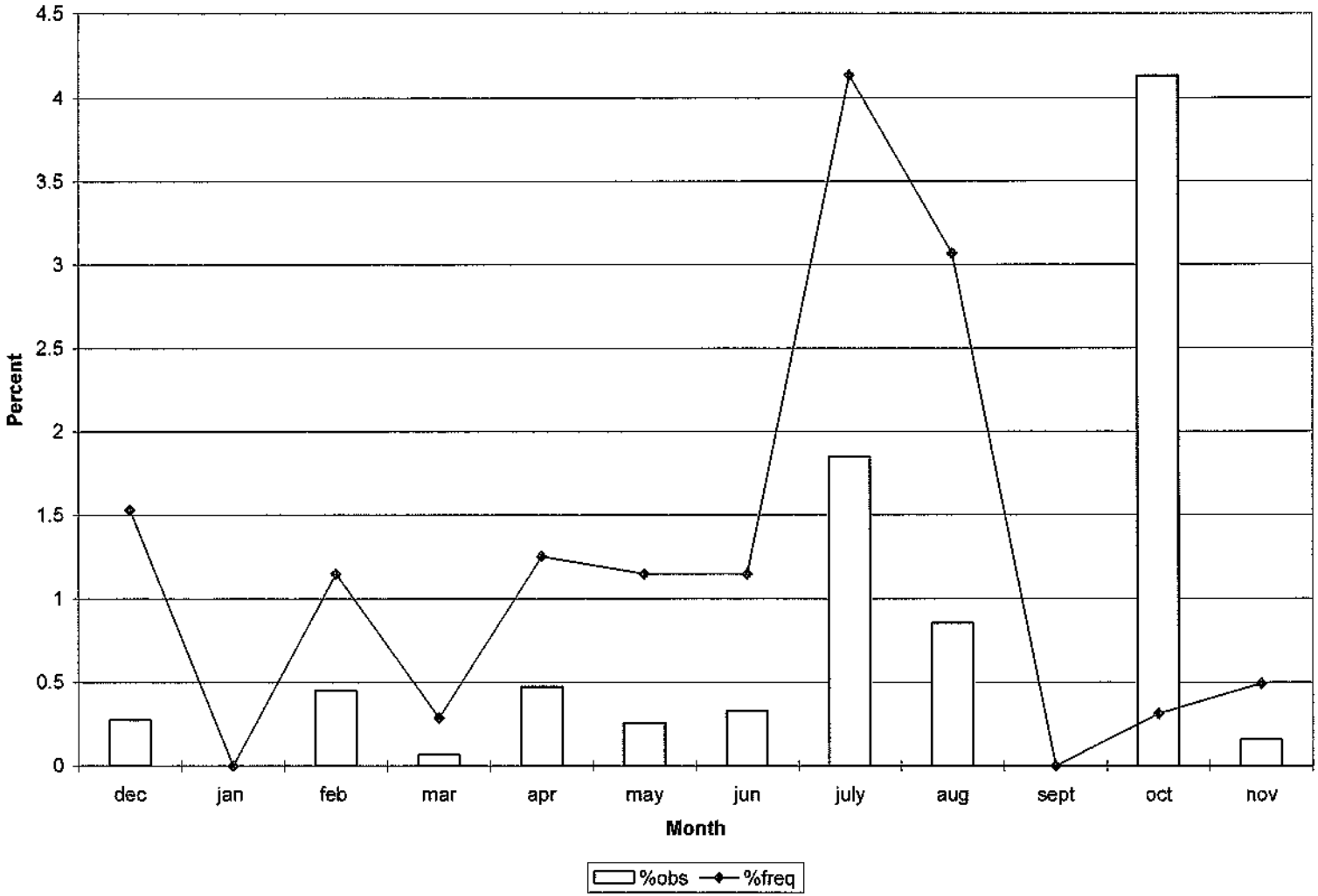


Figure 19. Monthly anhinga/cormorant percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

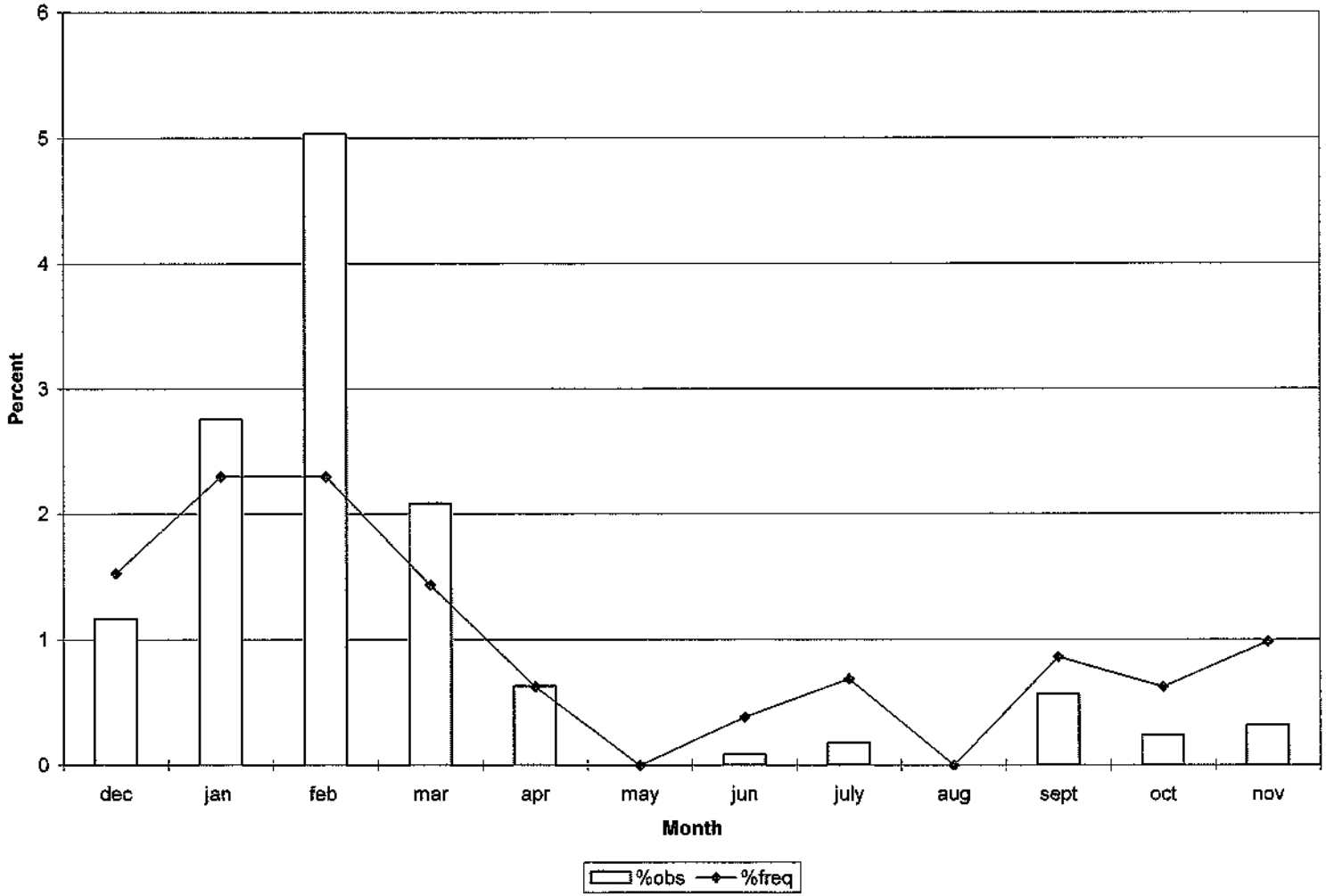


Figure 20. Monthly gallinule percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

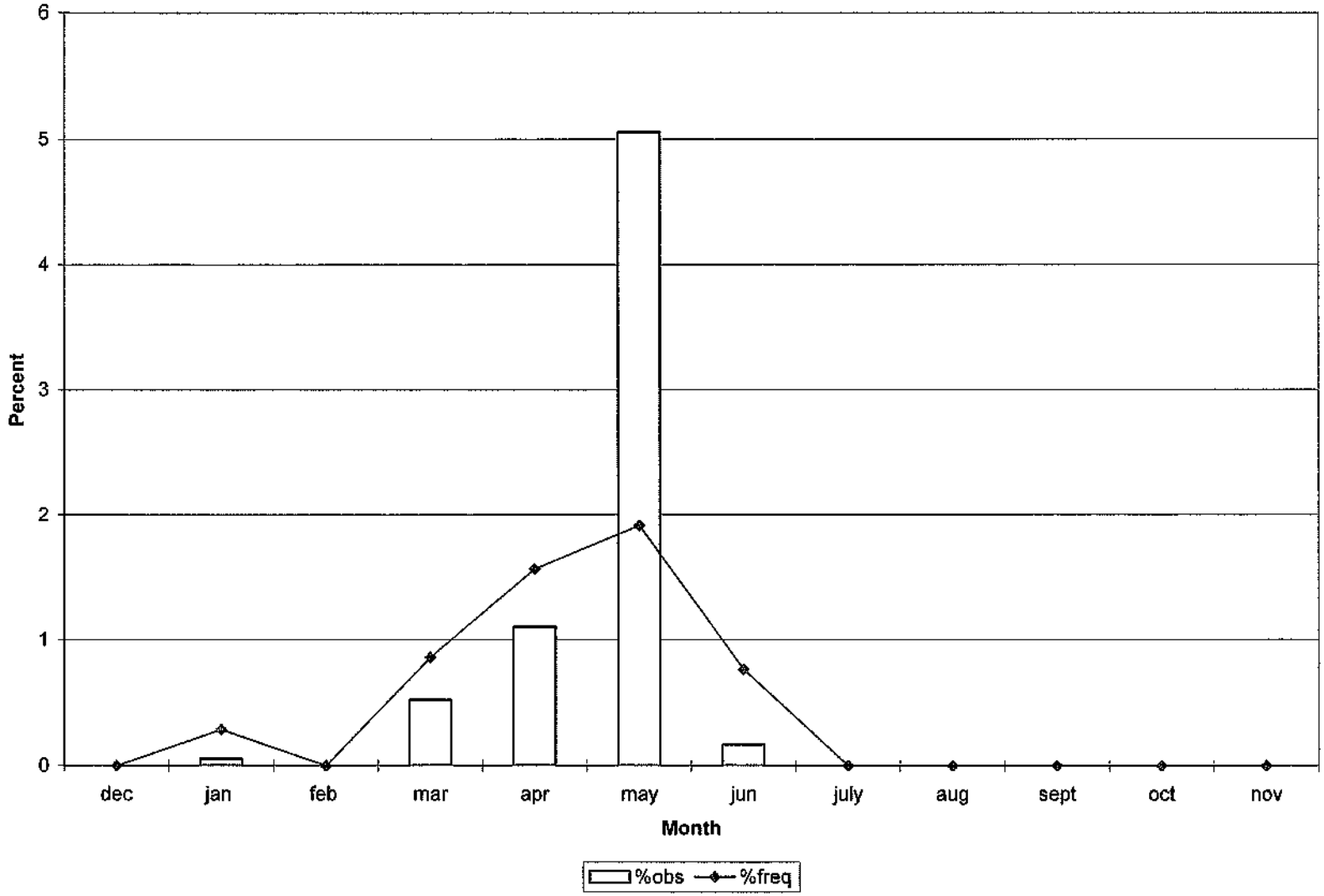


Figure 21. Monthly gull percentages observed at Orlando Sanford International Airport from December 2007-November 2008.

Table 1. Strike record at Orlando Sanford International Airport from November 22, 1991 – November 13, 2008.

Date	Location	Effect on Flight	Damage *	Species	Source
11/22/1991	36		M	HAWKS	FAA Form 5200-7
3/28/1992	27L	None	M?	TURKEY VULTURE	FAA Form 5200-7
5/3/1992	36		S	VULTURES	FAA Form 5200-7
5/27/1992	36	None	N	OSPREY	FAA Form 5200-7
6/29/1992		None	N	HAWKS, EAGLES, VULTURES	FAA Form 5200-7
6/7/1993		None	N	EGRETS	FAA Form 5200-7
8/16/1994	35	None	N	EUROPEAN STARLING	FAA Form 5200-7
9/21/1994	27L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
11/18/1994	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
4/11/1995	9L	None	N	UNKNOWN BIRD	FAA Form 5200-7
6/26/1995	9R	None	N	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
7/24/1995	9R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/11/1995	9L	None	M	UNKNOWN BIRD - LARGE	FAA Form 5200-7
11/24/1995	9R	Precautionary Landing	M	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
5/11/1996	9R	None	N	RED-TAILED HAWK	FAA Form 5200-7
6/4/1996	9L	None	N	ROCK PIGEON	FAA Form 5200-7
8/13/1996	9R	None	N	BLACKBIRDS	FAA Form 5200-7
10/26/1996	27L	Other	S	VULTURES	FAA Form 5200-7
12/1/1996	27L	Aborted Take-off	M	VULTURES	FAA Form 5200-7
4/20/1997	9R	Precautionary Landing	M	TURKEY VULTURE	FAA Form 5200-7
6/5/1997	9R	Precautionary Landing	N	CATTLE EGRET	FAA Form 5200-7
6/26/1997	9R	None	N	DOVES	FAA Form 5200-7
7/24/1997	9L	None	N	TURKEY VULTURE	FAA Form 5200-7
7/29/1997	9C	None	N	VULTURES	FAA Form 5200-7
2/23/1999	9R	None	N	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
5/20/1999	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
7/21/1999	8			OSPREY	FAA Form 5200-7
7/30/1999	9L	ENGINE SHUT DOWN	S	DOVES	FAA Form 5200-7
8/5/1999	27C	Precautionary Landing	M	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/12/1999	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
9/9/1999	27R	None	M	OSPREY	FAA Form 5200-7
9/16/1999	9L	Aborted Take-off	M	COMMON GRAY FOX	FAA Form 5200-7
9/30/1999	9L	None	M?	UNKNOWN BIRD - SMALL	FAA Form 5200-7
1/7/2000	27R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7

Date	Location	Effect on Flight	Damage *	Species	Source
1/7/2000	27R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
4/25/2000	9R	None	M?	UNKNOWN BIRD	FAA Form 5200-7
8/31/2000	9R	None	N	DOVES	FAA Form 5200-7
9/9/2000	9R	None	N	DOVES	FAA Form 5200-7
9/9/2000	9L	None	N	DOVES	FAA Form 5200-7
7/4/2001	27C	Aborted Take-off	M	UNKNOWN BIRD - SMALL	FAA Form 5200-7
7/11/2001	9R	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/1/2001	27	Other	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/15/2001	9L	None	N	OWLS	FAA Form 5200-7
9/7/2001	9L	None	N	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
10/3/2001	27R		N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
10/6/2001	27L	None	S	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
10/27/2001	9R	None	N	EGRETS	FAA Form 5200-7
10/29/2001	9L	Precautionary Landing		UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
11/9/2001	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
11/27/2001	27R	None	M	VULTURES	FAA Form 5200-7
3/5/2002	9R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
4/11/2002	9L	Precautionary Landing	N	DOVES	FAA Form 5200-7
5/3/2002	9L	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
5/17/2002	9L	None	N	UNKNOWN BIRD	FAA Form 5200-7
6/6/2002	9L	Precautionary Landing	M	TURKEY VULTURE	Multiple
6/12/2002	9L	Precautionary Landing	N	SANDPIPERS	FAA Form 5200-7
7/28/2002	9L	None	N	EASTERN MEADOWLARK	FAA Form 5200-7
8/16/2002	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
10/8/2002	9L	Precautionary Landing	M	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
10/12/2002	27r		N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
11/6/2002	9l	None	N	UNKNOWN BIRD – SMALL	FAA Form 5200-7
4/16/2003	27L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
5/10/2003	9L	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
7/17/2003	9C	Engine Shut Down	S	VULTURES	FAA Form 5200-7
7/18/2003	9C	Precautionary Landing	N	DOVES	FAA Form 5200-7
7/18/2003	9L	Precautionary Landing	N	DOVES	FAA Form 5200-7
7/31/2003	9L	None	N	DOVES	FAA Form 5200-7
8/12/2003	9L			UNKNOWN BIRD	FAA Form 5200-7

Date	Location	Effect on Flight	Damage *	Species	Source
8/17/2003	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/21/2003	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/29/2003	9L	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
11/3/2003	27L	None	N	OSPREY	FAA Form 5200-7
1/12/2004	27L	Precautionary Landing	N	KILLDEER	FAA Form 5200-7
1/23/2004	9R	Precautionary Landing	N	BALD EAGLE	FAA Form 5200-7
7/1/2004	27C		N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/2/2004	9C	None	N	EASTERN MEADOWLARK	FAA Form 5200-7
10/24/2004	27R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
2/7/2005	9C	None	N	UNKNOWN BIRD - LARGE	FAA Form 5200-7
5/25/2005	9L	None	N	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
6/13/2005	9R	None	N	UNKNOWN BIRD - LARGE	FAA Form 5200-7
8/29/2005	27L	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
9/15/2005	9L	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
9/24/2005	9L	None	N	UNKNOWN BIRD	FAA Form 5200-7
9/24/2005	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
9/25/2005	9C	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
11/5/2005	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
11/15/2005	9R	None	S	HAWKS	FAA Form 5200-7
11/16/2005	9R	None	N	SANDPIPERS	FAA Form 5200-7
1/10/2006	9R	None	N	SANDPIPERS	FAA Form 5200-7
1/10/2006	27C	Aborted Take-off	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
3/3/2006	36	None	M	UNKNOWN BIRD - MEDIUM	FAA Form 5200-7
4/14/2006	27L	Other	M?	VULTURES	FAA Form 5200-7
5/12/2006	9L	Precautionary Landing	N	OSPREY	FAA Form 5200-7
8/24/2006	27L	None		ROCK PIGEON	FAA Form 5200-7
10/6/2006	27R	None	N	UNKNOWN BIRD – SMALL	FAA Form 5200-7
11/17/2006	9C	Precautionary Landing	S	BALD EAGLE	FAA Form 5200-7
11/24/2006	36	None	N	DOVES	FAA Form 5200-7-E
12/8/2006	9L	None	N	UNKNOWN BIRD – MEDIUM	FAA Form 5200-7-E
1/4/2007		None		CHIMNEY SWIFT	FAA Form 5200-7-E
1/27/2007	9L	Precautionary Landing	D	TURKEY VULTURE	Multiple
6/9/2007	9L	Aborted Take-off	N	CATTLE EGRET	FAA Form 5200-7
6/19/2007	9L	Aborted Take-off	N	CATTLE EGRET	FAA Form 5200-7-E

Date	Location	Effect on Flight	Damage *	Species	Source
7/28/2007	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
8/31/2007	9R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7-E
8/31/2007	9R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7
9/7/2007	9R	Aborted Take-off	N	KILLDEER	FAA Form 5200-7-E
9/18/2007	9C			EASTERN MEADOWLARK	FAA Form 5200-7-E
9/26/2007	27R	Precautionary Landing	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7-E
11/3/2007	27R	Aborted Take-off	N	AMERICAN KESTREL	FAA Form 5200-7-E
11/3/2007	27R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7-E
11/10/2007	27C	None	N	GULLS	FAA Form 5200-7-E
11/26/2007	9L			EASTERN MEADOWLARK	FAA Form 5200-7-E
11/29/2007	9L			BALD EAGLE	FAA Form 5200-7-E
12/27/2007	9L	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7-E
12/31/2007	27R			SANDHILL CRANE	FAA Form 5200-7-E
1/14/2008	27R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7-E
2/9/2008	27R	None	N	BALD EAGLE	FAA Form 5200-7-E
2/25/2008	27R	None	N	UNKNOWN BIRD	FAA Form 5200-7-E
4/6/2008	27R			BALD EAGLE	FAA Form 5200-7-E
4/21/2008	9L			SNOWY EGRET	FAA Form 5200-7-E
5/26/2008	9L\27R			BALD EAGLE	FAA Form 5200-7-E
6/24/2008	9L			CATTLE EGRET	FAA Form 5200-7
7/10/2008	27L	None	M?	BLACK VULTURE	FAA Form 5200-7-E
7/12/2008	27R	None	M?	UNKNOWN BIRD - LARGE	FAA Form 5200-7-E
7/27/2008	27R	None	N	UNKNOWN BIRD - SMALL	FAA Form 5200-7-E
7/29/2008	27R	None	N	BARN SWALLOW	FAA Form 5200-7-E
7/30/2008	27L	None		BARN SWALLOW	FAA Form 5200-7-E
8/12/2008	9L	Precautionary Landing	N	GULL	FAA Form 5200-7
8/16/2008	9L	None	N	RED-TAILED HAWK	FAA Form 5200-7-E
8/24/2008	9L	None	N	BARN SWALLOW	FAA Form 5200-7
8/25/2008	9R	None		MOURNING DOVE	FAA Form 5200-7-E
10/17/2008				ROCK PIGEON	FAA Form 5200-7-E
11/13/2008				UNKNOWN	

*Damage Codes -N (None), M (Minor), M? (Damage, but extent unknown), S (Substantial) and D (Destroyed)

Table 2. Top ten hazard bird groups based on abundance from surveys, damage threat from strike records, and FAA ranking of 25 species groups as to relative hazard to aircraft in AC 150/5200-33B.

Bird Group	Abundance	Damage Threat
Unkown	N/A	Very High
Cattle Egret	Very High	High
Vulture	Moderate	Very High
Sandhill Crane	Moderate	Very High
Wading Birds	High	High
Birds of Prey	Moderate	High
Shorebirds	High	Moderate
Blackbirds	High	Moderate
Doves	High	Moderate
Swallows	High	Moderate

Table 3. List of endangered, threatened, and species of special concern found at Orlando Sanford International Airport from December 2007 – November 2008.

Species	Federal Status	State Status
American Alligator	None	Special Concern
Crested Caracara	Threatened	Threatened
Florida Sandhill Crane	None	Threatened
Gopher Tortoise	None	Threatened
Little Blue Heron	None	Special Concern
Osprey	None	Special Concern
Peregrine Falcon	None	Endangered
Snowy Egret	None	Special Concern
Southeastern American Kestrel	None	Threatened
Tricolor Heron	None	Special Concern
White Ibis	None	Special Concern
Wood Stork	Endangered	Endangered

Table 4. Average rainfall at Orlando Sanford International Airport from March 1999 - November 2008

Year	avg rainfall (in)
2008	58.1
2007	32.34
2006	41.41
2005	55.4
2004	54.38
2003	53.53
2002	71.54
2001	39.87
2000	27.49
1999	17.65

Table 5. Average temperature high, low, and mean from March 1999 – November 2008

Month	10 Yr High (F)	10 Yr low (F)	10 Yr mean (F)
Jan	71.14	48.94	60.07
Feb	74.09	52.04	56.08
Mar	79.46	56.58	68.05
Apr	83.63	60.54	72.11
May	88.59	66.51	77.60
Jun	90.67	72.49	81.47
Jul	92.12	74.26	83.20
Aug	92.31	74.51	83.42
Sept	89.05	73.13	81.13
Oct	84.02	66.10	75.09
Nov	77.19	56.84	67.03
Dec	72.50	51.56	62.07

Appendix A. List of species observed during fixed point surveys at Orlando Sanford International Airport from December 2007 – November 2008.

Species	
American Alligator	Hooded Merganser
American Coot	Killdeer
American Crow	Little Blue Heron
American Robin	Lesser Yellowlegs
Anhinga	Loggerhead Shrike
Armadillo	Merlin
Bald Eagle	Mourning Dove
Barn Swallow	Northern Cardinal
Belted Kingfisher	Northern Harrier
Blue-gray Gnatcatcher	Northern Mockingbird
Blue Jay	Osprey
Black-necked Stilt	Otter
Black Vulture	Palm Warbler
Bobolink	Peregrine Falcon
Boat-tailed Grackle	Pine Warbler
Cattle Egret	Raccoon
Carolina Wren	Ring-billed Gull
Chipping Sparrow	Rock Pigeon
Common Grackle	Red-shouldered Hawk
Cooper's Hawk	Red-tailed Hawk
Common Moorhen	Red-winged Blackbird
Common Snapping Turtle	Sanderling
Cottontail Rabbit	Sandhill Crane
Crested Caracara	Savannah Sparrow
Double-crested Cormorant	Snowy Egret
Eastern Kingbird	Southeastern American Kestrel
Eastern Meadowlark	Spotted Sandpiper
European Starling	Swallow-tailed Kite
Feral Cat	Tree Swallow
Fish Crow	Tricolored Heron
Florida Redbelly Turtle	Tufted Titmouse
Florida Softshell Turtle	Turkey Vulture
Forster's Tern	White Ibis
Great Blue Heron	Willet
Glossy Ibis	Wilson's Snipe
Gopher tortoise	Wild Turkey
Gray Catbird	Wood Stork
Great Egret	Yellow-rumped Warbler
Greater Yellowlegs	

Appendix B. List of species observed during spotlight surveys at Orlando Sanford International Airport from December 2007 – November 2008.

Species	Number
American Alligator	12
Anhinga	1
Armadillo	1
Barred Owl	1
Chuckwill's Widow	1
Common Night Hawk	3
Cottontail Rabbit	3
Coyote	3
Eastern Screech Owl	1
Feral Cat	9
Great Blue Heron	3
Great Horned Owl	1
Gray Fox	1
Killdeer	5
Opossum	3
Raccoon	1
Sandhill Crane	8
Yellow-crowned Night Heron	1

Appendix C. Data recorded from small mammal survey at Orlando Sanford International Airport.

August

Sprung	Unsprung	Caught	Species	Number
23	77	4	Marsh Rice Rat	3
			Woodrat	1

November

Sprung	Unsprung	Caught	Species	Number
8	92	1	Marsh Rice Rat	1

Appendix D. FAA Strike Report Analysis for Orlando Sanford International Airport 2003-2007.

Wildlife Strike Summary and Risk Analysis Report

Airport: ORLANDO SANFORD INTL AIRPORT - (KSFB), 2003-2007

This report provides a summary of wildlife strikes with civil aircraft for KSFB, 2003-2007. Strike data for KSFB are compared to mean values for all airports with a similar number of passenger enplanements (Group 3 airports) in KSFB's FAA Region and in the USA. The report also provides a simple wildlife species risk analysis to assist in setting risk management priorities at KSFB. The data is taken from strike reports entered into the FAA National Wildlife Strike Database (see http://wildlife-mitigation.tc.faa.gov for latest annual report on national wildlife strike statistics).

Part 1. Basic statistics: Reported wildlife strike numbers with civil aircraft and civil aircraft movements at KSFB for year 2007 and for 5-year period, 2003-2007.

Number of reported:	Year 2007	2003-2007 (5-year avg)
Wildlife strikes	17	10.8
Wildlife strikes causing damage	1	1.2
Aircraft movements - air carrier and GA	133,557	154,139

Part 2. Strike rates per 100,000 aircraft movements for KSFB (a Group 3 airport) compared to strike rates for all Group 3 airports (i.e., airports with similar number of enplanements) in the FAA Region and in the USA.

Strike category	Airport(s)	Strikes/100K movements		Comments
		Year 2007	2003-2007 (5-yr avg)	
All strikes	KSFB	12.73	7.01	Strike rate at KSFB in 2007 (12.73) was 82% above 5-year average at KSFB (7.01)

All strikes	Group3 airports in region	10.81	9.22	Strike rate at KSFB in 2007 (12.73) was 18% above Group 3 average for region (10.81)
All strikes	Group 3 airports in USA	19.78	14.15	Strike rate at KSFB in 2007 (12.73) was 36% below Group 3 average for the USA (19.78)
Damaging strikes	KSFB	0.75	0.78	Damaging strike rate at KSFB in 2007 (0.75) was 4% below 5-year average at KSFB (0.78)
Damaging strikes	Group 3 airports in region	1.90	0.77	Damaging strike rate at KSFB in 2007 (0.75) was 61% below Group 3 average for region (1.90)
Damaging strikes	Group 3 airports in USA	2.24	1.06	Damaging strike rate at KSFB in 2007 (0.75) was 67% below Group 3 average for USA (2.24)

Part 3. Wildlife species risk analysis based on damaging strikes at KSFB, 2003-2007[a].

Ranking of risk (2003-2007)	Species causing damaging strikes at KSFB	2003-2007			2007 only	
		No. of damaging strikes	% of total		No. of damaging strikes	% of total
1	VULTURES	2	33			
2	BALD EAGLE	1	17			
2	HAWKS	1	17			
2	TURKEY VULTURE	1	17		1	100
2	UNKNOWN BIRD	1	17			
	Total	6	100		1	100

[a]This ranking of wildlife species as to their risk to aviation safety at KSFB is based on the species reported as causing damage to aircraft at and in the vicinity of KSFB during the past 5 years. This ranking is intended to assist in prioritizing management activities and refining the airport's Wildlife Hazard Management Plan. However, this ranking is not meant to imply that all other wildlife species observed on or near KSFB can be ignored. Some of these other species, because of their size or flocking behavior, may pose a risk that has not been identified (e.g., the species has caused a damaging strike that was not reported, the species has caused a damaging strike but was identified as "unknown bird"), or the species has not manifested itself yet in a damaging strike.

U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

Subject: HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS	**Date:** 8/28/2007	**AC No:** 150/5200-33B
	Initiated by: AAS-300	**Change:**

1. PURPOSE. This Advisory Circular (AC) provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. It also discusses airport development projects (including airport construction, expansion, and renovation) affecting aircraft movement near hazardous wildlife attractants. Appendix 1 provides definitions of terms used in this AC.

2. APPLICABILITY. The Federal Aviation Administration (FAA) recommends that public-use airport operators implement the standards and practices contained in this AC. The holders of Airport Operating Certificates issued under Title 14, Code of Federal Regulations (CFR), Part 139, Certification of Airports, Subpart D (Part 139), may use the standards, practices, and recommendations contained in this AC to comply with the wildlife hazard management requirements of Part 139. Airports that have received Federal grant-in-aid assistance must use these standards. The FAA also recommends the guidance in this AC for land-use planners, operators of non-certificated airports, and developers of projects, facilities, and activities on or near airports.

3. CANCELLATION. This AC cancels AC 150/5200-33A, *Hazardous Wildlife Attractants on or near Airports*, dated July 27, 2004.

4. PRINCIPAL CHANGES. This AC contains the following major changes, which are marked with vertical bars in the margin:

a. Technical changes to paragraph references.

b. Wording on storm water detention ponds.

c. Deleted paragraph 4-3.b, *Additional Coordination.*

5. BACKGROUND. Information about the risks posed to aircraft by certain wildlife species has increased a great deal in recent years. Improved reporting, studies, documentation, and statistics clearly show that aircraft collisions with birds and other wildlife are a serious economic and public safety problem. While many species of wildlife can pose a threat to aircraft safety, they are not equally hazardous. Table 1

ranks the wildlife groups commonly involved in damaging strikes in the United States according to their relative hazard to aircraft. The ranking is based on the 47,212 records in the FAA National Wildlife Strike Database for the years 1990 through 2003. These hazard rankings, in conjunction with site-specific Wildlife Hazards Assessments (WHA), will help airport operators determine the relative abundance and use patterns of wildlife species and help focus hazardous wildlife management efforts on those species most likely to cause problems at an airport.

Most public-use airports have large tracts of open, undeveloped land that provide added margins of safety and noise mitigation. These areas can also present potential hazards to aviation if they encourage wildlife to enter an airport's approach or departure airspace or air operations area (AOA). Constructed or natural areas—such as poorly drained locations, detention/retention ponds, roosting habitats on buildings, landscaping, odor-causing rotting organic matter (putrescible waste) disposal operations, wastewater treatment plants, agricultural or aquaculture activities, surface mining, or wetlands—can provide wildlife with ideal locations for feeding, loafing, reproduction, and escape. Even small facilities, such as fast food restaurants, taxicab staging areas, rental car facilities, aircraft viewing areas, and public parks, can produce substantial attractions for hazardous wildlife.

During the past century, wildlife-aircraft strikes have resulted in the loss of hundreds of lives worldwide, as well as billions of dollars in aircraft damage. Hazardous wildlife attractants on and near airports can jeopardize future airport expansion, making proper community land-use planning essential. This AC provides airport operators and those parties with whom they cooperate with the guidance they need to assess and address potentially hazardous wildlife attractants when locating new facilities and implementing certain land-use practices on or near public-use airports.

6. MEMORANDUM OF AGREEMENT BETWEEN FEDERAL RESOURCE AGENCIES. The FAA, the U.S. Air Force, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture - Wildlife Services signed a Memorandum of Agreement (MOA) in July 2003 to acknowledge their respective missions in protecting aviation from wildlife hazards. Through the MOA, the agencies established procedures necessary to coordinate their missions to address more effectively existing and future environmental conditions contributing to collisions between wildlife and aircraft (wildlife strikes) throughout the United States. These efforts are intended to minimize wildlife risks to aviation and human safety while protecting the Nation's valuable environmental resources.

DAVID L. BENNETT
Director, Office of Airport Safety
and Standards

Table 1. Ranking of 25 species groups as to relative hazard to aircraft (1=most hazardous) based on three criteria (damage, major damage, and effect-on-flight), a composite ranking based on all three rankings, and a relative hazard score. Data were derived from the FAA National Wildlife Strike Database, January 1990–April 2003.[1]

Species group	Ranking by criteria			Composite ranking[2]	Relative hazard score[3]
	Damage[4]	Major damage[5]	Effect on flight[6]		
Deer	1	1	1	1	100
Vultures	2	2	2	2	64
Geese	3	3	6	3	55
Cormorants/pelicans	4	5	3	4	54
Cranes	7	6	4	5	47
Eagles	6	9	7	6	41
Ducks	5	8	10	7	39
Osprey	8	4	8	8	39
Turkey/pheasants	9	7	11	9	33
Herons	11	14	9	10	27
Hawks (buteos)	10	12	12	11	25
Gulls	12	11	13	12	24
Rock pigeon	13	10	14	13	23
Owls	14	13	20	14	23
H. lark/s. bunting	18	15	15	15	17
Crows/ravens	15	16	16	16	16
Coyote	16	19	5	17	14
Mourning dove	17	17	17	18	14
Shorebirds	19	21	18	19	10
Blackbirds/starling	20	22	19	20	10
American kestrel	21	18	21	21	9
Meadowlarks	22	20	22	22	7
Swallows	24	23	24	23	4
Sparrows	25	24	23	24	4
Nighthawks	23	25	25	25	1

[1] Excerpted from the *Special Report for the FAA, "Ranking the Hazard Level of Wildlife Species to Civil Aviation in the USA: Update #1, July 2, 2003".* Refer to this report for additional explanations of criteria and method of ranking.

[2] Relative rank of each species group was compared with every other group for the three variables, placing the species group with the greatest hazard rank for ≥ 2 of the 3 variables above the next highest ranked group, then proceeding down the list.

[3] Percentage values, from Tables 3 and 4 in Footnote 1 of the *Special Report*, for the three criteria were summed and scaled down from 100, with 100 as the score for the species group with the maximum summed values and the greatest potential hazard to aircraft.

[4] Aircraft incurred at least some damage (destroyed, substantial, minor, or unknown) from strike.

[5] Aircraft incurred damage or structural failure, which adversely affected the structure strength, performance, or flight characteristics, and which would normally require major repair or replacement of the affected component, or the damage sustained makes it inadvisable to restore aircraft to airworthy condition.

[6] Aborted takeoff, engine shutdown, precautionary landing, or other.

This page intentionally left blank.

Table of Contents

This page intentionally left blank.

SECTION 1.

GENERAL SEPARATION CRITERIA FOR HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS.

1-1. INTRODUCTION. When considering proposed land uses, airport operators, local planners, and developers must take into account whether the proposed land uses, including new development projects, will increase wildlife hazards. Land-use practices that attract or sustain hazardous wildlife populations on or near airports can significantly increase the potential for wildlife strikes.

The FAA recommends the minimum separation criteria outlined below for land-use practices that attract hazardous wildlife to the vicinity of airports. Please note that FAA criteria include land uses that cause movement of hazardous wildlife onto, into, or across the airport's approach or departure airspace or air operations area (AOA). (See the discussion of the synergistic effects of surrounding land uses in Section 2-8 of this AC.)

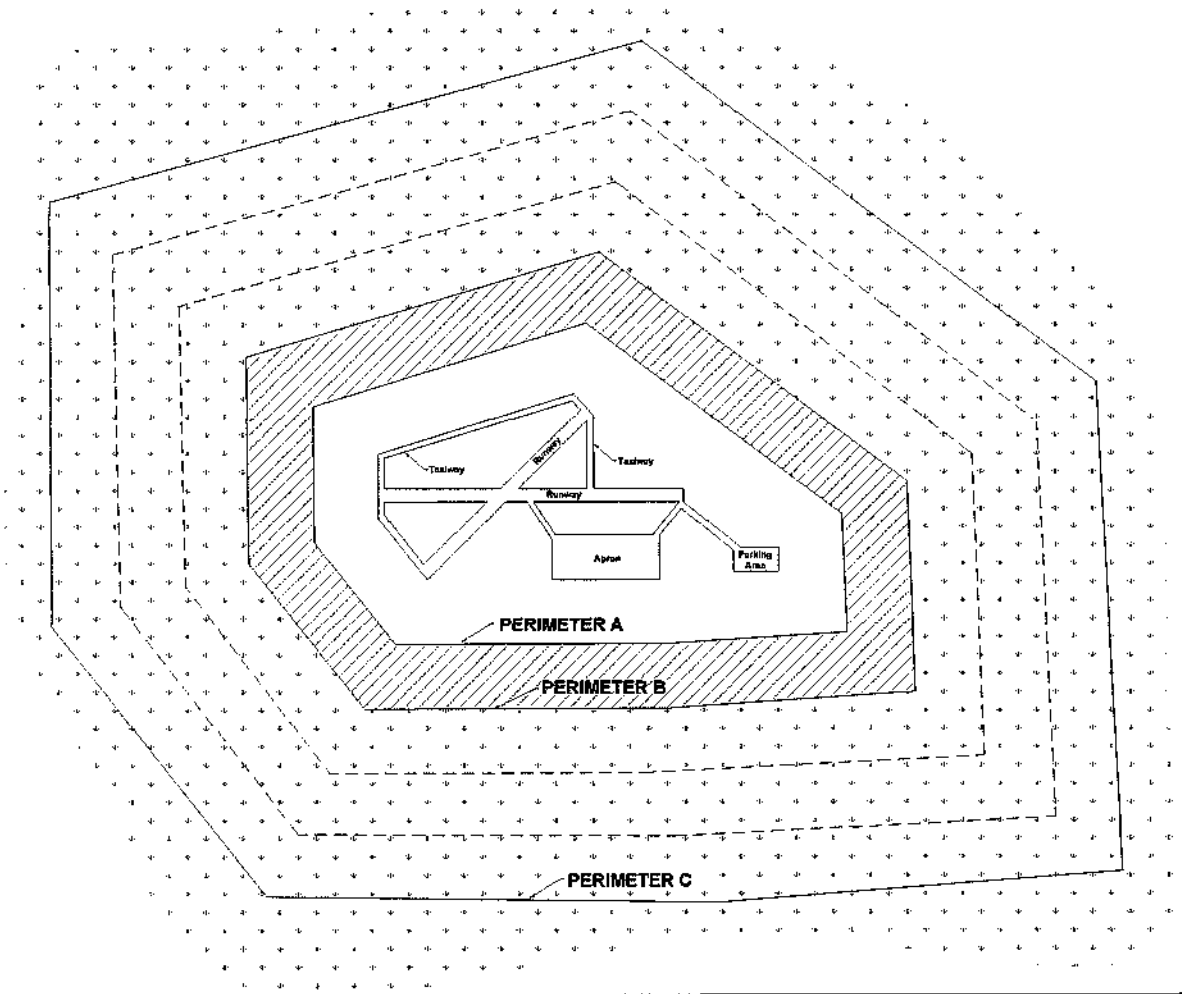
The basis for the separation criteria contained in this section can be found in existing FAA regulations. The separation distances are based on (1) flight patterns of piston-powered aircraft and turbine-powered aircraft, (2) the altitude at which most strikes happen (78 percent occur under 1,000 feet and 90 percent occur under 3,000 feet above ground level), and (3) National Transportation Safety Board (NTSB) recommendations.

1-2. AIRPORTS SERVING PISTON-POWERED AIRCRAFT. Airports that do not sell Jet-A fuel normally serve piston-powered aircraft. Notwithstanding more stringent requirements for specific land uses, the FAA recommends a separation distance of 5,000 feet at these airports for any of the hazardous wildlife attractants mentioned in Section 2 or for new airport development projects meant to accommodate aircraft movement. This distance is to be maintained between an airport's AOA and the hazardous wildlife attractant. Figure 1 depicts this separation distance measured from the nearest aircraft operations areas.

1-3. AIRPORTS SERVING TURBINE-POWERED AIRCRAFT. Airports selling Jet-A fuel normally serve turbine-powered aircraft. Notwithstanding more stringent requirements for specific land uses, the FAA recommends a separation distance of 10,000 feet at these airports for any of the hazardous wildlife attractants mentioned in Section 2 or for new airport development projects meant to accommodate aircraft movement. This distance is to be maintained between an airport's AOA and the hazardous wildlife attractant. Figure 1 depicts this separation distance from the nearest aircraft movement areas.

1-4. PROTECTION OF APPROACH, DEPARTURE, AND CIRCLING AIRSPACE. For all airports, the FAA recommends a distance of 5 statute miles between the farthest edge of the airport's AOA and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace.

Figure 1. Separation distances within which hazardous wildlife attractants should be avoided, eliminated, or mitigated.



PERIMETER A: For airports serving piston-powered aircraft, hazardous wildlife attractants must be 5,000 feet from the nearest air operations area.

PERIMETER B: For airports serving turbine-powered aircraft, hazardous wildlife attractants must be 10,000 feet from the nearest air operations area.

PERIMETER C: 5-mile range to protect approach, departure and circling airspace.

SECTION 2.

LAND-USE PRACTICES ON OR NEAR AIRPORTS THAT POTENTIALLY ATTRACT HAZARDOUS WILDLIFE.

2-1. GENERAL. The wildlife species and the size of the populations attracted to the airport environment vary considerably, depending on several factors, including land-use practices on or near the airport. This section discusses land-use practices having the potential to attract hazardous wildlife and threaten aviation safety. In addition to the specific considerations outlined below, airport operators should refer to *Wildlife Hazard Management at Airports,* prepared by FAA and U.S. Department of Agriculture (USDA) staff. (This manual is available in English, Spanish, and French. It can be viewed and downloaded free of charge from the FAA's wildlife hazard mitigation web site: http://wildlife-mitigation.tc.FAA.gov.). And, *Prevention and Control of Wildlife Damage,* compiled by the University of Nebraska Cooperative Extension Division. (This manual is available online in a periodically updated version at: ianrwww.unl.edu/wildlife/solutions/handbook/.)

2-2. WASTE DISPOSAL OPERATIONS. Municipal solid waste landfills (MSWLF) are known to attract large numbers of hazardous wildlife, particularly birds. Because of this, these operations, when located within the separations identified in the siting criteria in Sections 1-2 through 1-4, are considered incompatible with safe airport operations.

a. Siting for new municipal solid waste landfills subject to AIR 21. Section 503 of the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (Public Law 106-181) (AIR 21) prohibits the construction or establishment of a new MSWLF within 6 statute miles of certain public-use airports. Before these prohibitions apply, both the airport and the landfill must meet the very specific conditions described below. These restrictions do not apply to airports or landfills located within the state of Alaska.

The airport must (1) have received a Federal grant(s) under 49 U.S.C. § 47101, et. seq.; (2) be under control of a public agency; (3) serve some scheduled air carrier operations conducted in aircraft with less than 60 seats; and (4) have total annual enplanements consisting of at least 51 percent of scheduled air carrier enplanements conducted in aircraft with less than 60 passenger seats.

The proposed MSWLF must (1) be within 6 miles of the airport, as measured from airport property line to MSWLF property line, and (2) have started construction or establishment on or after April 5, 2001. Public Law 106-181 only limits the construction or establishment of some new MSWLF. It does not limit the expansion, either vertical or horizontal, of existing landfills.

NOTE: Consult the most recent version of AC 150/5200-34, *Construction or Establishment of Landfills Near Public Airports,* for a more detailed discussion of these restrictions.

b. **Siting for new MSWLF not subject to AIR 21.** If an airport and MSWLF do not meet the restrictions of Public Law 106-181, the FAA recommends against locating MSWLF within the separation distances identified in Sections 1-2 through 1-4. The separation distances should be measured from the closest point of the airport's AOA to the closest planned MSWLF cell.

c. **Considerations for existing waste disposal facilities within the limits of separation criteria.** The FAA recommends against airport development projects that would increase the number of aircraft operations or accommodate larger or faster aircraft near MSWLF operations located within the separations identified in Sections 1-2 through 1-4. In addition, in accordance with 40 CFR 258.10, owners or operators of existing MSWLF units that are located within the separations listed in Sections 1-2 through 1-4 must demonstrate that the unit is designed and operated so it does not pose a bird hazard to aircraft. (See Section 4-2(b) of this AC for a discussion of this demonstration requirement.)

d. **Enclosed trash transfer stations.** Enclosed waste-handling facilities that receive garbage behind closed doors; process it via compaction, incineration, or similar manner; and remove all residue by enclosed vehicles generally are compatible with safe airport operations, provided they are not located on airport property or within the Runway Protection Zone (RPZ). These facilities should not handle or store putrescible waste outside or in a partially enclosed structure accessible to hazardous wildlife. Trash transfer facilities that are open on one or more sides; that store uncovered quantities of municipal solid waste outside, even if only for a short time; that use semi-trailers that leak or have trash clinging to the outside; or that do not control odors by ventilation and filtration systems (odor masking is not acceptable) do not meet the FAA's definition of fully enclosed trash transfer stations. The FAA considers these facilities incompatible with safe airport operations if they are located closer than the separation distances specified in Sections 1-2 through 1-4.

e. **Composting operations on or near airport property.** Composting operations that accept only yard waste (e.g., leaves, lawn clippings, or branches) generally do not attract hazardous wildlife. Sewage sludge, woodchips, and similar material are not municipal solid wastes and may be used as compost bulking agents. The compost, however, must never include food or other municipal solid waste. Composting operations should not be located on airport property. Off-airport property composting operations should be located no closer than the greater of the following distances: 1,200 feet from any AOA or the distance called for by airport design requirements (see AC 150/5300-13, *Airport Design*). This spacing should prevent material, personnel, or equipment from penetrating any Object Free Area (OFA), Obstacle Free Zone (OFZ), Threshold Siting Surface (TSS), or Clearway. Airport operators should monitor composting operations located in proximity to the airport to ensure that steam or thermal rise does not adversely affect air traffic. On-airport disposal of compost by-products should not be conducted for the reasons stated in 2-3f.

f. **Underwater waste discharges.** The FAA recommends against the underwater discharge of any food waste (e.g., fish processing offal) within the separations identified in Sections 1-2 through 1-4 because it could attract scavenging hazardous wildlife.

g. **Recycling centers.** Recycling centers that accept previously sorted non-food items, such as glass, newspaper, cardboard, or aluminum, are, in most cases, not attractive to hazardous wildlife and are acceptable.

h. **Construction and demolition (C&D) debris facilities.** C&D landfills do not generally attract hazardous wildlife and are acceptable if maintained in an orderly manner, admit no putrescible waste, and are not co-located with other waste disposal operations. However, C&D landfills have similar visual and operational characteristics to putrescible waste disposal sites. When co-located with putrescible waste disposal operations, C&D landfills are more likely to attract hazardous wildlife because of the similarities between these disposal facilities. Therefore, a C&D landfill co-located with another waste disposal operation should be located outside of the separations identified in Sections 1-2 through 1-4.

i. **Fly ash disposal.** The incinerated residue from resource recovery power/heat-generating facilities that are fired by municipal solid waste, coal, or wood is generally not a wildlife attractant because it no longer contains putrescible matter. Landfills accepting only fly ash are generally not considered to be wildlife attractants and are acceptable as long as they are maintained in an orderly manner, admit no putrescible waste of any kind, and are not co-located with other disposal operations that attract hazardous wildlife.

   Since varying degrees of waste consumption are associated with general incineration (not resource recovery power/heat-generating facilities), the FAA considers the ash from general incinerators a regular waste disposal by-product and, therefore, a hazardous wildlife attractant if disposed of within the separation criteria outlined in Sections 1-2 through 1-4.

2-3. WATER MANAGEMENT FACILITIES. Drinking water intake and treatment facilities, storm water and wastewater treatment facilities, associated retention and settling ponds, ponds built for recreational use, and ponds that result from mining activities often attract large numbers of potentially hazardous wildlife. To prevent wildlife hazards, land-use developers and airport operators may need to develop management plans, in compliance with local and state regulations, to support the operation of storm water management facilities on or near all public-use airports to ensure a safe airport environment.

a. **Existing storm water management facilities.** On-airport storm water management facilities allow the quick removal of surface water, including discharges related to aircraft deicing, from impervious surfaces, such as pavement and terminal/hangar building roofs. Existing on-airport detention ponds collect storm water, protect water quality, and control runoff. Because they slowly release water

after storms, they create standing bodies of water that can attract hazardous wildlife. Where the airport has developed a Wildlife Hazard Management Plan (WHMP) in accordance with Part 139, the FAA requires immediate correction of any wildlife hazards arising from existing storm water facilities located on or near airports, using appropriate wildlife hazard mitigation techniques. Airport operators should develop measures to minimize hazardous wildlife attraction in consultation with a wildlife damage management biologist.

Where possible, airport operators should modify storm water detention ponds to allow a maximum 48-hour detention period for the design storm. The FAA recommends that airport operators avoid or remove retention ponds and detention ponds featuring dead storage to eliminate standing water. Detention basins should remain totally dry between rainfalls. Where constant flow of water is anticipated through the basin, or where any portion of the basin bottom may remain wet, the detention facility should include a concrete or paved pad and/or ditch/swale in the bottom to prevent vegetation that may provide nesting habitat.

When it is not possible to drain a large detention pond completely, airport operators may use physical barriers, such as bird balls, wires grids, pillows, or netting, to deter birds and other hazardous wildlife. When physical barriers are used, airport operators must evaluate their use and ensure they will not adversely affect water rescue. Before installing any physical barriers over detention ponds on Part 139 airports, airport operators must get approval from the appropriate FAA Regional Airports Division Office.

The FAA recommends that airport operators encourage off-airport storm water treatment facility operators to incorporate appropriate wildlife hazard mitigation techniques into storm water treatment facility operating practices when their facility is located within the separation criteria specified in Sections 1-2 through 1-4.

b. **New storm water management facilities.** The FAA strongly recommends that off-airport storm water management systems located within the separations identified in Sections 1-2 through 1-4 be designed and operated so as not to create above-ground standing water. Stormwater detention ponds should be designed, engineered, constructed, and maintained for a maximum 48–hour detention period after the design storm and remain completely dry between storms. To facilitate the control of hazardous wildlife, the FAA recommends the use of steep-sided, rip-rap lined, narrow, linearly shaped water detention basins. When it is not possible to place these ponds away from an airport's AOA, airport operators should use physical barriers, such as bird balls, wires grids, pillows, or netting, to prevent access of hazardous wildlife to open water and minimize aircraft-wildlife interactions. When physical barriers are used, airport operators must evaluate their use and ensure they will not adversely affect water rescue. Before installing any physical barriers over detention ponds on Part 139 airports, airport operators must get approval from the appropriate FAA Regional Airports Division Office. All vegetation in or around detention basins that provide food or cover for hazardous wildlife should be eliminated. If soil conditions and other requirements allow, the FAA encourages

the use of underground storm water infiltration systems, such as French drains or buried rock fields, because they are less attractive to wildlife.

c. **Existing wastewater treatment facilities.** The FAA strongly recommends that airport operators immediately correct any wildlife hazards arising from existing wastewater treatment facilities located on or near the airport. Where required, a WHMP developed in accordance with Part 139 will outline appropriate wildlife hazard mitigation techniques. Accordingly, airport operators should encourage wastewater treatment facility operators to incorporate measures, developed in consultation with a wildlife damage management biologist, to minimize hazardous wildlife attractants. Airport operators should also encourage those wastewater treatment facility operators to incorporate these mitigation techniques into their standard operating practices. In addition, airport operators should consider the existence of wastewater treatment facilities when evaluating proposed sites for new airport development projects and avoid such sites when practicable.

d. **New wastewater treatment facilities.** The FAA strongly recommends against the construction of new wastewater treatment facilities or associated settling ponds within the separations identified in Sections 1-2 through 1-4. Appendix 1 defines wastewater treatment facility as "any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes." The definition includes any pretreatment involving the reduction of the amount of pollutants or the elimination of pollutants prior to introducing such pollutants into a publicly owned treatment works (wastewater treatment facility). During the site-location analysis for wastewater treatment facilities, developers should consider the potential to attract hazardous wildlife if an airport is in the vicinity of the proposed site, and airport operators should voice their opposition to such facilities if they are in proximity to the airport.

e. **Artificial marshes.** In warmer climates, wastewater treatment facilities sometimes employ artificial marshes and use submergent and emergent aquatic vegetation as natural filters. These artificial marshes may be used by some species of flocking birds, such as blackbirds and waterfowl, for breeding or roosting activities. The FAA strongly recommends against establishing artificial marshes within the separations identified in Sections 1-2 through 1-4.

f. **Wastewater discharge and sludge disposal.** The FAA recommends against the discharge of wastewater or sludge on airport property because it may improve soil moisture and quality on unpaved areas and lead to improved turf growth that can be an attractive food source for many species of animals. Also, the turf requires more frequent mowing, which in turn may mutilate or flush insects or small animals and produce straw, both of which can attract hazardous wildlife. In addition, the improved turf may attract grazing wildlife, such as deer and geese. Problems may also occur when discharges saturate unpaved airport areas. The resultant soft, muddy conditions can severely restrict or prevent emergency vehicles from reaching accident sites in a timely manner.

2-4. WETLANDS. Wetlands provide a variety of functions and can be regulated by local, state, and Federal laws. Normally, wetlands are attractive to many types of wildlife, including many which rank high on the list of hazardous wildlife species (Table 1).

NOTE: If questions exist as to whether an area qualifies as a wetland, contact the local division of the U.S. Army Corps of Engineers, the Natural Resources Conservation Service, or a wetland consultant qualified to delineate wetlands.

a. **Existing wetlands on or near airport property.** If wetlands are located on or near airport property, airport operators should be alert to any wildlife use or habitat changes in these areas that could affect safe aircraft operations. At public-use airports, the FAA recommends immediately correcting, in cooperation with local, state, and Federal regulatory agencies, any wildlife hazards arising from existing wetlands located on or near airports. Where required, a WHMP will outline appropriate wildlife hazard mitigation techniques. Accordingly, airport operators should develop measures to minimize hazardous wildlife attraction in consultation with a wildlife damage management biologist.

b. **New airport development.** Whenever possible, the FAA recommends locating new airports using the separations from wetlands identified in Sections 1-2 through 1-4. Where alternative sites are not practicable, or when airport operators are expanding an existing airport into or near wetlands, a wildlife damage management biologist, in consultation with the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and the state wildlife management agency should evaluate the wildlife hazards and prepare a WHMP that indicates methods of minimizing the hazards.

c. **Mitigation for wetland impacts from airport projects.** Wetland mitigation may be necessary when unavoidable wetland disturbances result from new airport development projects or projects required to correct wildlife hazards from wetlands. Wetland mitigation must be designed so it does not create a wildlife hazard. The FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited outside of the separations identified in Sections 1-2 through 1-4.

   (1) Onsite mitigation of wetland functions. The FAA may consider exceptions to locating mitigation activities outside the separations identified in Sections 1-2 through 1-4 if the affected wetlands provide unique ecological functions, such as critical habitat for threatened or endangered species or ground water recharge, which cannot be replicated when moved to a different location. Using existing airport property is sometimes the only feasible way to achieve the mitigation ratios mandated in regulatory orders and/or settlement agreements with the resource agencies. Conservation easements are an additional means of providing mitigation for project impacts. Typically the airport operator continues to own the property, and an easement is created stipulating that the property will be maintained as habitat for state or Federally listed species.

Mitigation must not inhibit the airport operator's ability to effectively control hazardous wildlife on or near the mitigation site or effectively maintain other aspects of safe airport operations. Enhancing such mitigation areas to attract hazardous wildlife must be avoided. The FAA will review any onsite mitigation proposals to determine compatibility with safe airport operations. A wildlife damage management biologist should evaluate any wetland mitigation projects that are needed to protect unique wetland functions and that must be located in the separation criteria in Sections 1-2 through 1-4 before the mitigation is implemented. A WHMP should be developed to reduce the wildlife hazards.

(2) Offsite mitigation of wetland functions. The FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited outside of the separations identified in Sections 1-2 through 1-4 unless they provide unique functions that must remain onsite (see 2-4c(1)). Agencies that regulate impacts to or around wetlands recognize that it may be necessary to split wetland functions in mitigation schemes. Therefore, regulatory agencies may, under certain circumstances, allow portions of mitigation to take place in different locations.

(3) Mitigation banking. Wetland mitigation banking is the creation or restoration of wetlands in order to provide mitigation credits that can be used to offset permitted wetland losses. Mitigation banking benefits wetland resources by providing advance replacement for permitted wetland losses; consolidating small projects into larger, better-designed and managed units; and encouraging integration of wetland mitigation projects with watershed planning. This last benefit is most helpful for airport projects, as wetland impacts mitigated outside of the separations identified in Sections 1-2 through 1-4 can still be located within the same watershed. Wetland mitigation banks meeting the separation criteria offer an ecologically sound approach to mitigation in these situations. Airport operators should work with local watershed management agencies or organizations to develop mitigation banking for wetland impacts on airport property.

2-5. DREDGE SPOIL CONTAINMENT AREAS. The FAA recommends against locating dredge spoil containment areas (also known as Confined Disposal Facilities) within the separations identified in Sections 1-2 through 1-4 if the containment area or the spoils contain material that would attract hazardous wildlife.

2-6. AGRICULTURAL ACTIVITIES. Because most, if not all, agricultural crops can attract hazardous wildlife during some phase of production, the FAA recommends against the used of airport property for agricultural production, including hay crops, within the separations identified in Sections 1-2 through 1-4. . If the airport has no financial alternative to agricultural crops to produce income necessary to maintain the viability of the airport, then the airport shall follow the crop distance guidelines listed in the table titled "Minimum Distances between Certain Airport Features and Any On-Airport Agricultural Crops" found in AC 150/5300-13, *Airport Design*, Appendix 17. The cost of wildlife control and potential accidents should be weighed against the income produced by the on-airport crops when deciding whether to allow crops on the airport.

a. **Livestock production.** Confined livestock operations (i.e., feedlots, dairy operations, hog or chicken production facilities, or egg laying operations) often attract flocking birds, such as starlings, that pose a hazard to aviation. Therefore, The FAA recommends against such facilities within the separations identified in Sections 1-2 through 1-4. Any livestock operation within these separations should have a program developed to reduce the attractiveness of the site to species that are hazardous to aviation safety. Free-ranging livestock must not be grazed on airport property because the animals may wander onto the AOA. Furthermore, livestock feed, water, and manure may attract birds.

b. **Aquaculture.** Aquaculture activities (i.e. catfish or trout production) conducted outside of fully enclosed buildings are inherently attractive to a wide variety of birds. Existing aquaculture facilities/activities within the separations listed in Sections 1-2 through 1-4 must have a program developed to reduce the attractiveness of the sites to species that are hazardous to aviation safety. Airport operators should also oppose the establishment of new aquaculture facilities/activities within the separations listed in Sections 1-2 through 1-4.

c. **Alternative uses of agricultural land.** Some airports are surrounded by vast areas of farmed land within the distances specified in Sections 1-2 through 1-4. Seasonal uses of agricultural land for activities such as hunting can create a hazardous wildlife situation. In some areas, farmers will rent their land for hunting purposes. Rice farmers, for example, flood their land during waterfowl hunting season and obtain additional revenue by renting out duck blinds. The duck hunters then use decoys and call in hundreds, if not thousands, of birds, creating a tremendous threat to aircraft safety. A wildlife damage management biologist should review, in coordination with local farmers and producers, these types of seasonal land uses and incorporate them into the WHMP.

2-7. GOLF COURSES, LANDSCAPING AND OTHER LAND-USE CONSIDERATIONS.

a. **Golf courses.** The large grassy areas and open water found on most golf courses are attractive to hazardous wildlife, particularly Canada geese and some species of gulls. These species can pose a threat to aviation safety. The FAA recommends against construction of new golf courses within the separations identified in Sections 1-2 through 1-4. Existing golf courses located within these separations must develop a program to reduce the attractiveness of the sites to species that are hazardous to aviation safety. Airport operators should ensure these golf courses are monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be immediately implemented.

b. **Landscaping and landscape maintenance.** Depending on its geographic location, landscaping can attract hazardous wildlife. The FAA recommends that airport operators approach landscaping with caution and confine it to airport areas not associated with aircraft movements. A wildlife damage management biologist should review all landscaping plans. Airport operators should also monitor all landscaped areas on a continuing basis for the presence of hazardous wildlife. If

hazardous wildlife is detected, corrective actions should be immediately implemented.

Turf grass areas can be highly attractive to a variety of hazardous wildlife species. Research conducted by the USDA Wildlife Services' National Wildlife Research Center has shown that no one grass management regime will deter all species of hazardous wildlife in all situations. In cooperation with wildlife damage management biologist, airport operators should develop airport turf grass management plans on a prescription basis, depending on the airport's geographic locations and the type of hazardous wildlife likely to frequent the airport

Airport operators should ensure that plant varieties attractive to hazardous wildlife are not used on the airport. Disturbed areas or areas in need of re-vegetating should not be planted with seed mixtures containing millet or any other large-seed producing grass. For airport property already planted with seed mixtures containing millet, rye grass, or other large-seed producing grasses, the FAA recommends disking, plowing, or another suitable agricultural practice to prevent plant maturation and seed head production. Plantings should follow the specific recommendations for grass management and seed and plant selection made by the State University Cooperative Extension Service, the local office of Wildlife Services, or a qualified wildlife damage management biologist. Airport operators should also consider developing and implementing a preferred/prohibited plant species list, reviewed by a wildlife damage management biologist, which has been designed for the geographic location to reduce the attractiveness to hazardous wildlife for landscaping airport property.

c. **Airports surrounded by wildlife habitat.** The FAA recommends that operators of airports surrounded by woodlands, water, or wetlands refer to Section 2.4 of this AC. Operators of such airports should provide for a Wildlife Hazard Assessment (WHA) conducted by a wildlife damage management biologist. This WHA is the first step in preparing a WHMP, where required.

d. **Other hazardous wildlife attractants.** Other specific land uses or activities (e.g., sport or commercial fishing, shellfish harvesting, etc.), perhaps unique to certain regions of the country, have the potential to attract hazardous wildlife. Regardless of the source of the attraction, when hazardous wildlife is noted on a public-use airport, airport operators must take prompt remedial action(s) to protect aviation safety.

2-8. SYNERGISTIC EFFECTS OF SURROUNDING LAND USES. There may be circumstances where two (or more) different land uses that would not, by themselves, be considered hazardous wildlife attractants or that are located outside of the separations identified in Sections 1-2 through 1-4 that are in such an alignment with the airport as to create a wildlife corridor directly through the airport and/or surrounding airspace. An example of this situation may involve a lake located outside of the separation criteria on the east side of an airport and a large hayfield on the west side of an airport, land uses that together could create a flyway for Canada geese directly across the airspace of the airport. There are numerous examples of such situations;

therefore, airport operators and the wildlife damage management biologist must consider the entire surrounding landscape and community when developing the WHMP.

SECTION 3.

PROCEDURES FOR WILDLIFE HAZARD MANAGEMENT BY OPERATORS OF PUBLIC-USE AIRPORTS.

3.1. INTRODUCTION. In recognition of the increased risk of serious aircraft damage or the loss of human life that can result from a wildlife strike, the FAA may require the development of a Wildlife Hazard Management Plan (WHMP) when specific triggering events occur on or near the airport. Part 139.337 discusses the specific events that trigger a Wildlife Hazard Assessment (WHA) and the specific issues that a WHMP must address for FAA approval and inclusion in an Airport Certification Manual.

3.2. COORDINATION WITH USDA WILDLIFE SERVICES OR OTHER QUALIFIED WILDLIFE DAMAGE MANAGEMENT BIOLOGISTS. The FAA will use the Wildlife Hazard Assessment (WHA) conducted in accordance with Part 139 to determine if the airport needs a WHMP. Therefore, persons having the education, training, and expertise necessary to assess wildlife hazards must conduct the WHA. The airport operator may look to Wildlife Services or to qualified private consultants to conduct the WHA. When the services of a wildlife damage management biologist are required, the FAA recommends that land-use developers or airport operators contact a consultant specializing in wildlife damage management or the appropriate state director of Wildlife Services.

NOTE: Telephone numbers for the respective USDA Wildlife Services state offices can be obtained by contacting USDA Wildlife Services Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD, 20737-1234, Telephone (301) 734-7921, Fax (301) 734-5157 *(http://www.aphis.usda.gov/ws/)*.

3-3. WILDLIFE HAZARD MANAGEMENT AT AIRPORTS: A MANUAL FOR AIRPORT PERSONNEL. This manual, prepared by FAA and USDA Wildlife Services staff, contains a compilation of information to assist airport personnel in the development, implementation, and evaluation of WHMPs at airports. The manual includes specific information on the nature of wildlife strikes, legal authority, regulations, wildlife management techniques, WHAs, WHMPs, and sources of help and information. The manual is available in three languages: English, Spanish, and French. It can be viewed and downloaded free of charge from the FAA's wildlife hazard mitigation web site: http://wildlife-mitigation.tc.FAA.gov/. This manual only provides a starting point for addressing wildlife hazard issues at airports. Hazardous wildlife management is a complex discipline and conditions vary widely across the United States. Therefore, qualified wildlife damage management biologists must direct the development of a WHMP and the implementation of management actions by airport personnel.

There are many other resources complementary to this manual for use in developing and implementing WHMPs. Several are listed in the manual's bibliography.

3-4. WILDLIFE HAZARD ASSESSMENTS, TITLE 14, CODE OF FEDERAL REGULATIONS, PART 139. Part 139.337(b) requires airport operators to conduct a Wildlife Hazard Assessment (WHA) when certain events occur on or near the airport.

Part 139.337 (c) provides specific guidance as to what facts must be addressed in a WHA.

3-5. WILDLIFE HAZARD MANAGEMENT PLAN (WHMP). The FAA will consider the results of the WHA, along with the aeronautical activity at the airport and the views of the airport operator and airport users, in determining whether a formal WHMP is needed, in accordance with Part 139.337. If the FAA determines that a WHMP is needed, the airport operator must formulate and implement a WHMP, using the WHA as the basis for the plan.

The goal of an airport's Wildlife Hazard Management Plan is to minimize the risk to aviation safety, airport structures or equipment, or human health posed by populations of hazardous wildlife on and around the airport.

The WHMP must identify hazardous wildlife attractants on or near the airport and the appropriate wildlife damage management techniques to minimize the wildlife hazard. It must also prioritize the management measures.

3-6. LOCAL COORDINATION. The establishment of a Wildlife Hazards Working Group (WHWG) will facilitate the communication, cooperation, and coordination of the airport and its surrounding community necessary to ensure the effectiveness of the WHMP. The cooperation of the airport community is also necessary when new projects are considered. Whether on or off the airport, the input from all involved parties must be considered when a potentially hazardous wildlife attractant is being proposed. Airport operators should also incorporate public education activities with the local coordination efforts because some activities in the vicinity of your airport, while harmless under normal leisure conditions, can attract wildlife and present a danger to aircraft. For example, if public trails are planned near wetlands or in parks adjoining airport property, the public should know that feeding birds and other wildlife in the area may pose a risk to aircraft.

Airport operators should work with local and regional planning and zoning boards so as to be aware of proposed land-use changes, or modification of existing land uses, that could create hazardous wildlife attractants within the separations identified in Sections 1-2 through 1-4. Pay particular attention to proposed land uses involving creation or expansion of waste water treatment facilities, development of wetland mitigation sites, or development or expansion of dredge spoil containment areas. At the very least, airport operators must ensure they are on the notification list of the local planning board or equivalent review entity for all communities located within 5 miles of the airport, so they will receive notification of any proposed project and have the opportunity to review it for attractiveness to hazardous wildlife.

3-7 COORDINATION/NOTIFICATION OF AIRMEN OF WILDLIFE HAZARDS. If an existing land-use practice creates a wildlife hazard and the land-use practice or wildlife hazard cannot be immediately eliminated, airport operators must issue a Notice to Airmen (NOTAM) and encourage the land–owner or manager to take steps to control the wildlife hazard and minimize further attraction.

SECTION 4.

FAA NOTIFICATION AND REVIEW OF PROPOSED LAND-USE PRACTICE CHANGES IN THE VICINITY OF PUBLIC-USE AIRPORTS

4-1. FAA REVIEW OF PROPOSED LAND-USE PRACTICE CHANGES IN THE VICINITY OF PUBLIC-USE AIRPORTS.

a. The FAA discourages the development of waste disposal and other facilities, discussed in Section 2, located within the 5,000/10,000-foot criteria specified in Sections 1-2 through 1-4.

b. For projects that are located outside the 5,000/10,000-foot criteria but within 5 statute miles of the airport's AOA, the FAA may review development plans, proposed land-use changes, operational changes, or wetland mitigation plans to determine if such changes present potential wildlife hazards to aircraft operations. The FAA considers sensitive airport areas as those that lie under or next to approach or departure airspace. This brief examination should indicate if further investigation is warranted.

c. Where a wildlife damage management biologist has conducted a further study to evaluate a site's compatibility with airport operations, the FAA may use the study results to make a determination.

4-2. WASTE MANAGEMENT FACILITIES.

a. Notification of new/expanded project proposal. Section 503 of the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (Public Law 106-181) limits the construction or establishment of new MSWLF within 6 statute miles of certain public-use airports, when both the airport and the landfill meet very specific conditions. See Section 2-2 of this AC and AC 150/5200-34 for a more detailed discussion of these restrictions.

The Environmental Protection Agency (EPA) requires any MSWLF operator proposing a new or expanded waste disposal operation within 5 statute miles of a runway end to notify the appropriate FAA Regional Airports Division Office and the airport operator of the proposal (40 CFR 258, *Criteria for Municipal Solid Waste Landfills*, Section 258.10, *Airport Safety*). The EPA also requires owners or operators of new MSWLF units, or lateral expansions of existing MSWLF units, that are located within 10,000 feet of any airport runway end used by turbojet aircraft, or within 5,000 feet of any airport runway end used only by piston-type aircraft, to demonstrate successfully that such units are not hazards to aircraft. (See 4-2.b below.)

When new or expanded MSWLF are being proposed near airports, MSWLF operators must notify the airport operator and the FAA of the proposal as early as possible pursuant to 40 CFR 258.

b. **Waste handling facilities within separations identified in Sections 1-2 through 1-4.** To claim successfully that a waste-handling facility sited within the separations identified in Sections 1-2 through 1-4 does not attract hazardous wildlife and does not threaten aviation, the developer must establish convincingly that the facility will not handle putrescible material other than that as outlined in 2-2.d. The FAA strongly recommends against any facility other than that as outlined in 2-2.d (enclosed transfer stations). The FAA will use this information to determine if the facility will be a hazard to aviation.

c. **Putrescible-Waste Facilities.** In their effort to satisfy the EPA requirement, some putrescible-waste facility proponents may offer to undertake experimental measures to demonstrate that their proposed facility will not be a hazard to aircraft. To date, no such facility has been able to demonstrate an ability to reduce and sustain hazardous wildlife to levels that existed before the putrescible-waste landfill began operating. For this reason, demonstrations of experimental wildlife control measures may not be conducted within the separation identified in Sections 1-2 through 1-4.

4-3. OTHER LAND-USE PRACTICE CHANGES. As a matter of policy, the FAA encourages operators of public-use airports who become aware of proposed land use practice changes that may attract hazardous wildlife within 5 statute miles of their airports to promptly notify the FAA. The FAA also encourages proponents of such land use changes to notify the FAA as early in the planning process as possible. Advanced notice affords the FAA an opportunity (1) to evaluate the effect of a particular land-use change on aviation safety and (2) to support efforts by the airport sponsor to restrict the use of land next to or near the airport to uses that are compatible with the airport.

The airport operator, project proponent, or land-use operator may use FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, or other suitable documents similar to FAA Form 7460-1 to notify the appropriate FAA Regional Airports Division Office. Project proponents can contact the appropriate FAA Regional Airports Division Office for assistance with the notification process.

It is helpful if the notification includes a 15-minute quadrangle map of the area identifying the location of the proposed activity. The land-use operator or project proponent should also forward specific details of the proposed land-use change or operational change or expansion. In the case of solid waste landfills, the information should include the type of waste to be handled, how the waste will be processed, and final disposal methods.

a. **Airports that have received Federal grant-in-aid assistance.** Airports that have received Federal grant-in-aid assistance are required by their grant assurances to take appropriate actions to restrict the use of land next to or near the airport to uses that are compatible with normal airport operations. The FAA recommends that airport operators to the extent practicable oppose off-airport land-use changes or practices within the separations identified in Sections 1-2 through 1-4 that may attract hazardous wildlife. Failure to do so may lead to noncompliance with applicable grant assurances. The FAA will not approve the placement of airport

development projects pertaining to aircraft movement in the vicinity of hazardous wildlife attractants without appropriate mitigating measures. Increasing the intensity of wildlife control efforts is not a substitute for eliminating or reducing a proposed wildlife hazard. Airport operators should identify hazardous wildlife attractants and any associated wildlife hazards during any planning process for new airport development projects.

This page intentionally left blank.

APPENDIX 1. DEFINITIONS OF TERMS USED IN THIS ADVISORY CIRCULAR.

1. **GENERAL.** This appendix provides definitions of terms used throughout this AC.

    1. **Air operations area.** Any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft. An air operations area includes such paved areas or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiways, or apron.

    2. **Airport operator.** The operator (private or public) or sponsor of a public-use airport.

    3. **Approach or departure airspace.** The airspace, within 5 statute miles of an airport, through which aircraft move during landing or takeoff.

    4. **Bird balls.** High-density plastic floating balls that can be used to cover ponds and prevent birds from using the sites.

    5. **Certificate holder.** The holder of an Airport Operating Certificate issued under Title 14, Code of Federal Regulations, Part 139.

    6. **Construct a new MSWLF.** To begin to excavate, grade land, or raise structures to prepare a municipal solid waste landfill as permitted by the appropriate regulatory or permitting agency.

    7. **Detention ponds.** Storm water management ponds that hold storm water for short periods of time, a few hours to a few days.

    8. **Establish a new MSWLF.** When the first load of putrescible waste is received on-site for placement in a prepared municipal solid waste landfill.

    9. **Fly ash.** The fine, sand-like residue resulting from the complete incineration of an organic fuel source. Fly ash typically results from the combustion of coal or waste used to operate a power generating plant.

    10. **General aviation aircraft.** Any civil aviation aircraft not operating under 14 CFR Part 119, Certification: Air Carriers and Commercial Operators.

    11. **Hazardous wildlife.** Species of wildlife (birds, mammals, reptiles), including feral animals and domesticated animals not under control, that are associated with aircraft strike problems, are capable of causing structural damage to airport facilities, or act as attractants to other wildlife that pose a strike hazard

    12. **Municipal Solid Waste Landfill (MSWLF).** A publicly or privately owned discrete area of land or an excavation that receives household waste and that is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined under 40 CFR § 257.2. An MSWLF may receive

other types wastes, such as commercial solid waste, non-hazardous sludge, small-quantity generator waste, and industrial solid waste, as defined under 40 CFR § 258.2. An MSWLF can consist of either a stand alone unit or several cells that receive household waste.

13. **New MSWLF.** A municipal solid waste landfill that was established or constructed after April 5, 2001.

14. **Piston-powered aircraft.** Fixed-wing aircraft powered by piston engines.

15. **Piston-use airport.** Any airport that does not sell Jet-A fuel for fixed-wing turbine-powered aircraft, and primarily serves fixed-wing, piston-powered aircraft. Incidental use of the airport by turbine-powered, fixed-wing aircraft would not affect this designation. However, such aircraft should not be based at the airport.

16. **Public agency.** A State or political subdivision of a State, a tax-supported organization, or an Indian tribe or pueblo (49 U.S.C. § 47102(19)).

17. **Public airport.** An airport used or intended to be used for public purposes that is under the control of a public agency; and of which the area used or intended to be used for landing, taking off, or surface maneuvering of aircraft is publicly owned (49 U.S.C. § 47102(20)).

18. **Public-use airport.** An airport used or intended to be used for public purposes, and of which the area used or intended to be used for landing, taking off, or surface maneuvering of aircraft may be under the control of a public agency or privately owned and used for public purposes (49 U.S.C. § 47102(21)).

19. **Putrescible waste.** Solid waste that contains organic matter capable of being decomposed by micro-organisms and of such a character and proportion as to be capable of attracting or providing food for birds (40 CFR §257.3-8).

20. **Putrescible-waste disposal operation.** Landfills, garbage dumps, underwater waste discharges, or similar facilities where activities include processing, burying, storing, or otherwise disposing of putrescible material, trash, and refuse.

21. **Retention ponds.** Storm water management ponds that hold water for several months.

22. **Runway protection zone (RPZ).** An area off the runway end to enhance the protection of people and property on the ground (see AC 150/5300-13). The dimensions of this zone vary with the airport design, aircraft, type of operation, and visibility minimum.

23. **Scheduled air carrier operation.** Any common carriage passenger-carrying operation for compensation or hire conducted by an air carrier or commercial

operator for which the air carrier, commercial operator, or their representative offers in advance the departure location, departure time, and arrival location. It does not include any operation that is conducted as a supplemental operation under 14 CFR Part 119 or as a public charter operation under 14 CFR Part 380 (14 CFR § 119.3).

24. **Sewage sludge.** Any solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and a material derived from sewage sludge. Sewage does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works. (40 CFR 257.2)

25. **Sludge.** Any solid, semi-solid, or liquid waste generated form a municipal, commercial or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility or any other such waste having similar characteristics and effect. (40 CFR 257.2)

26. **Solid waste.** Any garbage, refuse, sludge, from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including, solid liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or by product material as defined by the Atomic Energy Act of 1954, as amended, (68 Stat. 923). (40 CFR 257.2)

27. **Turbine-powered aircraft.** Aircraft powered by turbine engines including turbojets and turboprops but excluding turbo-shaft rotary-wing aircraft.

28. **Turbine-use airport.** Any airport that sells Jet-A fuel for fixed-wing turbine-powered aircraft.

29. **Wastewater treatment facility.** Any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes, including Publicly Owned Treatment Works (POTW), as defined by Section 212 of the Federal Water Pollution Control Act (P.L. 92-500) as amended by the Clean Water Act of 1977 (P.L. 95-576) and the Water Quality Act of 1987 (P.L. 100-4). This definition includes any pretreatment involving the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW. (See 40 CFR Section 403.3 (q), (r), & (s)).

30. **Wildlife.** Any wild animal, including without limitation any wild mammal, bird, reptile, fish, amphibian, mollusk, crustacean, arthropod, coelenterate, or other invertebrate, including any part, product, egg, or offspring thereof (50 CFR 10.12, *Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants*). As used in this AC, wildlife includes feral animals and domestic animals out of the control of their owners (14 CFR Part 139, Certification of Airports).

31. **Wildlife attractants.** Any human-made structure, land-use practice, or human-made or natural geographic feature that can attract or sustain hazardous wildlife within the landing or departure airspace or the airport's AOA. These attractants can include architectural features, landscaping, waste disposal sites, wastewater treatment facilities, agricultural or aquaculture activities, surface mining, or wetlands.

32. **Wildlife hazard.** A potential for a damaging aircraft collision with wildlife on or near an airport.

33. **Wildlife strike.** A wildlife strike is deemed to have occurred when:

    a. A pilot reports striking 1 or more birds or other wildlife;

    b. Aircraft maintenance personnel identify aircraft damage as having been caused by a wildlife strike;

    c. Personnel on the ground report seeing an aircraft strike 1 or more birds or other wildlife;

    d. Bird or other wildlife remains, whether in whole or in part, are found within 200 feet of a runway centerline, unless another reason for the animal's death is identified;

    e. The animal's presence on the airport had a significant negative effect on a flight (i.e., aborted takeoff, aborted landing, high-speed emergency stop, aircraft left pavement area to avoid collision with animal) (Transport Canada, Airports Group, *Wildlife Control Procedures Manual*, Technical Publication 11500E, 1994).

2. RESERVED.

Appendix F

Guidelines for Using Effigies to Disperse Nuisance Vulture Roosts

John S. Humphrey, Eric A. Tillman, Michael L Avery
USDA-APHIS-Wildlife Services-National Wildlife Research Center, Florida Field Station, 2820 East University Avenue, Gainesville, FL 32641

WHAT IS AN EFFIGY?
An effigy as defined in Webster's dictionary is a "full or partial representation likeness" of a person or object. Effigies used for dispersing vultures include a fresh carcass, a taxidermic preparation, or an artificial likeness such as a goose decoy painted to resemble a vulture. Both black and turkey vultures respond similarly to effigies of either species.

OVERVIEW
Vulture night roosts consist of single or mixed species. These guidelines were developed principally for wooded roosts, but the same principles apply for roosts in towers and other sites. Furthermore, these procedures might also be applicable to nuisance situations caused by daytime vulture activity. **Regardless of the situation or roost habitat, proper placement is the single most important aspect in successfully using an effigy to disperse vultures.**

To place the effigy properly, one must fully evaluate the roost site for optimal effigy attachment points. Important factors to consider when deciding where to hang an effigy include:
~ locations with the highest bird activity or use, often indicated by an accumulation of feces and feather;
- visibility of the effigy to birds coming into the roost;
- prominent branches or support structures; and
- accessibility by the biologist to the site.

Optimal effigy attachment points are:
- high and prominent;
- relatively free from entanglement (branches or support structures); and
— inaccessible to perching vultures.

THE EFFIGY
Once a bird has been acquired under a legal permit, it should be determined whether a long term or temporary placement is needed. If long term placement or multiple usage is required, it is advised that the bird be prepared by a taxidermist and then treated with a spray on preservative such as Scotch Guard for leather. The posture of the prepared bird should resemble that of a dead bird hung by its feet with one or both wings hanging down in an outstretched manner. For short term placement (up to 3 months, depending on weather conditions) and if odor is not a concern, then an intact carcass can be used.

MATERIALS
The materials that are needed for hanging effigies in the roost can be found at most outdoor or general merchandise stores such as Wal-Mart or K-Mart. These include:
- a bow and fishing arrow (fiberglass or other heavy arrow with line attachment point and field point);
- archery fishing set-up with rod, reel, and 20-40# line;
- spool of 1/8" -1/4" effigy attachment line (nylon or other synthetic weather resistant);
- heavy duty fishing type snap swivels; and
- a small smooth weight (e.g. sinker) or sand bag that can be used to adjust the line.
PLACING THE EFFIGY ATTACHMENT LINE

Appendix F

Vulture effigies can readily be placed in wooded roosts using a compound bow fitted with a commercially available fishing set-up (Zebco 808 reel mounted on a small rod attached to the stabilizer hole and a fishing arrow). Alternatively, it is possible to use a standard fishing rod with fishing arrow (fiberglass field point arrow with a small hole near the nock for line attachment), however this requires a second person to hold the rod and ensure that the line does not get hung up. It is recommended that 20-lb monofilament line be used due to its strength and flexibility.

Choose a branch or attachment point that is in an area of high use, as evidenced by an accumulation of feces and/or feathers or pellets, and with the high visibility to birds entering the roost. The space below should also be free from branches or structures that could entangle the effigy during heavy winds. **Optimally, the bird should not hang farther than the distance from the attachment point to any other branch or structure to the side** (i.e. from an attachment point 5 ft out on a branch the effigy should hang no more than 5 ft down to prevent it becoming tangled in the truck of the tree).

Shoot the arrow over the attachment branch. Attempt to limit the number of branches the line goes over by putting tension on the line following release, but not before reaching the branch. This will reduce the friction on the line when raising the effigy and reduce branch or line breakage. Allow the arrow to drop to the ground and then remove it from the line. Secure the attachment line to the fishing line. Reel or wind the fishing line, pulling the effigy attachment line over the branch. After removing the fishing line, attach a heavy duty snap swivel to the effigy attachment line. If this line has gone over multiple branches, it may be necessary to pull back the line from all but the main attachment branch. This can be done by attaching a smooth-edged weight to the end of the line closest to the excess branches, pulling the weight over the branch until it reaches the effigy attachment branch, and then lowering the weight down.

For lower attachment point, it may be possible to use a throwing bag slung over the branch or attachment point. For towers or other structures, a professional climber or other authorized maintenance person should ascend the tower and hang the effigy from a prominent point.

ATTACHING THE EFFIGY

To attach the effigy, take a 2 - 3 ft length of the same material as the attachment line, fold it in half and tie a small loop at the midpoint. This is the point at which the attachment line and snap swivel are connected. Next, tie the ends of the looped line to the legs of the effigy just above the feet, making sure to wrap the line twice around the leg before tying to secure knot. The knotted loop ensures that in the event one of the leg knots comes loose, the effigy will remain in place. If the leg joints have been damaged or otherwise had their strength compromised, a length of line should be tied from the foot knot to the neck in case the leg separates from the effigy.

PUTTING THE EFFIGY TO WORK

Raising the effigy into place may require two people depending on the weight of the bird, the height of the attachment point, and the number of branches the line contacts. It often helps to get the effigy moving by having one person push up on it while a second person pulls on the other end of the line.

Raise the effigy as high as possible while evaluating the factors of visibility, entanglement, and accessibility to perching vultures. It is advisable to back away from the roost and look at it from different angles to determine if it is at a height to satisfy the above concerns. Finally, tie the trailing end of the attachment line to a secure location that minimizes potential interference by pedestrian, wildlife, or other traffic. Wrap and secure the excess line so that it will be available at a later time should the effigy need to be lowered for maintenance or replacement. Avoid tying to places (such as along a fence top, horizontal branch, or other movement corridor) where chewing damage by rodents is likely. The effigy should now be visible to incoming bird, hanging upside down with its wings outstretched, and ready to disperse the roost.