

Contents

List of Tables.....	ii
List of Figures.....	ii
List of Appendices.....	iii
List of Acronyms.....	iii
Introduction.....	1
Review of Wildlife Hazards to Aircraft.....	2
Wildlife Laws and Protected Species.....	3
Federal Regulations.....	4
State and Local Regulations.....	4
Study Area.....	5
Site Description.....	5
Habitat and Land Cover.....	6
Methodology.....	7
Wildlife Hazard Site Visit.....	7
Wildlife Strike History.....	8
Wildlife Attractants and Hazards.....	8
Wildlife Surveys.....	9
Standardized Surveys.....	9
Non-standardized Surveys.....	9
Wildlife Guilds.....	10
Behavior.....	11
Spatial and Temporal Wildlife Movements.....	11
Results.....	12
Wildlife Hazard Site Visit.....	12
Wildlife Strike History.....	13
Wildlife Attractants and Hazards.....	13
Wildlife Surveys.....	20
Standardized Surveys.....	24
Non-standardized Surveys.....	25
Wildlife Guilds.....	25
Behavior.....	26
Spatial and Temporal Wildlife Movements.....	26
Seasonal Wildlife Observations.....	27
Discussion.....	28
Wildlife Hazard Site Visit.....	28
Wildlife Strike History.....	28
Wildlife Attractants and Potential Management of Hazards.....	28
Wildlife attractants and hazards outside the AOA:.....	30
Wildlife Numbers.....	30
Wildlife Guilds.....	30
Blackbirds.....	31
Columbids.....	31
Raptors.....	32
Corvids.....	32
Shorebirds.....	32
Waterfowl.....	33

Gulls.....	33
Gallinaceous Birds	34
Carnivores.....	34
Ungulates.....	35
Other guilds	35
Behavior.....	35
Spatial and Temporal Wildlife Movements.....	36
Conclusions and Summary Recommendations	37
Modify existing habitat to make it less attractive to wildlife.....	38
Resident Species management.....	38
Wildlife exclusion from airfield.....	39
Reporting Wildlife Strikes.....	39
Summary Recommendations.....	39
Implementation of Recommendations.....	40
Further Assessments	40
Literature Cited.....	41

List of Tables

Table 1. Permits required for harassment or take of wildlife species that do or can occur near Fairfield County Airport.....	3
Table 2. Standardized survey results.....	24
Table 3. Non-standardized survey results.....	25
Table 4. Behaviors observed during survey.....	26
Table 5. Wildlife heights observed during survey.....	27
Table 6. Wildlife observations over two visits.....	27

List of Figures

Figure 1. Fairfield County Airport and surrounding area showing 5,000 and 10,000 feet approach, departure, and circling airspace.....	5
Figure 2. Ecoregions level III and level IV of Ohio and Indiana (Wood et al. 2002).....	6
Figure 3. Land cover within the boundaries of Fairfield County Airport.....	7
Figure 4. Location of Standardized Survey Points.....	10
Figure 5. Location of wildlife attractants and hazards in the vicinity of Fairfield County Airport.....	13
Figure 6. Existing types of fence surrounding the AOA.....	14
Figure 7. Vegetation on fencing.....	15
Figure 8. Brush and tall vegetation within the AOA.....	15
Figure 9. Reduce standing water in ditches.....	16
Figure 10. Dirt pile near cement pads and apron.....	17
Figure 11. Weeds and grass growing within cement pad and apron.....	17
Figure 12. Crop fields within AOA.....	18
Figure 13. Wooded area and emergent wetland to the northwest.....	19
Figure 14. Forested wetland west of the AOA across Columbus-Lancaster Road.....	20
Figure 15. Dumpster near terminal.....	21
Figure 16. Bird nest in landscaping.....	21
Figure 17. Landscaping and shelter near terminal.....	22

Figure 18. Coyote feces on taxiway.22

Figure 19. White-tailed deer hair in small wooded area.....23

Figure 20. LHQ removed tall vegetation along ditch since the last visit.23

Figure 21. Standing water after rain event.....24

Figure 22. Wildlife guilds observed during survey.....26

Figure 23. Observed and projected wildlife movements in the vicinity of Fairfield County Airport.37

List of Appendices

- Appendix A - Resources and Supplementary Materials
- Appendix B - Scientific Names of Wildlife Species
- Appendix C - Photographs of Standardized Survey Points

List of Acronyms

- AGL Above Ground Level
- AOA Air Operating Area
- FAA Federal Aviation Administration
- FIFRA Federal Insecticide, Fungicide, and Rodenticide Act
- GA General Aviation
- OLHQ Fairfield County Airport
- MBTA Migratory Bird Treaty Act
- NLDC National Land Cover Database
- ODNR Ohio Department of Natural Resources
- QAWB Qualified Airport Wildlife Biologist
- SSP Standardized survey points
- USA United States of America
- USFWS United States Fish and Wildlife Service
- WHA Wildlife Hazard Assessment
- WHSV Wildlife Hazard Site Visit
- WHMP Wildlife Hazard Management Plan

Wildlife Hazard Site Visit Report

Fairfield County Airport

Fairfield County, Ohio

Introduction

The Fairfield County Airport Authority who operates The Fairfield County Airport (LHQ) located near Lancaster, Fairfield County, Ohio, has requested a Wildlife Hazard Site Visit (WHSV) based on the draft AC 150/5200-33C (Appendix A) that states all airports that are not classified as certificated airports (commercial airports) are required to monitor, evaluate, and mitigate wildlife hazard risks to comply by the Airport Improvement Program Grant Assurance No. 19. non-certified airports are placed in four categories to determine what type of survey is required and the frequency of those surveys. There are two types of surveys: a yearlong Wildlife Hazards Assessment (WHA) (see Title 14 Code of Federal Regulations, Part 139.337(b)) and a WHSV, an abbreviated analysis of a triggering event to determine if the WHMP adequately addresses the incident or to determine if a WHA is warranted. Based on the draft AC 150/5200-33C, airports with 20-99 based turbine-powered aircraft of 30,000 to 74,999 total annual operations, which includes LHQ (U.S. Department of Transportation 2016), are required to initiate a WHSV within three years of receiving a development grant after the final Federal Register notice and the airport must sponsor and update the WHSV at least once every five years after the initial WHSV.

The goals of a WHSV include:

- Present results of the WHSV and discuss identified hazardous wildlife attractants.
- Present recommendations for mitigating the identified hazards and attractants.
- Determine if a year-long WHA is needed.

Potential triggers for a WHA to be conducted include:

- Wildlife encounters with aircraft.
- Substantial damage from a wildlife strike.
- Engine ingestion of wildlife.
- Wildlife is present in size or numbers to cause the above events.

A WHA is needed to implement a WHMP which is a plan to help an airport use adaptive management to reduce wildlife hazards. The purpose of a WHA is to:

- Identify wildlife attractants on or near the airport.
- Identify wildlife numbers and seasonal movements that may occur on or near the airport.
- Describe wildlife hazards to aircraft operations on the airport.
- Provide recommendations to mitigate wildlife hazards on the airport.

- Provide a scientific basis for management of wildlife hazards and wildlife attractants on or near the airport.

This report covers documentation of wildlife numbers and attractants conducted on October 14, 2015 and March 23, 2016 which provides recommendations to eliminate or manage these hazards.

Review of Wildlife Hazards to Aircraft

Bird collisions with aircraft (bird strikes) are a serious problem worldwide. In the United States of America (USA) bird strikes cause over \$700 million in damage annually to civil aircraft. Waterfowl (ducks and geese), gulls, and raptors (primarily hawks and vultures) are the bird species that cause the most damage to civil aircraft in the USA (Dolbeer et al. 2012). Vultures and waterfowl cause the most losses of U.S. military aircraft (DeFusco 1996). A total of \$480,838,938.00 worth of reported costs and 760,886 hours of aircraft down time was incurred from 1990 to 2011 (Dolbeer et al. 2012). An analysis of wildlife strikes reported from 1990 to 2013 resulted in 142,675 wildlife strikes with 97% of those strikes were birds, 2.2% were terrestrial mammals, and 0.7% were bats. Wildlife strike reporting has increased 6.2 fold, but damage to wildlife has declined since the peak in 2000 (Dolbeer 2015).

Bird and other wildlife strikes not only result in economic loss because of damage and downtime to aircraft, but strikes can also result in crashes and loss of human life. World-wide in civil and military aviation, bird and other wildlife strikes have destroyed at least 225 aircraft and over 250 fatalities resulted since 1988 (Dolbeer 2000, unpublished data, Richardson and West 2000, Thorpe 2003, 2005, 2012). Three recent strikes involving civil transport aircraft illustrate the risk that birds pose. A Cessna Citation business jet crashed in Oklahoma City, USA in March 2008 after hitting white pelicans shortly after takeoff, killing all 5 people on board (scientific names of wildlife referenced in this report are given in Appendix B). In January 2009, an Airbus 320 with 155 crew and passengers made a forced landing in the Hudson River after hitting a flock of Canada geese on departure from LaGuardia Airport, New York. In September 2012, a Dornier 228 hit a vulture shortly after takeoff from Tribhuvan Airport, Kathmandu, Nepal and crashed, killing all 19 passengers and crew (Dolbeer et al. 2012, unpublished data).

Airports do not exist in a vacuum and the surrounding land-use can attract wildlife and become a hazard to aviation safety. Major wildlife attractants include, but are not limited to, large water bodies, wetlands, waste management facilities, golf courses, and agriculture operations (Cleary and Dolbeer 1999). Waste management facilities, especially the placement of landfills near airports, is of particular concern to aviation interests because landfills often attract various bird species that are hazardous to aircraft (e.g., Belant et al. 1995, Cleary and Dolbeer 2005). In the USA, there have been at least two lawsuits filed against landfill operators near airports because of aircraft crashes caused by birds (Dolbeer 2005).

There are two organizations that meet regularly to discuss the problem of wildlife strikes and methods for reducing the economic losses and hazards to human life. A joint meeting of Bird Strike Committee USA and Bird Strike Committee Canada

convenes once per year at an airport in the United States or Canada (www.birdstrike.org) and the International Bird Strike Committee (www.int-birdstrike.org) meets every 2 years.

Wildlife Laws and Protected Species

Wildlife and their habitats can be protected by federal, state, and/or local laws. Before trained airport personnel proceed to harass or take a species, specific permits will need to be obtained. Protection of wildlife ranges from unlimited take (i.e. no protection) to federally threatened and endangered species that require specific permits for take and are protected by federal law (Table 1). Airports are responsible for obtaining and complying with any necessary permits to harass or take wildlife species. Many permits need to be updated annually, accompanied by a corresponding report sent to the issuing agency. Airports should use lethal methods only when absolutely necessary and when all other options have either been exhausted or in cases where human lives are at risk.

Table 1. Permits required for harassment or take of wildlife species that do or can occur near Fairfield County Airport.

Wildlife Category	Species Examples	State Permit	Federal Permit
Resident game bird	Turkey, quail, pheasants, and grouse	Yes	No
Resident nongame ¹ bird	Starlings, house sparrows, and pigeons	No	No
Migratory game bird	Geese, ducks, doves, snipe, woodcocks, rails, and gallinules	Yes	Yes
Migratory nongame bird	Raptors, wading birds, shorebirds, jays, songbirds, swifts, woodpeckers, nighthawks, hummingbirds, and swallows	Yes	Yes
Depredation order ² birds	Crows, red-wing blackbirds, brown-headed cowbirds, and grackles	No	No
Depredation order ³ mammals	Coyotes, woodchuck, skunk, and raccoon	No	No
Game mammals	White-tailed deer, fox, rabbits, squirrels, bobcats, opossum, muskrat, beaver, and weasels	Yes	No
Nongame mammals	Bats	Yes	No
“Pest” mammals ¹	Voles, mice, rat, shrews, groundhogs, chipmunks, and wild boar	No	No
Threatened and Endangered Species ⁴	See Appendices B and C for list of federal and state listed species	Yes	Yes
Feral domestic species	Cats, dogs, and livestock	No	No
Amphibians and Reptiles	Frogs, salamanders, snakes, lizards, and turtles	Yes	No

¹ Unprotected species can be taken anytime and without limit.

² A federal or state permit is not required if they occur in such numbers or manner to compose a significant health hazard or nuisance (see 50. CFR 21.43 in Appendix A).

³ May be taken “when causing or about to cause damage”.

⁴ Note that nongame wildlife can be considered threatened or endangered by USFWS.

Federal Regulations

Wildlife receives protection at the federal level through a number of laws and regulations. These include:

- Endangered Species Act
- Bald and Golden Eagle Act
- Lacey Act
- Migratory Bird Treaty Act (MBTA)
- National Environmental Policy Act
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Many government agencies can be involved with many of the above acts, but the U.S. Fish and Wildlife Service (USFWS) administers the MBTA and Endangered Species Act. It is LHQ's responsibility to comply with the above acts and obtain permits if any protected wildlife is to be harassed or taken.

A desktop review was conducted to determine if any federally threatened or endangered terrestrial wildlife species could occur on LHQ property or in the local area. There are three federally endangered, threatened, or species being considered for federal status documented in Fairfield County (Appendix A) The majority of the federally protected species listed are unlikely to occur on airport property due to the lack of habitat; the species is extirpated from the state; the species migrates through the area and is only rarely documented; or the species' known/believed range does not overlap with Fairfield County. Indiana bat and northern long-eared bat summer habitats generally include forested land and adjacent habitats that contain live or dead trees with exfoliating bark, cracks, or crevasses. Within the AOA there is some forested/wooded habitat that could be utilized by the Indiana or northern long-eared bat. Winter habitat for the Indiana and northern long-eared bats includes caves, typically located in karst regions, which do not occur on LHQ property. Eastern massasauga habitat includes wetlands (and nearby uplands) and early successional fields are not abundant on airport property.

Some species that are protected and could occur on or near LHQ include the bald eagle (summer, winter, and during migration). The bald eagle is known to occur in the vicinity of LHQ, but is rare. Although, the range of the bald eagle overlaps with Fairfield County, records of the species are not publically available or the species has not been recorded.

State and Local Regulations

State of Ohio has similar laws or regulations complimenting the above Federal acts such as the MBTA and Endangered Species Act. There are 119 state endangered, 54 state threatened, 102 species of special concern, and 46 species of special interest that occur in Ohio (Appendix A). Ohio State law regulates the harassment or take of migratory birds, game wildlife, and nongame wildlife. Ohio Department of Natural Resources (ODNR) Division of Wildlife is responsible for issuing permits and enforcing laws for harassment or take of protected species in Ohio.

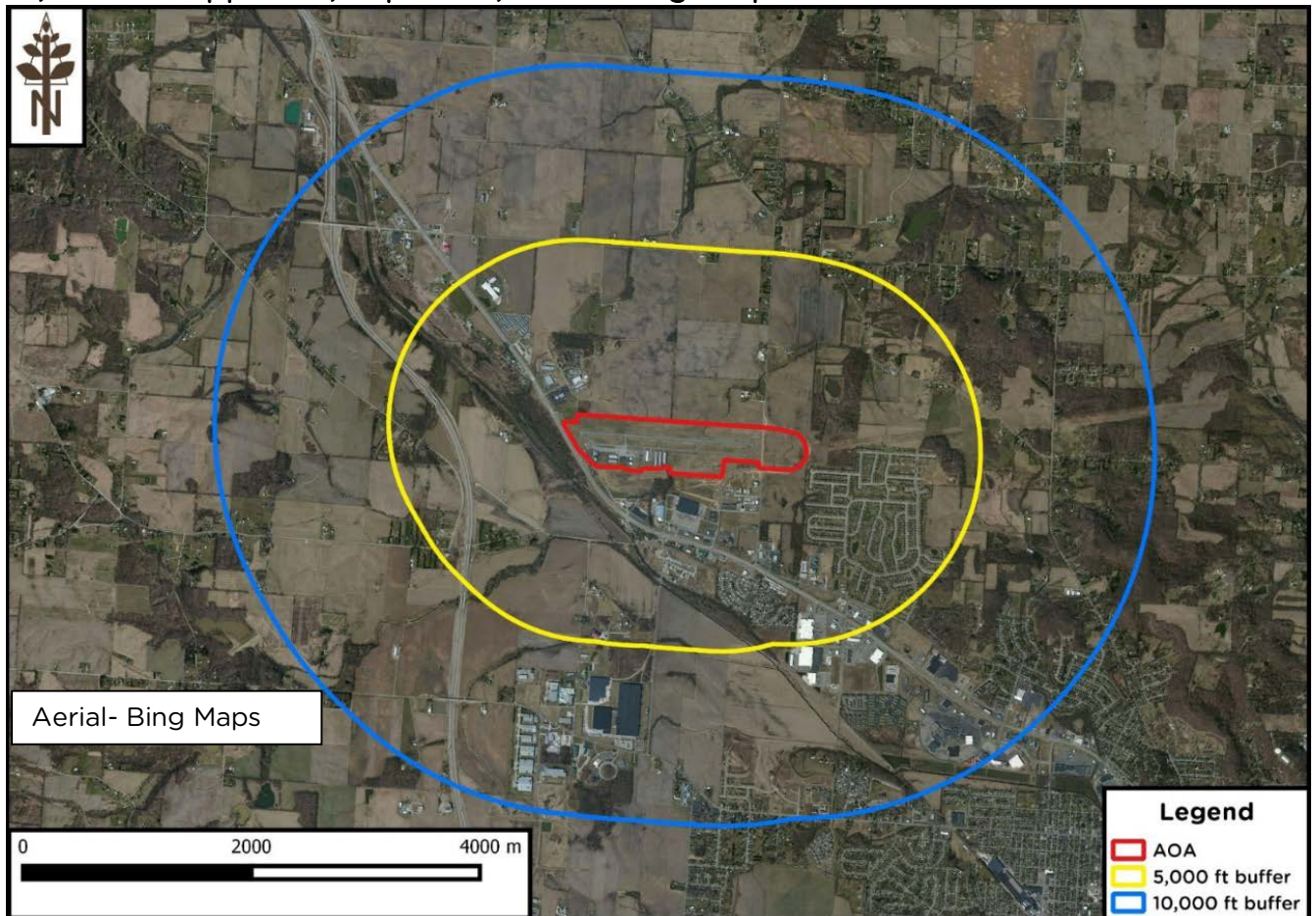
Study Area

Site Description

LHQ is located northwest of Lancaster, Ohio along Columbus-Lancaster Road (Figure 1). The land use adjacent to the airport to the north of the airport is agricultural cropland with wooded fencerows. To the east is cropland, woodlots, and housing. South of the airport, is cropland, old field, and development. To the west is forest, emergent wetlands, and forest/shrub wetlands according National Wetland Inventory (National Wetland Inventory 2016).

LHQ has a single runway: 10/28- 5,004 X 75-feet and is classified as a general utility airport. There are 58 single engine aircraft, four multi-engine aircraft, seven helicopters, and one ultra-light based at LHQ with approximately 43,000 operations per year comprised of 99.8% local general aviation (GA), and 1.2% military (U.S. Department of Transportation 2016).

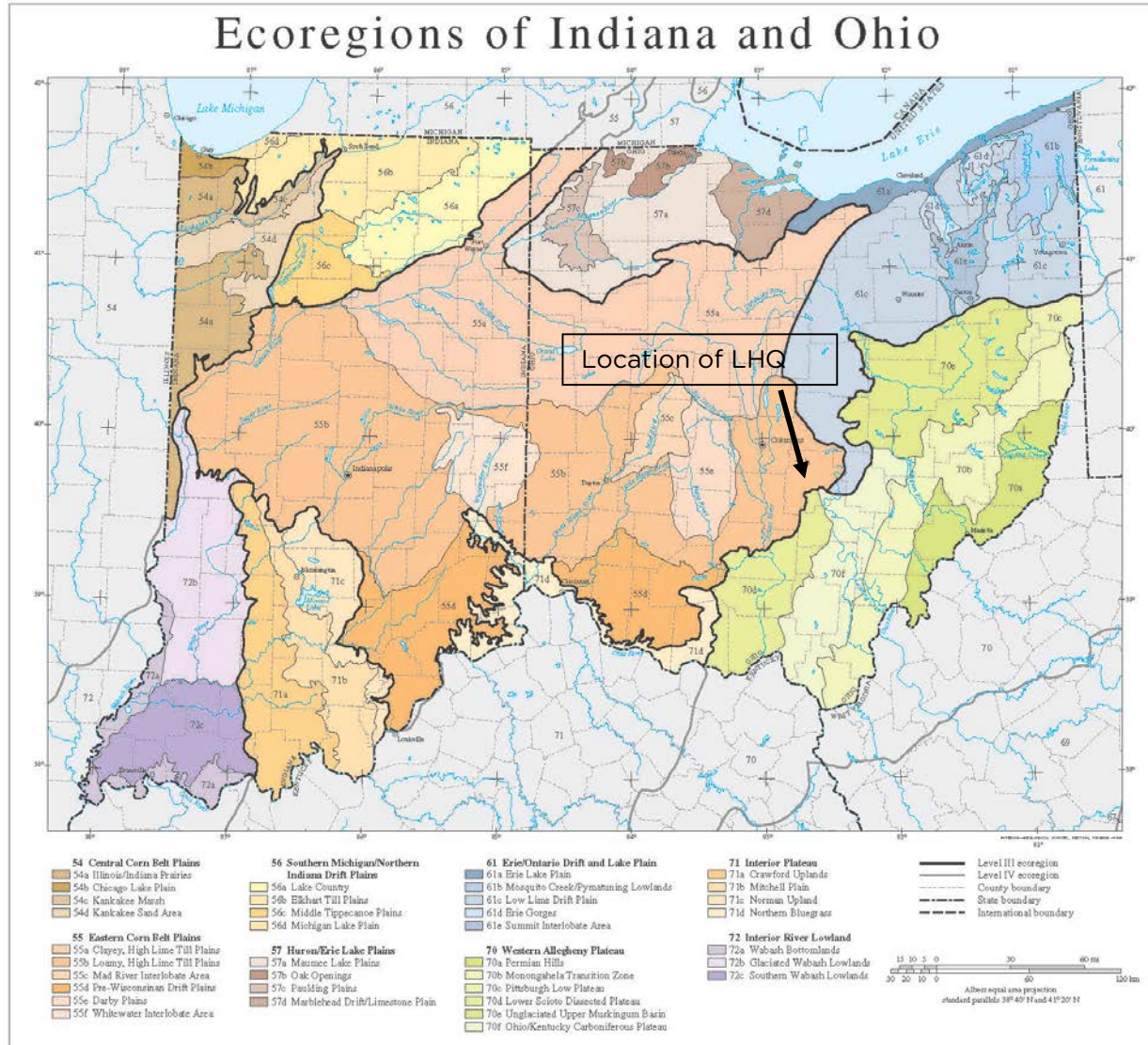
Figure 1. Fairfield County Airport and surrounding area showing 5,000 and 10,000 feet approach, departure, and circling airspace.



Habitat and Land Cover

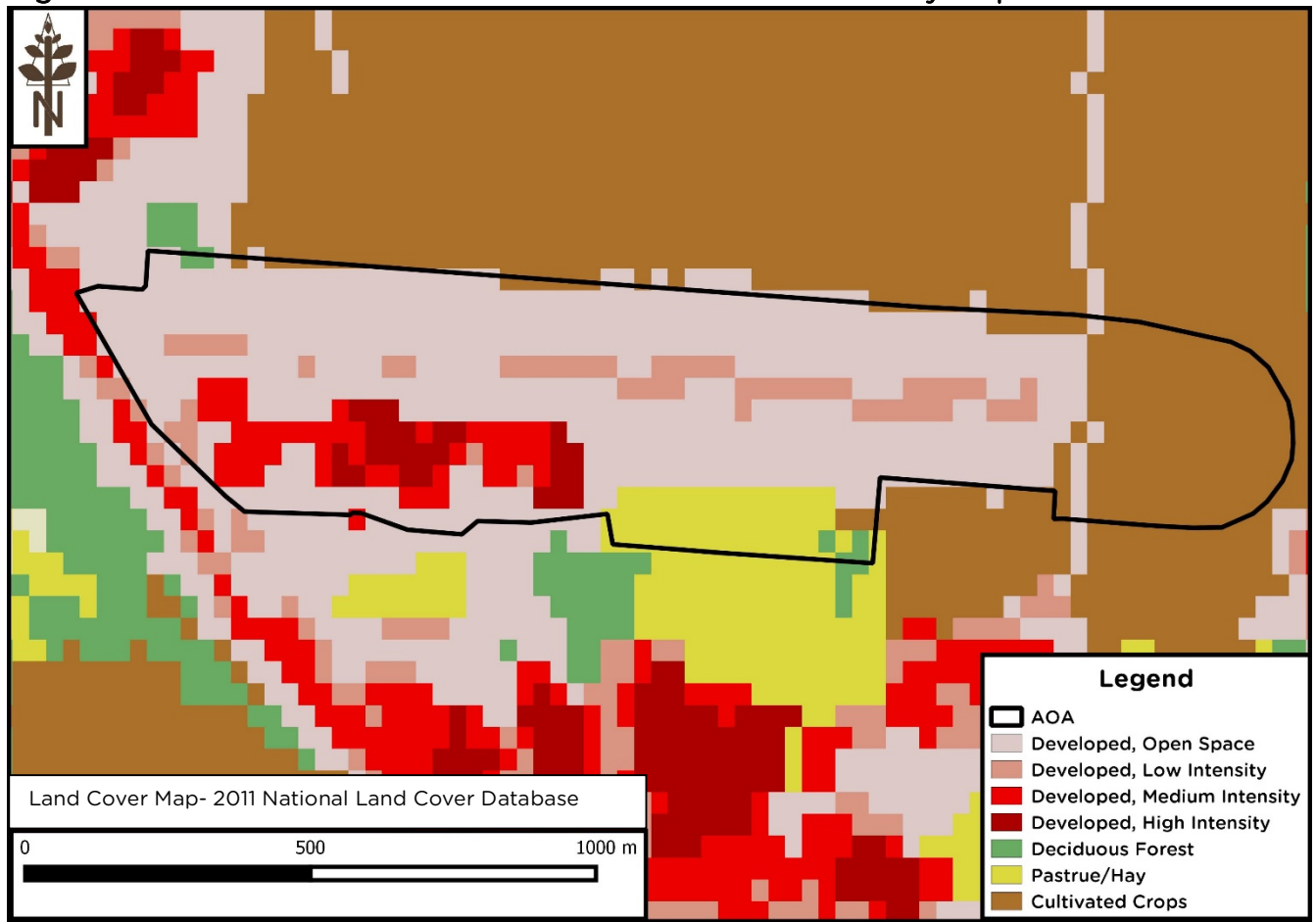
The proposed site is located within the Eastern Corn Belt Plains Level III Ecoregion that consists rolling till plain with local end moraines. Specifically, the Loamy, High Lime Till Plain (Level IV) which consists of soils that develop from loamy, limy, glacial deposits (Figure 2). Historically the area was dominated by beech forests, oak-maple forests, and elm-ash swamp forest that grew on near level terrain. Presently, the primary land uses are to raise corn, soybeans, and livestock (Woods et al. 2002).

Figure 2. Ecoregions level III and level IV of Ohio and Indiana (Wood et al. 2002).



The LHQ AOA covers approximately 197 acres with the airport owning a total of 230 acres. A land cover analysis of LHQ AOA, using a map of the NLDC Land Cover Dataset (NLCD 2011) resulted in seven land cover types: developed space (77.5%), deciduous forest (7.5%), pasture/hay (5%), and cultivated crops (10%) (Figure 3). The developed space ranges from open space (e.g. mowed grass), low intensity, medium intensity, and high intensity development (e.g. buildings and pavement).

Figure 3. Land cover within the boundaries of Fairfield County Airport.



Methodology

Wildlife Hazard Site Visit

The WHSV is a one-to-three-day limited survey, depending on the size of the airport and complexity of the hazards. A general description of a WHSV:

- Conduct a kickoff meeting with the Airport Manager and other personnel concerned about wildlife hazard management to discuss their views and understanding of wildlife problems at the airport.
- Conduct a survey to get an understanding of the current wildlife hazards.
- Provide an analysis of the events or circumstances that prompted the WHSV. Data from the FAA bird strike database, interviews with airport personnel, and other sources were reviewed to provide documentation.
- Conduct an out-briefing with the Airport Manager and other personnel concerned about wildlife hazard management to:
 - Discuss the review of current wildlife management, as well as established policies and procedures.

- o Set up a clear chain of command for reporting wildlife hazards and recommendations for their mitigation.
- o Address any concerns about mitigation of hazards and determine if a yearlong WHA is warranted
- o If needed, begin applications for Federal and State wildlife depredation control permits.

Wildlife Strike History

The FAA Wildlife Strike Database Website was consulted for any strikes report at LHQ (<http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx>). The reported strikes are listed in chronological order and described in detail.

Wildlife Attractants and Hazards

Wildlife requires three basic needs for survival: food, water, and shelter. However, locations providing any one of these three basic needs can attract wildlife. The purpose of the WHSV is to identify and eliminate any wildlife attractants on or near LHQ. Wildlife attractants and hazards were identified on the AOA, within 5,000 feet, and 10,000 feet buffers of the airport using aerial maps and verified on site (Cleary and Dolbeer 2005; Figure 1). During two separate visits, attractants were documented and photographed when encountered. Identifying these attractants is important in determining how to manage or eliminate potential wildlife hazards.

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).

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.

- **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 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.
- **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 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.

- **PROTECTION OF APPROACH, DEPARTURE, AND CIRCLING AIRSPACE.** For all airports, the FAA recommends a distance of five statute miles between the farthest edges 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.

Wildlife Surveys

Descriptive statistics were utilized to analyze the data from the standardized and non-standardized to represent the environmental at LHQ relevant to the time of the survey.

Standardized Surveys

Standardized wildlife surveys were conducted at 10-minute intervals at established observation points. Wildlife within a quarter mile radius of each observation point were identified using binoculars and field guides to species or group. The spatial location and direction of movement (including height above ground level) of each individual or group of wildlife identified within the observation point radii was documented. Behavior of wildlife on the airport was observed and documented especially when wildlife crossed aircraft movement areas or moved about the AOA.

FAA draft protocols suggest a minimum of a survey point per 50 hectares of the AOA. Standardized survey points (SSP) were based on a modified USFWS breeding bird survey which was conducted during the WHSV. Wildlife that was visually observed was noted during a 10-minute period at each site. Three SSP were selected (Figure 4) with all of the sites within or near the AOA. The survey sites will provide a standardized survey resulting in an index of wildlife species in the area and their activity.

Below are descriptions of the standardized survey points (see photographs in Appendix C):

- SSP 1 is located near the ramp adjacent to the terminal with the adjacent habitats consisting of lawn, landscaping bushes/trees, asphalt, and buildings.
- SSP 2 is located on the western end of the AOA with adjacent habitats consisting of lawn, asphalt, and landscaping bushes/trees.
- SSP 3 is located north east of AOA adjacent habitats consist of wetland ditch, agricultural field (corn), and old field/hay.

Non-standardized Surveys

Non-standardized wildlife observations were documented anytime wildlife was encountered during the WHSV. On the AOA the wildlife encountered were documented and relative location recorded. This data, though not standardized, supplements the standardized survey and provides valuable insight about wildlife or attractants that would otherwise be missed by the standardized survey.

Figure 4. Location of Standardized Survey Points.



Wildlife Guilds

To analyze the wildlife survey data, wildlife species were organized by species and guilds. Guilds are groupings of wildlife based on similar behavior, especially foraging behavior, and not necessarily on species relatedness. For example, red-winged blackbirds, common grackle, brown-headed cowbirds and European starlings, are combined into the guild “blackbirds.” Tracking wildlife of similar behavioral characteristics is important in determining which species are most likely to be involved in wildlife aircraft strikes. Also, wildlife of similar behavior tends to respond to the same control methods such as habitat modification, hazing, or types of exclusion.

- Birds
 - Aerial Foragers
 - Blackbirds
 - Columbids (doves and pigeons)
 - Corvids (jays and crows)
 - Finches/Sparrows
 - Gallinaceous (non-migratory birds)
 - Gulls
 - Hummingbirds
 - Insectivores
 - Raptors

- Shorebirds
- Waterfowl
- Mammals
 - Carnivores
 - Rodents/Rabbits
 - Ungulates (hoofed mammals)
 - Small Mammals
- Reptiles and Amphibians
 - Turtles
 - Frogs/Salamanders
 - Lizards/Snakes

Behavior

Behavior is an important consideration when managing wildlife because flocking birds such as starlings, geese, and blackbirds pose a greater threat to aircraft than solitary small birds. In addition to behavior, this observational data should also be reviewed in conjunction with a species' (or guild's) strike history to determine a species' importance in terms of risk level to aircraft (Dolbeer and Eschenfelder 2002). Wildlife observed will have a behavior assigned when sited.

List of possible behaviors assigned to wildlife:

- Feeding (FD)
- Loafing (LF)
- Roosting (RS)
- Nesting (NS)
- Vocalizing (VO)
- Flying Local (FL)
- Flying Passing (FP)
- Running (RN)
- Bedded (BD)
- Perched (PE)
- Standing (ST)
- Towering (TW)
- Hawking (HW)
- Swimming (SW)

Spatial and Temporal Wildlife Movements

The location of wildlife on or above the airport and approximate height (if aerial) of each species observed was recorded in order to understand how aircraft could interact with wildlife. The majority (50,013 - 82.4%) of all reported wildlife aircraft strikes nationally occurred below 1,500 feet (457 meters) above ground level (AGL); the remainder, 10,651 (17.6%) of the reported strikes occurred above 1,500 feet (457 meters) AGL (Dolbeer et al. 2012). The vast majority, 71.8% of the 60,664 reported strikes occurred under 1,200 feet (350 meters) AGL and between ground level and 500 feet (152 meters) AGL (Dolbeer et al. 2012). At each of the SSP, but especially within the AOA, the height of travel was noted for each animal observed during

standardized monitoring below 1,500 feet (457 meters). All wildlife that are observed crossing or loafing on the runway were also noted.

Wildlife height (AGL) observations were divided into four classes to reduce estimator error:

- 0 meters (0 feet) AGL = ground
- 1-40 meters (1-131 feet) AGL = low
- 41-150 meters (132-492 feet) AGL = mid
- 151-455 meters (493-1492 feet) AGL = high

Spatial and behavioral use of the airport by bird species/guild was analyzed and the data obtained during the single field visit shows important information about each species or guild represented.

Results

Wildlife Hazard Site Visit

A project kickoff meeting objectives include a review of the existing program, policies, and procedures and a general survey of the airport to identify the primary hazardous wildlife attractants on or around the airport. It also provided a starting place, or point of reference, for the airport manager to begin addressing airport wildlife hazard issues. A project kickoff meeting was conducted on October 14, 2015, with Orbis' Qualified Airport Wildlife Biologist (QAWB), LHQ's Airport Managers, a member of LHQ's Board, and CMT's Project Managers to discuss the WHSV process, information about the airport, and the airport's current wildlife policies. LHQ has not previously conducted a WHA or WHSV and does not have a WHMP to guide their decisions in the monitoring, evaluation, and mitigation of wildlife hazards. Although LHQ has not conducted surveys or have a management plan in place, the airport manager is aware of some of the wildlife hazards that occur and has taken steps to actively manage for wildlife and attractants.

The airport manager has identified geese and turkey vultures as the most abundant wildlife on the AOA. According the airport manager's observations there are not any seasonal events that attract wildlife to the airport in large numbers. Current mitigation for wildlife includes maintaining the grass at approximately two-three inches in height by mowing approximately twice a week during the growing season and harassing wildlife if detected on the AOA. Additionally, LHQ promotes reporting wildlife strikes to pilots with information posted in the terminal.

Following the kickoff meeting Orbis QAWB and LHQ's Airport Manager toured the airport. After the tour the QAWB continued to assess wildlife, hazards, and assessment both within and outside the AOA.

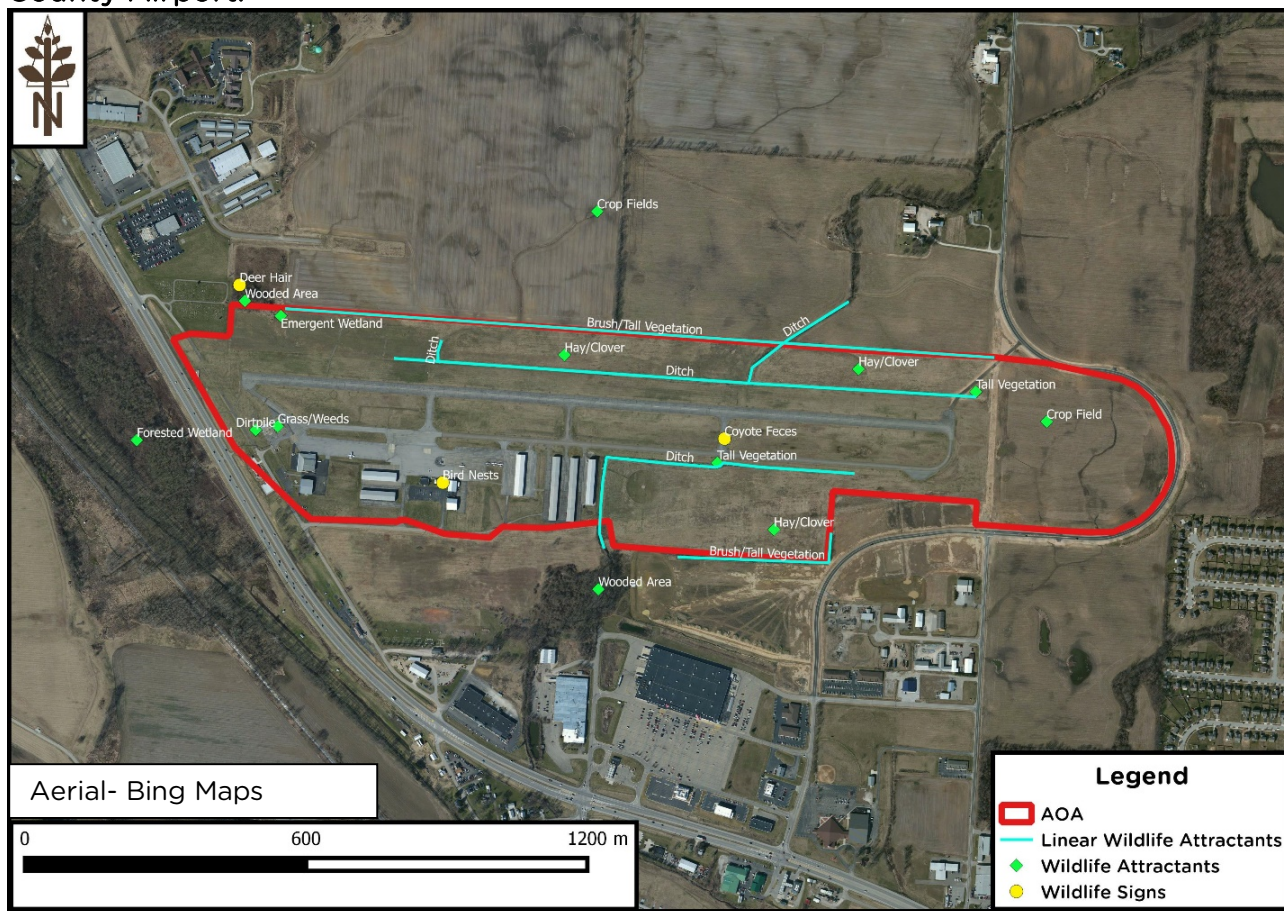
Wildlife Strike History

A query into the FAA strike database did not produce any reported strikes for LHQ.

Wildlife Attractants and Hazards

Multiple wildlife attractants and hazards were identified during the WHSV (Figure 5). Below is a list of wildlife attractants and hazards observed within the AOA and outside the AOA at LHQ, based on two separate site visits, October 14, 2015 and March 23, 2016.

Figure 5. Location of wildlife attractants and hazards in the vicinity of Fairfield County Airport.



Identified wildlife attractants and hazards within the AOA:

- Partial fencing around the AOA (Figure 6).
- Vegetation on existing fencing (e.g. climbing vines, trees, etc., Figure 7).
- Brush and tall vegetation within the AOA (Figure 8).
- Standing water in ditches (Figure 9).
- Dirt pile near cement pads and apron that attract birds that ingest grit for digestion (Figure 10).
- Weeds and grass from movement areas that are used by Killdeer for nests (Figure 11).

- Grain crop fields within the AOA (Figure 12).

Figure 6. Existing types of fence surrounding the AOA.



Figure 7. Vegetation on fencing.



Figure 8. Brush and tall vegetation within the AOA.



Figure 9. Reduce standing water in ditches.



Figure 10. Dirt pile near cement pads and apron.



Figure 11. Weeds and grass growing within cement pad and apron.



Figure 12. Crop fields within AOA.



Identified wildlife attractants and hazards outside the AOA:

- Wooded area and emergent wetland to the northwest, just outside of the AOA (Figure 13).
- Forested wetland west of the AOA across Columbus-Lancaster Road (Figure 14).

Figure 13. Wooded area and emergent wetland to the northwest.



Figure 14. Forested wetland west of the AOA across Columbus-Lancaster Road.



Wildlife Surveys

During the first visit, October 14, 2015, a total of 85 animals were observed during standardized and non-standardized surveys consisting of ten species/group. The mean temperature was 57.0°F, slightly warmer than average (54.9°F) with partly cloudy conditions. The majority of wildlife attractants were identified during this first visit. General wildlife or attractant observations of note are included below:

- Dumpster near terminal, appears relatively clean (Figure 15).
- Bird nest in landscaping near terminal (Figure 16).
- Landscaping and shelter near terminal (Figure 17).

During the second visit, March 23, 2016, a total of 141 animals were observed during the standardized and non-standardized surveys consisting of 12 species/groups. The mean temperature was 60.0°F, warmer than average (54.7°F). General wildlife or attractant observations of note are included below:

- Coyote feces on taxiway (Figure 18).
- Hair of a white-tailed deer located in small wooded area (Figure 19).
- LHQ removed tall vegetation along ditch since the last visit (Figure 20).
- Standing water after rain event (Figure 21).

Figure 15. Dumpster near terminal.



Figure 16. Bird nest in landscaping.



Figure 17. Landscaping and shelter near terminal.



Figure 18. Coyote feces on taxiway.



Figure 19. White-tailed deer hair in small wooded area.



Figure 20. LHQ removed tall vegetation along ditch since the last visit.



Figure 21. Standing water after rain event.



Standardized Surveys

Three standardized surveys, at three sites, were conducted during the WHSV with a total of 156 animals observed over two visits composed of 15 bird species/groups (Table 2).

Table 2. Standardized survey results.

Wildlife Species	Site 1	Site 2	Site 3	Total	Guild	Protected Status
Great Blue Heron*	0	1	0	1	Shorebirds	MBTA
Turkey Vulture*	6	4	0	10	Raptors	MBTA
Killdeer	4	1	3	8	Shorebirds	MBTA
Mourning Dove+	1	2	2	5	Columbids	MBTA
Tree Swallow	0	1	0	1	Insectivorous	MBTA
European Starling+	22	20	15	57	Blackbirds	Not protected
American Crow*	5	0	0	5	Corvids	MBTA
Blue Jay	1	0	0	1	Corvids	MBTA
American Robin	1	2	1	4	Insectivorous	MBTA
Blackbird species+	1	0	0	1	Blackbirds	-
Common Grackle	2	0	0	2	Blackbirds	MBTA
Eastern Meadowlark	1	5	1	7	Blackbirds	MBTA

(Table 2 continued)

Wildlife Species	Site 1	Site 2	Site 3	Total	Guild	Protected Status
Red-winged Blackbird+	0	41	10	51	Blackbirds	MBTA
House Sparrow	2	0	0	2	Finches/Sparrows	Not protected
Song Sparrow	1	0	0	1	Finches/Sparrows	MBTA
Total	47	77	32	156		

An asterisk (*) denotes species that are large enough to cause significant damage to an aircraft and a plus (+) denotes species that occur in large enough groups to cause significant damage to aircraft.

Non-standardized Surveys

Non-standardized observations of wildlife totaled 70 animals composed of 11 species/groups of birds and mammals (Table 3).

Table 3. Non-standardized survey results.

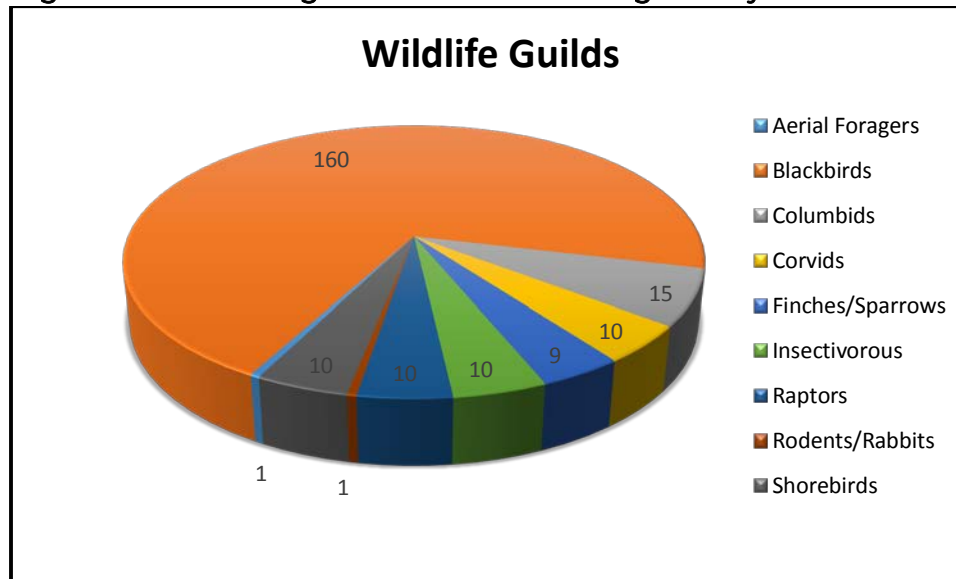
Wildlife Species	First Visit	Second Visit	Total	Guild	Protected Status
Killdeer+	0	1	1	Shorebirds	MBTA
Mourning Dove+	6	4	10	Columbids	MBTA
European Starling+	14	22	36	Blackbirds	Not protected
American Crow*	0	4	4	Corvids	MBTA
American Robin	0	6	6	Insectivorous	MBTA
Eastern Meadowlark	2	1	3	Blackbirds	MBTA
Red-winged Blackbird+	0	3	3	Blackbirds	MBTA
Northern Cardinal	0	2	2	Finches/Sparrows	MBTA
House Sparrow	0	1	1	Finches/Sparrows	Not protected
Sparrow Species	0	3	3	Finches/Sparrows	-
Thirteen-lined ground squirrel	1	0	1	Mammal	Not protected
Total	23	47	70		

An asterisk (*) denotes species that are large enough to cause significant damage to an aircraft and a plus (+) denotes species that occur in large enough groups to cause significant damage to aircraft.

Wildlife Guilds

Combining the standardized surveys and non-standardized observations of 226 animals, a total of nine guilds were observed at LHQ. The most abundant guild observed were blackbirds with 160 (70.8%), followed by columbids 15 (6.6%), corvids 10 (4.4%), insectivorous 10 (4.4%), raptors 10 (4.4%), shorebirds 10 (4.4%), finches/sparrows 9 (4.0%), aerial foragers 1 (0.4%), and rodents/rabbits 1 (0.4%) (Figure 22).

Figure 22. Wildlife guilds observed during survey.



Behavior

Six behaviors were observed during the standardized and non-standardized surveys (feeding, flying-local, flying-past, loafing, perched, and vocalizing) out of the 14 possible behaviors. The most abundant behavior observed was flying local (37%), followed by feeding (13%), flying-past (11%), perching (11%), vocalizing (10%), and loafing (8%) (Table 4).

Table 4. Behaviors observed during survey.

Behavior	Standardized Survey	Non-standardized Survey	Total
Feeding (FD)	5	3	8
Loafing (LF)	0	5	5
Roosting (RS)	0	0	0
Nesting (NS)	0	0	0
Vocalizing (VO)	6	0	6
Flying Local (FL)	16	7	23
Flying Passing (FP)	6	1	7
Running (RN)	0	0	0
Bedded (BD)	0	0	0
Perched (P)	4	3	7
Standing (ST)	0	0	0
Towering (TW)	0	0	0
Hawking (HW)	0	0	0
Swimming (SW)	0	0	0
Total	43	19	62

Spatial and Temporal Wildlife Movements

During the WHSV survey wildlife were recorded at all four possible heights (Table 5). Most birds were documented at 1-40 meters AGL (the level aircraft are landing or departing, 76.1%), followed by wildlife at ground level (17.7%), at 41-150 meters AGL (5.8%), and at 151- 455 meters AGL (0.4%). A total of 41 birds were seen during the standardized and non-standardized surveys either crossing the runway or taxiway.

Table 5. Wildlife heights observed during survey.

Survey	Ground	Low	Mid	High	Total
Site 1	4	31	11	1	47
Site 2	2	73	2	0	77
Site 3	18	14	0	0	32
Non-standardized	16	54	0	0	70
Total	40	172	13	1	226

Seasonal Wildlife Observations

Two visits were completed during the WHSV spanning approximately six months. The first visit was in the fall, October 14, 2015 and the second was in the spring, March 23, 2016. A total of 85 species was documented during the first visit and 137 species on the second visit (Table 6).

Table 6. Wildlife observations over two visits.

Wildlife Species	First Visit		Second Visit		Total
	Standardized Survey	Non-standardized Survey	Standardized Survey	Non-standardized Survey	
Great Blue Heron*	0	0	0	1	1
Turkey Vulture*	0	8	0	2	8
Killdeer+	0	4	1	4	5
Mourning Dove+	6	0	4	5	10
European Starling+	14	0	22	57	36
America Crow*	0	5	4	0	9
Blue Jay	0	1	0	0	1
American Robin	0	0	6	4	6
Blackbird species+	0	1	0	0	1
Eastern Meadowlark	2	4	1	3	7
Red-winged Blackbird+	0	39	3	12	42
Northern Cardinal	0	0	2	0	2
House Sparrow	0	0	1	2	1
Sparrow Species	0	0	3	0	3
Thirteen-lined Ground Squirrel	1	0	0	0	1
Total	23	62	47	90	132

An asterisk (*) denotes species that are large enough to cause significant damage to an aircraft and a plus (+) denotes species that occur in large enough groups to cause significant damage to aircraft.

Discussion

Wildlife Hazard Site Visit

The WHSV objectives are to observe wildlife and identify hazardous wildlife attractants, begin developing recommendations for airport personnel to address identified wildlife hazards, and determine if a further assessment is needed. Since a WHSV is an abbreviated analysis of wildlife hazards at an airport and confined to a limited site visits the analysis of the visit can only give us a small window into the yearly cycles of wildlife movements and behavior. Seasonal hazards and events cannot be observed during a WHSV, but can be accounted for with communication with the airport. With those limitations in mind, a WHSV can still provide an airport valuable information to mitigate many wildlife hazards and be prepared for hazards that may not be specifically addressed in the WHSV report.

Wildlife Strike History

The FAA strike reporting is strictly voluntary and is not a regulatory requirement. Therefore, just because there are no reports of strikes occurring at a particular airport in the FAA's National Wildlife Aircraft Strike Database, does not mean that wildlife strikes have not occurred at that airport. In the Late 1990s, Cleary and Dolbeer (1999) calculated a national strike reporting rate of about 20 percent. Dolbeer (2015) calculated a peak in the national strike reporting rate in 2013, when he estimated a reporting rate of 91% of strikes at Part 139 airports, a six-fold increase from the rate reported during the 1990s. The increase in strike reporting is attributed to a greater awareness within the aviation community of the importance of reporting wildlife strikes. GA airports have seen an increase in reporting but have also seen an increase in damaging strikes (Dolbeer 2015).

A query into the FAA National Wildlife Aircraft Strike Database resulted in zero wildlife strikes at LHQ. This could be due to either the lack of strikes or the lack of reporting. There is a possibility that strikes have occurred at LHQ but have not been reported. Currently LHQ has information in the terminal building how to report a wildlife strike.

Wildlife Attractants and Potential Management of Hazards

Wildlife requires food, shelter, and water for survival. If any of these three requirements are present wildlife will be attracted to an airport. What constitutes food, water, and shelter varies depending on the species or guild.

Wildlife attractants (food, water, cover, or shelter) and hazards documented within the AOA include:

- Partial fencing around the whole AOA, to restrict wildlife movements.
- Agricultural crops.
- Brush and tall vegetation within AOA.
- Remove weeds and grass from cement pads and aprons.
- Ditches with standing water and tall vegetation.

Although there is a well maintained perimeter fence surrounding parts of LHQ, a wildlife fence tall enough to keep terrestrial wildlife from entering the airfield with a buried fence-skirt would further prevent or discourage wildlife from entering the AOA.

FAA strongly recommends against having crops within the AOA because it is a hazardous wildlife attractant (FAA draft Advisory Circular 150/5200-33c). Crop fields dominate the landscape around LHQ and elimination of this attractant is practically impossible. Approximately 15% of the AOA is either hay/clover (5%) or grain crops (10%). The current use of hay/clover fields is less of an attractant than grain fields and will only provide cover in between harvesting, whereas grain crops provide a highly valued food source and cover. If the hay/clover is regularly harvested it will reduce the attractiveness to nesting birds and small mammals. Grain crops should be eliminated from the AOA but they cannot be eliminated then they need to be harvested in a timely manner to reduce the time period when the crop is available to wildlife.

Vegetation, brush, and wooded areas should be removed when possible, and in general should not be tolerated within the AOA because it provides shelter for many wildlife species to feed, loaf, congregate, or commute through the AOA. After the initial visit in October, LHQ has proactively removed most of the high vegetation along the ditches. LHQ will continue to remove and reduce tall vegetation within the AOA.

The ditches with water and tall vegetation located within the AOA can be a wildlife attractant. Wetlands provide a variety of ecological functions and are 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. These smaller ditches likely are less of an attractant to birds that prefer open water, but will attract some wildlife because they provide food, water, and shelter.

Food, carcasses, and feces on the taxiway or runway, although a symptom of wildlife having access to the AOA, can also be an attractant to other wildlife. Airport personnel should remove these attractants when encountered. If qualified airport personnel take wildlife, or find carcasses, airport personnel need to remove and dispose of the carcass promptly to insure that it will not attract wildlife. Carcasses should not be left to rot in the open and should be buried under a minimum of three feet of soil or taken off airport property.

Grass and landscaping is an often overlooked wildlife attractant on airports. Grasses should be mowed and maintained at a minimum of seven inches to a maximum of 14 inches. Grass height can be shorter along movement areas to reduce obstructions of lights, signs, and foreign objects. Although not a current issue at LHQ, landscaped plants, shrubs, and trees should be confined to areas where aircraft do not operate and removed from areas where they can attract wildlife. The airport should avoid planting plant species that provide a food source for wildlife such as fruits or seeds.

Wildlife attractants and hazards outside the AOA:

- Forested wetland west of the AOA across Columbus-Lancaster Road.
- Wooded area to the northwest, just outside of the AOA.

It is important to not only eliminate or manage wildlife attractants and hazards on the airport but also in the surrounding landscape. It is not feasible to expect an airport to eliminate all attractant(s) that are outside their property but it is important that they are aware of the attractant(s) and work with other landowners and/or businesses to reduce these hazards. For instance, the proximity of the forested wetland directly across from the beginning of Runway-10 (Figure 5), can attract potentially hazardous wildlife. While this wetland is not likely to be eliminated, the wetland's effects can be mitigated knowing the role it contributes to the overall aircraft safety.

The wooded areas directly adjacent to the airport likely provide habitat for some wildlife species. Many birds and mammals when traveling between forested areas will cross the AOA. Many wildlife species will prefer narrow gaps between forested habitats to avoid predators. It is not feasible to eliminate the forested habitat outside of the AOA, but keeping limbs from crossing the perimeter fence, maintaining a buffer of at least ten feet between the fence and vegetation, and not allowing narrow points between the tree lines will help mitigate wildlife crossing.

Wildlife Numbers

The initial communication with the airport manager indicated that geese and turkey vultures were the greatest threat to aircraft safety because of their numbers or frequent use of the airport. Although geese were not observed during the site visit, habitat for geese and other waterfowl occurs on and near the AOA. Geese (specifically Canada geese) are one of the most dangerous wildlife to aircraft (Dolbeer et al. 2000, DeVault et al. 2011). Turkey vultures are just as dangerous to aircraft as geese with high hazard level ratings (Dolbeer et al. 2012, DeVault et al. 2011). Turkey vultures were the most abundant raptor and are a major hazard to aircraft operations due to their large size and soaring behavior (flying in circles up and down thermal columns). These species should not be tolerated within the AOA because they are either large enough or occur in large enough numbers to cause significant damage to aircraft.

European Starlings were the most abundant wildlife observed at LHQ. European starlings and other blackbirds are typically not a threat to aircraft until migration when large flocks of thousands of birds, composed of multiple species, can form. These large flocks are a hazard to aircraft operations. During the spring and fall these large flocks should be monitored and should be harassed if within the AOA.

Wildlife Guilds

Nine wildlife guilds were identified during standardized surveys and non-standardized wildlife observations including seven bird guilds composed of species that are a specific hazard to LHQ aircraft operations (blackbirds, columbids, raptors, corvids, and shorebirds). Other guilds such as finches/sparrows, aerial foragers, and insectivores were observed but do not pose significant hazard to aircraft operations. Other bird

guilds, which could occur at LHQ but were not observed directly, that may be hazardous to aircraft operations include waterfowl, gallinaceous birds, and gulls. Two mammal guilds (rodents/rabbits and carnivores) were identified to occur at LHQ, but only carnivores are a direct hazard to aircraft on LHQ. Rodents are not a direct hazard to aircraft safety but can pose a threat if they occur in such numbers to attract larger predators. Ungulates likely occur at LHQ and are a direct hazard to aircraft, but were not directly observed during the site visits.

Species composition, general behavior, published strike data, and specific management practices for each guild that is a specific hazard to LHQ is discussed below:

Blackbirds

Blackbirds include European starlings, red-wing blackbirds, brown-headed cowbirds, and several other species of birds that have similar behaviors. Most species are omnivorous eating vegetation such as grain, fruits, and insects. Blackbirds individually are small birds that do not pose a great threat to aircraft safety but during migration, especially in the fall and winter, they group in large mixed-species flocks consisting of thousands of birds. By far, blackbirds were the most abundant guild with a total of 160 (70.8%) individuals observed. Between 1990 and 2011, 6,326 wildlife aircraft strikes (strikes) involving blackbirds and starlings were reported to the FAA; 229 (3.6%) caused damage to the aircraft and 299 (4.7%) had a negative effect on the flight of the aircraft. These strikes resulted in 4,515 hours of aircraft downtime, and \$6,482,959 worth of aircraft damage (Dolbeer et al 2012). Habitat management such as mowing grass between 7-14 inches and removing roosting structures (trees, lattice towers, overhead wires) can reduce the attractiveness of an airport to most of these species. If habitat management is not sufficient and blackbirds are flocking within the AOA, trained airport personnel should use pyrotechnics to harass the birds and lethal/trapping methods if necessary. Species of blackbirds have many unique nesting behaviors with the European starling's behavior the most likely to be a hazard to aircraft. European starlings are cavity nesters and are found nesting in buildings and possible idle aircraft; thus may be attracted to airport hangars and other buildings within the AOA. Holes and gaps in buildings on airport property should be filled to exclude starling nest sites and idle aircraft should be protected with cowl covers/plugs and monitored for nests which could cause fires.

Columbids

Columbids, composed of mourning doves and rock doves (pigeons), were second most observed guild during the WHSV, 15 (6.6%). A total of 8,113 doves and pigeons strikes were reported to the FAA between 1990 and 2011 costing \$15,219,640 in damages and 23,374 hours of aircraft downtime. Strikes involving mourning doves and rock doves had a negative effect on the flight of 493 (6.1%) aircraft and damaged 422 (5.2%) aircraft (Dolbeer et al 2012). Columbids are a hazard to aircraft because they flock in groups and are large enough to cause significant damage to aircraft and should not be tolerated on airports. Columbids feed mostly on grain and are attracted to short grass and agricultural fields (especially after harvest). Mowing grass greater than six inches will deter columbids from foraging or loafing in grassy areas. Roost sites on the airport such as hangars and tall structures will provide shelter for columbids.

Elimination of roosting sites by placing anti-perching devices or reducing potential nest sites on buildings will likely deter columbids from the AOA. Hazing and lethal control should be used by trained airport personnel if columbids are present within the AOA.

Raptors

Raptors, which include eagles, hawks, falcons, owls, and vultures, can pose a significant threat to aircraft operations because they can occur almost anywhere on the AOA and at any height. Between 1990 and 2011, 8,980 raptor strikes were reported to the FAA, 1,204 (13.4%) of the strikes caused aircraft damage and 831 (9.3%) had a negative effect on the flight of the aircraft. Reported raptor strikes caused 100,363 hours of aircraft down time, and \$79,630,285 worth of aircraft damage (Dolbeer et al 2012). Turkey vultures were the only raptor observed (10, 4.4%) on or near LHQ. Raptors can be deterred from using the AOA by elimination of perching habitat, prompt removal all animal carcasses properly as previously described, and by eliminating cover for small mammals (junk/debris, tall grass, shrubs, woodland) and hunting perches (trees, snags, poles). Raptors can also be deterred from congregating near the airport by encouraging the removal of road killed carcasses from public right-of-ways.

Corvids

Only two species of corvids occur in Ohio: the American crow and the blue jay, both species where documented at LHQ (5 and 1 respectively). The American crow poses a significant threat to aircraft safety because of their size and flocking behavior. Between 1990 and 2011, 588 strikes by corvids were reported to the FAA. Of these strikes, 58 (9.9%) caused aircraft damage and 53 (9.0%) had a negative effect on the flight of the aircraft. A total of 6,611 hours of aircraft down time and \$1,578,210 worth of damage were reported for these 588 strikes (Dolbeer et al. 2012). Blue jays do not pose as large of a threat to aircraft safety as American crows because they are small in size and typically do not flock in large numbers. American crows are omnivorous and are habitat generalists, making them very difficult to manage or exclude from airports. Eliminating the access to food sources such as carrion, open dumpsters/trash containers, and removal of fruiting trees or shrubs will lessen the attractiveness of an airport. American crows also easily become habituated to hazing methods, so a variety of harassments such as pyrotechnics, vehicular harassment, human presence, and lethal measures may need to be applied.

Shorebirds

The shorebird guild includes many species that range from small plovers, like killdeer, to large wading birds such as great blue herons and sandhill cranes. A total of 5,622 of shorebirds strikes were reported to the FAA between 1990 and 2011. These strikes resulted in 12,404 hours of aircraft downtime and \$15,267,284 in aircraft damage. Shorebird strikes damaged 305 (5.4%) aircraft and 323 (5.7%) had a negative effect on the flight of the aircraft (Dolbeer et al 2012). The majority of shorebird species are attracted to open water or wetlands and would not likely be attracted to most of LHQ's AOA which is mostly upland. Many of the small species of shorebirds are not a threat to aircraft safety except for when they form large migratory flocks. Killdeer occur within the AOA, and can be a threat to aircraft in flocks, but individually, are not likely to be a significant hazard to aircraft. Larger species such as herons (a single great blue

heron was recorded at LHQ) and cranes are a threat to aircraft safety. The habitat to attract these larger shorebird species does occur on the AOA but LHQ is also surrounded by habitat for shorebirds and it is likely they will cross-over the airfield or possibly loaf in the AOA during migration. Sandhill cranes are a good example of a species that are hazardous during migration when they form large flocks and could pose a hazard to circling aircraft above the airport.

Waterfowl

The waterfowl guild includes ducks, geese, and swans, but other swimming birds such as grebes and rails were included due to similar size and behavior. Waterfowl were not observed during the two visits at LHQ, but Canada geese are known to occur seasonally. Waterfowl tend to be near water, but can be found foraging or loafing in uplands during migration or their daily activities. Many waterfowl are of the size, flocking behavior, and abundance to be one of the greatest threats to aircraft safety. Nationally, waterfowl represent 8.6% of known species to be struck by aircraft (Cleary et al. 2008). A total of 4,127 waterfowl strikes were reported to the FAA between 1990 and 2011, causing a reported 139,673 hours of aircraft downtime and costing \$170,470,612 in damage. Waterfowl strikes damaged 1,739 (42.1%) aircraft and 884 (21.4%) had a negative effect on the flight of the aircraft (Dolbeer et al 2012).

The most important method of control of waterfowl is the elimination of wetlands and open water within or near the AOA. If water bodies and wetlands cannot be eliminated, then exclusion of waterfowl can be achieved by installing netting, suspended wires, or some other device that covers the water. Furthermore, areas where waterfowl can loaf or forage should be managed to reduce the attractiveness by modifying the habitat or constant harassment. Habitat modification can include mowing, removal of food sources, or changing the terrain so waterfowl cannot see the landscape and do not feel safe (i.e. snow fence). Hazing of waterfowl is effective but needs to be adaptive to avoid habituation. Harassing waterfowl can include pyrotechnics, lasers, and chemical repellents. Lasers are a high tech visual hazing that move lasers across the ground which scare away waterfowl and possibly other wildlife. Chemical repellents usually consist of a foul tasting substance to deter feeding or it induces digestive discomfort. The waterfowl may avoid the treated area in the future due to the association of the bad taste or digestive discomfort.

Gulls

Gulls can be a threat to aircraft because of their size and tendency to flock. Gulls are attracted to water or food, including refuse from dumpsters and landfills, earthworms, insects, and carrion. The presence of a few gulls can act as a strong attractant to others passing. They are also attracted to airports because the landscape often provides ideal loafing sites. Agricultural tillage on or around the airport can be an attractant to gulls who feed on the exposed worms. A total of 8,881 gull strikes were reported to the FAA between 1990 and 2011, causing a reported 56,516 hours of aircraft downtime and costing \$39,394,374 in damage. Gull strikes damaged 1,282 aircraft and 1,060 had a negative effect on the flight of the aircraft (Dolbeer et al. 2012). Gulls are the most frequently struck of the bird guilds with almost 2.4 times more strikes than waterfowl. Gulls are also one of the bird guilds with the most reports of multiple strikes (Dolbeer et al. 2012). Gulls were not observed at LHQ and are rare occurrence on the

airport. Modification of habitats that may attract gulls, such as the removal of refuse, removal of animal carcasses from the airfield, and the elimination of standing water will reduce gull strikes. Persistent water bodies, such as drainage ditches and containment ponds, can be excluded through the use of netting, suspended wires, or some other device that covers the water. Gulls should be harassed until they move out of the AOA if found loafing or feeding. These efforts should include an integration of active control methods (pyrotechnics, bioacoustics, and visual scare devices). Gulls can habituate rather quickly to hazing, requiring the need for some lethal measures as a reinforcement of non-lethal harassment techniques. Gulls should be hazed early and often in any area of the AOA that is safe. A zero-tolerance policy prevents the birds from becoming accustomed to using the AOA.

Gallinaceous Birds

The gallinaceous bird guild (or galliformes) includes non-migratory birds such as turkeys, pheasants, quails, and grouse. A total of 204 galliformes strikes were reported to the FAA between 1990 and 2011. These strikes resulted in \$747,952 in damage and 2,260 hours of aircraft downtime. Gallinaceous strikes had a negative effect on the flight of 44 (21.6%) aircraft and damaged 58 (28.4%) aircraft (Dolbeer et al 2012). The smaller species (i.e. bobwhite and ruffed grouse) are less of a threat to aircraft safety due to their behavior and habitat needs, but the wild turkey does pose a significant hazard. Galliformes were not observed during the WHSV but they could occur at LHQ. Wild turkeys spend most of their time on the ground but will take to flight if frightened. Wild turkeys should not be tolerated within the AOA and if they are found within the wildlife fence they should be harassed or taken by trained airport personnel.

Carnivores

The carnivore guild includes two groups: medium sized mammals (weasels, skunks, raccoons, opossums, and feral cats) and larger mammals (coyotes, bobcat, feral dogs, and fox). Between 1990 and 2011, 932 carnivore strikes were reported to the FAA, 55 (5.9%) of the strikes caused aircraft damage 119 (12.8%) had a negative effect on the flight of the aircraft, and resulted in 14,351 hours of aircraft down time, and \$3,175,026 worth of damage (Dolbeer et al 2012). Carnivore species were not observed during the WHSV but there were coyote feces found on the taxiway (Figure 18). Additionally, there is habitat (e.g. tall vegetation) for small mammals such as rodents and rabbits that could attract coyotes. Linear corridors with cover are also areas utilized by carnivores as travel corridors. Exclusion and habitat management are the best practices to eliminate carnivores from the AOA. A wildlife fence will exclude all medium and larger terrestrial mammals from entering the AOA. The elimination of prey habitat and shelter will also make the airport less attractive to carnivores. Proper maintenance of grassy areas and elimination of shrubby and wooded areas will reduce potential shelter for carnivores and their prey species. Removal of carcasses and the proper storage of garbage will also decrease potential food sources for carnivore species. If a carnivore is found within the fence a zero-tolerance policy should be enforced because the animal may not be able to leave the AOA. Trained airport personnel should remove the animal as quickly and as humanely as possible.

Ungulates

Ungulates are hooved mammals that eat vegetation and occur in the eastern USA including sheep, deer, pigs, cows, and horses. A total of 1,059 hooved mammal strikes were reported to the FAA between 1990 and 2011 causing 266,674 hours of aircraft downtime and costing \$38,304,541 in damage. Hooved mammal strikes damaged 894 (84.4%) aircraft and 495 (46.7%) had a negative effect on the flight of the aircraft; of the 1,059 hooved mammal strikes 925 (87.3%) were white-tailed deer (Dolbeer et al 2012). Many hooved mammals are common on the landscape as livestock but these are not usually a threat to aviation. However, white-tailed deer are a threat to aviation safety and account for more collisions (44%) than any other mammal, and due to their size, cause significant damage to aircraft when struck (Cleary et al. 2006). White-tailed deer were ranked the second most hazardous wildlife by DeVault et al. (2011), based on percentage of total strikes that caused any damage to aircraft, percentage of total strikes that caused substantial damage, and the percentage of total strikes that caused an effect on the flight of an aircraft. Dolbeer et al. (2012) also ranked white-tailed deer as the second most hazardous terrestrial mammal using similar criteria. Neither white-tailed deer nor their sign was observed within the AOA at LHQ, but white-tailed deer hair was found at the small woodlot north of the AOA (Figure 19). However, white-tail deer are abundant in Ohio and without a wildlife fence, pose a threat to the daily operations of LHQ. A zero-tolerance policy should be enforced if deer are detected within the AOA. Trained airport personnel should remove the animal as quickly and as humanely as possible.

Other guilds

Aerial foragers, insectivores, finches/sparrows, reptiles/amphibians, hummingbirds, and rodent/rabbit guilds are typically not a threat to aircraft safety because they are either not large enough, do not occur in large numbers, or rarely occur in the area. Aerial foragers, insectivores, finches/sparrows, and hummingbirds, which include many species of birds and with different habits, are small in size and rarely flock in large numbers to be a threat to aircraft safety. The above bird guilds are likely not a threat to aircraft safety at LHQ, although any wildlife struck by an aircraft has a potential to cause damage to aircraft. Rodents and rabbits are not a direct threat to aircraft safety but could attract raptors and carnivores that are hazards to aircraft. Reptiles/amphibians such as frogs, toads, salamanders, snakes, turtles, and lizards are not likely to be a direct threat to aircraft safety but they could also be prey for other wildlife.

Behavior

Wildlife behaviors can affect how they move on the airport, the most observed behaviors during the WHSV were flying local (37%), followed by feeding (13%), flying-past (11%), perching (11%), vocalizing (10%), and loafing (8%). Some wildlife species can be more dangerous than others depending on their behavior, movement on the landscape, and different times of the year (although all wildlife can be a hazard to aircraft). Temporal behavior can only be inferred due to the limitation of two visits at LHQ. Behaviors can be biased based on the time of year and time of day the survey are conducted; since the WHSV was conducted during fall and spring migration; many of the bird species observed flying past could be migrants with a few local residents.

Spatial and Temporal Wildlife Movements

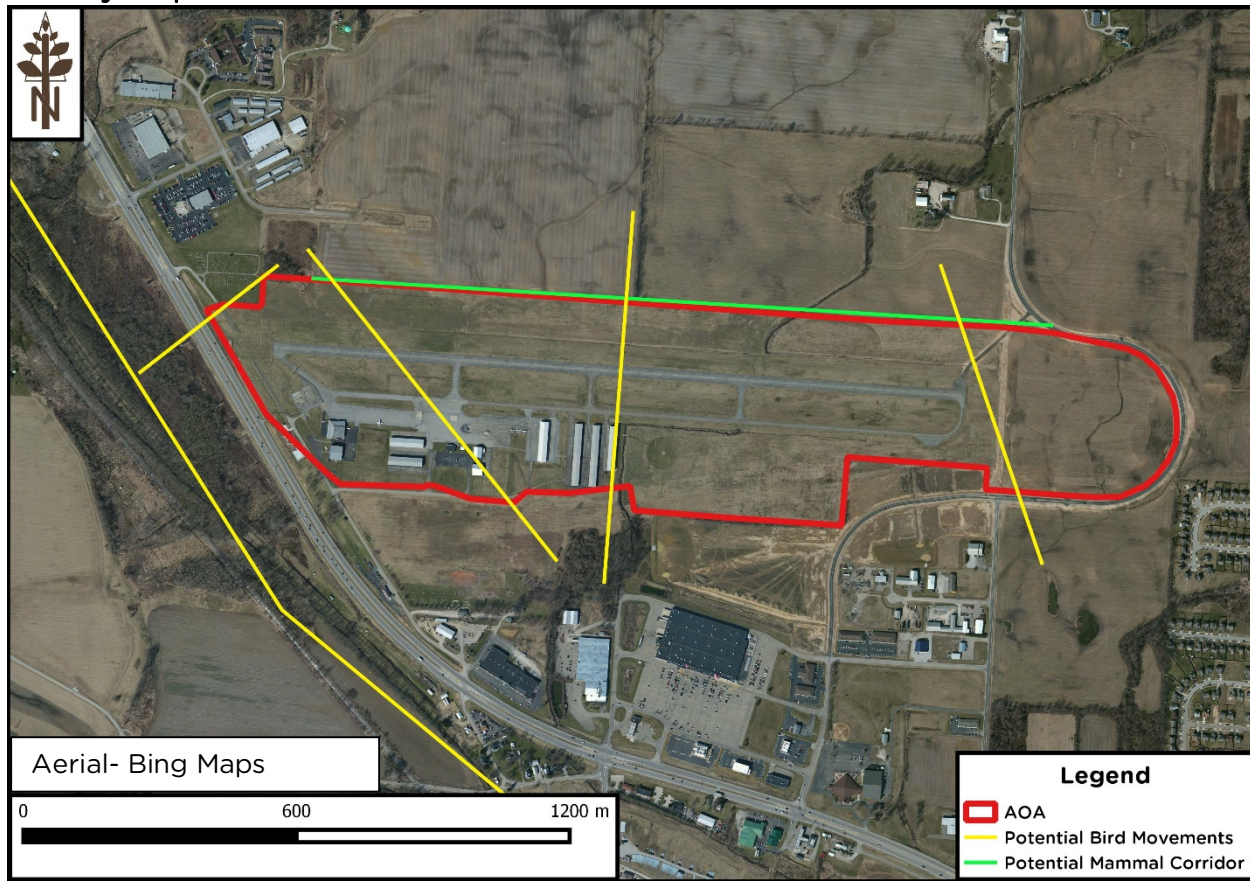
It is important to be aware of seasonal wildlife movements, especially when trying to reduce wildlife strikes with aircraft. Where wildlife is moving or spending its time within the AOA can provide insights on how to eliminate or manage wildlife hazards. Species numbers will fluctuate throughout a year with spikes of activity during migration. During fall and spring migration many bird species are moving across the landscape and may loaf or feed on an airfield. During migration larger bird species such as waterfowl, cranes, herons, and raptors or small species that occur in large flocks such as European starlings and various species of blackbirds may periodically attempt to use the AOA for food or shelter and will need to be harassed if they occur on the airfield. The movements of terrestrial mammals also changes throughout the year but are typically local in nature.

Wildlife movements change on a daily basis, with animals moving across the landscape at different times and for different reasons. Many diurnal (daytime) wildlife are well known to airport operators because they are seen during the daily activities, but crepuscular (morning or evening) or nocturnal (nighttime) wildlife are typically not observed and usually cryptic by nature. Diurnal wildlife, whether as large individuals or insufficient numbers to be a threat to aircraft, are typically easy to detect when on an airport and airport personnel can harass wildlife if they are within the AOA. Wildlife that occurs on the airport at night or during the low-light conditions of morning or evening can be hard to detect and may pose a bigger threat to aircraft than diurnal wildlife. Many airports may not have airport personnel on site during over-night hours to haze wildlife, so passive management, such as habitat management or fencing, is crucial to deter wildlife from the AOA.

Wildlife movements were documented during the WHSV, but this information is limited and biased due to brevity of the survey (Figure 23). During the WHSV birds were seen moving from cover or attractants along the lines shown on Figure 23. Most of the cover was forest or crops. Mammals typically use cover and will follow linear features, the northern fence provides such a corridor. The lines on Figure 23 are projected corridors based on observations and assumed paths from identified wildlife attractants or cover. These corridors could change depending on weather, season, or species. They also do not show all possible wildlife movements.

Wildlife are not limited to moving in two dimensions across the landscape and it is important within an airport to determine at what height wildlife occur. Most birds were observed at the low classification during the WHSV. Aircraft that are landing or departing, 1-40 meters AGL (1-131 feet), are very vulnerable to wildlife strikes; more so than any other range. Wildlife crossing or loafing on the runway pose the largest threat to aircraft operations and should not be tolerated. To reduce wildlife on the runway and mitigate the movement of all wildlife on the AOA, LHQ should install a wildlife fence, harass/take wildlife that are a direct threat to aircraft, remove vegetation that serves as wildlife corridors (i.e. trees and shrubs along fence row), and manage the habitat to reduce the attractiveness of the airport to wildlife.

Figure 23. Observed and projected wildlife movements in the vicinity of Fairfield County Airport.



Conclusions and Summary Recommendations

The following conclusions and recommendations are based on two single day surveys (October 14, 2015 and March 23, 2016) and discussions with airport personnel. These conclusions and recommendations fulfill the goals of the WHSV to address wildlife hazards at LHQ.

The WHSV is a snapshot of the wildlife hazards that occur at LHQ at the time the surveys were conducted. Wildlife hazards by nature change, and over time LHQ will need to adopt an adaptive management plan to have the flexibility to manage for wildlife hazards that may occur in the future.

Buildings within and outside the AOA can provide shelter to a variety of wildlife, specifically nesting areas for birds. Although not observed during the WHSV, many bird species can use hangars to build nests. If birds are nesting on or in a building, the nests should be removed when the birds are not breeding or have young (if it is a protected species). Netting or some other method to exclude the birds should be implemented to discourage further nesting. The same practices apply to mammals. Sometimes mammals will move into a building usually attracted by shelter or a food source. Eliminating any food sources in non-secure buildings and securing any gaps or cracks will help deter mammals from buildings.

Modify existing habitat to make it less attractive to wildlife

Maintaining the AOA as a homogenous habitat will reduce wildlife hazards on the airport. Before construction or landscape management a qualified wildlife biologist should be consulted to determine if the proposed activities will create wildlife hazards. Creating an AOA that is not attractive to wildlife requires regular mowing of grassy areas, removal/maintenance of shrubby and wooded areas within the AOA. Grass that is not adjacent to the runway or taxiway should be maintained at a minimum of 7 inches to a maximum of 14 inches. This height range deters foraging of many bird species. This mowing regimen should reduce the attractiveness of the airfield to flocks of blackbirds that can occur in large numbers. Vegetation and unmaintained areas within the AOA provide cover for wildlife which in turn provides an attractant to predators and should be eliminated from the airfield. Areas where tall grass/weeds, trees, fence rows, or brush on opposite sides of the airfield can create a wildlife “corridor” encouraging many birds and mammals to cross. Wildlife likely uses these smaller gaps because it is the shortest distance between cover. Trees or brush should not be allowed within the perimeter fence and should be cut back away from the proposed wildlife fence to remove these potential corridors and thus discourage wildlife from crossing the runway.

Water resources such as standing water, ditches, and storm water basins should drain quickly to deter their attractiveness to wildlife. Other structures or resources that wildlife can use as cover, such as dirt mounds or hangars, should be monitored to determine if wildlife are utilizing them and the appropriate control methods should be used to deter or eliminate those attractants. 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 cover or nesting habitat.

Resident Species management

Wildlife should be eliminated or dispersed if detected on the airfield. Airport personnel should harass any wildlife observed on or near the airfield to discourage use and, if necessary, use lethal control to take wildlife in compliance with USFWS, ODNR, and local regulations. Lethal control should be used as a last option but is sometimes necessary to maintain aircraft safety. LHQ should keep a clear and concise log of control efforts and of wildlife observed that can be easily accessed by airport personnel. LHQ should adopt a no tolerance policy when it comes to wildlife within the AOA. Currently LHQ does not hold any permits to harass or take any threatened or endangered species and should obtain permits before engaging in wildlife control or harassment. If any pesticides are used to control wildlife, LHQ must comply with the Pesticide & Fertilizer Regulation Section and have a valid pesticide applicator license. Pesticides are regulated by the Ohio Department of Agriculture.

Gulls, American crows, raptors, large flocks of blackbirds, and other bird species would not be excluded by the wildlife fence and can present a significant hazard to aircraft. None of these species should be tolerated within the airfield and should be harassed by trained personnel as soon as they are detected. Any medium or large mammals detected on the airfield should be removed using lethal control by trained personnel. If airport personnel are unable to actively remove wildlife they may be able to work with a local trapper to reduce wildlife hunters assuming all wildlife permits and laws are followed.

Wildlife exclusion from airfield

To exclude medium to large mammals and discourage any other terrestrial wildlife from the airfield a wildlife fence should be placed around the perimeter of the airfield. Without a wildlife fence aircraft are much more likely to strike a deer or coyote that could cause a fatality and will cause significant damage to aircraft. LHQ should install a wildlife fence which not only keeps wildlife out but can also prevent unauthorized personnel from entering the airfield. The fence should be inspected and repaired; removing vegetation from the fence when detected. A 10-foot-wide buffer on both sides of the fence should be maintained to facilitate the maintenance and inspection of the fence and to reduce wildlife cover (Cleary and Dolbeer 2005). To further exclude wildlife, especially carnivores and rodents digging or going under the fence a deterrent such as crushed rock should be installed at the foot of the fence.

Reporting Wildlife Strikes

Reporting wildlife strikes is important to help understand what species may be a hazard on an airfield and can help an airport adapt their management practices to eliminate these hazards. Wildlife strikes should be reported on the FAA's Wildlife Strike Database website (<http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx>). The website makes reporting strikes quick and easy and should be used as a tool for the airport to develop and adapt their wildlife management. The airport should develop a culture of reporting wildlife strikes and encourage vendors and clients to do the same.

If a wildlife carcass that has been struck by an aircraft cannot be identified, it should be sent to an expert for identification. If the carcass is a bird it can be sent to the Smithsonian Institute Feather Lab (see Appendix A) at no cost to the airport. If the carcass is a mammal you can send the carcass to a qualified wildlife biologist.

Summary Recommendations

- Modify Habitat On the Airport.
 - Maintain grassy areas not directly adjacent to the runway or taxiways at seven to fourteen inches in height.
 - Remove all brush and tall vegetation from the airfield.
 - Remove wooded area to the northwest just outside of the AOA.
 - Reduce standing water in ditches.
 - Remove or cover dirt piles.
 - Remove weeds and grass from cement pad and apron.
 - Remove vegetation from existing fencing (e.g. climbing vines, trees, etc.).

- Limit or eliminate agriculture within the AOA.
- Resident Species management.
 - Airport personnel should continue with hazardous wildlife control:
 - Monitor wildlife on airfield and their movements.
 - Pursue permits and training for wildlife management.
 - Harass or remove wildlife on the airfield.
- Wildlife exclusion from airfield
 - Install wildlife fencing around the AOA.
 - Phased installation with focus on hotspots and hi-traffic areas.
- Report Wildlife Encounters.
 - Emphasize/Advertise reporting of all wildlife strikes.

Implementation of Recommendations.

Recommendations to remove or mitigate attractants fall into two categories short-term and long-term based on the complexity of the attractant or hazard. The prioritizing of recommendations will aid LHQ in understanding where to allocate resources and take the steps necessary to reduce wildlife hazards and attractants in an effective manner.

Short-term recommendations include the majority of the above recommendations and can be completed in the near future with existing airport resources. Short-term recommendations are not meant to be just a one-time simple solution and can be recurring. Short-term recommendations are categorized in a way the airport can, in the near future and with current resources, eliminate or mitigate a wildlife hazard or attractant. Short-term recommendations include most of the habitat modification efforts, active wildlife control, and the emphasis to encourage reporting wildlife strikes. Removing tall vegetation and similar recommendations is a short-term recommendation because it is within the airport's present means to complete with the resources the airport already poses.

Long-term recommendations are more complex and typically take more resources to complete or mitigate. The wildlife fence is an example of a long-term recommendation due to the planning, construction, and financial costs to complete the project. Long-term recommendations include: installing a wildlife fence, mitigation of wetlands, removing trees, and limiting or eliminating agriculture within the AOA.

Further Assessments

LHQ has few wildlife hazards or attractants and the airport is commended on proactively reducing existing wildlife hazards. This WHSV is the first assessment of LHQ's wildlife hazard management practices and given time to implement the above recommendations most of the wildlife hazards and attractants should be mitigated. Further assessments should not be warranted until the mandatory five year assessment after the first WHSV. If all the recommendations have been implemented and there are still major wildlife hazards or other triggering mechanism (see AC 150/5200-33C) then a longer more in depth WHA should be conducted to gather data to be the scientific bases of a WHMP.

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Appendix A

Resources and Supplementary Materials

Wildlife Hazard Site Visit Report



Fairfield County Airport

Fairfield County, Ohio

Source	Website
FAA Advisory Circular 150/5200-33C	http://www.faa.gov/documentLibrary/media/Advisory_Circular/draft_150_5200_33C.pdf
FAA Advisory Circular 150/5200-32B	http://www.faa.gov/documentLibrary/media/advisory_circular/150-5200-32A/150_5200_32A.pdf
FAA Advisory Circular 150/5200-33B	http://www.faa.gov/documentLibrary/media/advisory_circular/150-5200-33B/150_5200_33b.pdf
FAA Advisory Circular 150/5200-34A	http://www.faa.gov/documentLibrary/media/advisory_circular/150-5200-34A/150_5200_34a.pdf
FAA Advisory Circular 150/5200-36A	http://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5200_36a_consolidated.pdf
Ohio's Listed Species	http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/information/pub356.pdf
Bird Strike Committee USA/Canada	www.birdstrike.org
The International Bird Strike Committee	http://www.int-birdstrike.org/
FAA Wildlife Strike Database Website	http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx

Appendix B

Scientific Names of Wildlife Species

Wildlife Hazard Site Visit Report



Fairfield County Airport

Fairfield County, Ohio

Common Name	Scientific Name
BIRDS	
Herons/Cranes	
Great Blue Heron*	<i>Ardea herodias</i>
Sandhill Crane*	<i>Grus canadensis</i>
Waterfowl	
Canada Goose*	<i>Branta canadensis</i>
Raptors	
Bald Eagle*	<i>Haliaeetus leucocephalus</i>
Golden Eagle*	<i>Aquila chrysaetos</i>
Turkey Vulture	<i>Cathartes aura</i>
Gallinaceous birds	
Wild Turkey*	<i>Meleagris gallopavo</i>
Shorebirds	
Killdeer+	<i>Charadrius vociferus</i>
Pigeons/Doves	
Mourning Dove+	<i>Zenaida macroura</i>
Rock Dove+	<i>Columbia livia</i>
Pelicans	
American White Pelican*	<i>Pelecanus erythrorhynchos</i>
Swallows/Swifts	
Tree Swallow	<i>Tachycineta bicolor</i>
Starlings	
European Starling+	<i>Sturnus vulgaris</i>
Crows/Jays	
America Crow*	<i>Corvus brachyrhynchos</i>
Blue Jay	<i>Cyanocitta cristata</i>
Thrushes	
American Robin	<i>Turdus migratorius</i>
Finches/Buntings	
Northern Cardinal	<i>Cardinalis cardinalis</i>
Blackbirds	
Brown-headed Cowbird+	<i>Molothrus ater</i>
Common Grackle+	<i>Quiscalus quiscula</i>
Eastern Meadowlark	<i>Sturnella neglecta</i>
Red-winged Blackbird+	<i>Agelaius phoeniceus</i>

+ Species that can occur in numbers to be a hazard to aircraft.

* Species that are large enough to be a hazard to aircraft.

Common Name	Scientific Name
Sparrows	
House Sparrow	<i>Passer domesticus</i>
Song Sparrow	<i>Melospiza melodia</i>
MAMMALS	
Bats	
Indiana bat	<i>Myotis sodalis</i>
Northern-long eared bat	<i>Myotis septentrionalis</i>
Rodents	
Muskrat	<i>Ondatra zibethicus</i>
Thirteen-lined ground	<i>Spermophilus tridecemlineatus</i>
Carnivores	
Bobcat*	<i>Lynx rufus</i>
Coyote*	<i>Canis latrans</i>
Raccoon	<i>Procyon lotor</i>
American Badger	<i>Taxidea taxus</i>
Virginia opossum	<i>Didelphis virginiana</i>
Even-toed Ungulates	
White-tailed deer*	<i>Odocoileus virginianus</i>
REPTILES	
Snakes	
Eastern Massasauga	<i>Sistrurus catenatus</i>

+ Species that can occur in numbers to be a hazard to aircraft.

* Species that are large enough to be a hazard to aircraft.

Appendix C

Photographs of Standardized Survey Points

Wildlife Hazard Site Visit Report



Fairfield County Airport

Fairfield County, Ohio



FP 1: Looking north.



FP 1: Looking east.



FP 1: Looking south.



FP 1: Looking west.



Standardized Survey Points
Fairfield County Airport Wildlife Hazard Site Visit
Fairfield County, Ohio

Photographic
Documentation
Project 1504007



FP2: Looking north.



SSP 2: Looking east.



SSP 2: Looking south.



SSP 2: Looking west.



Standardized Survey Points
Fairfield County Airport Wildlife Hazard Site Visit
Fairfield County, Ohio

Photographic Documentation
October 26, 2015
Project 1503014



FP 3: Looking north.



FP 3: Looking east.



FP 3: Looking south.



FP 3: Looking west.



Standardized Survey Points
Fairfield County Airport Wildlife Hazard Site Visit
Fairfield County, Ohio

Photographic Documentation
October 26, 2015
Project 1503014

Adoption of Wildlife Hazard Site Visit Recommendations

Fairfield County Airport, LHQ, Lancaster, Ohio
Airport Manager Name/Airport Sponsor Name: Pat Rooney, Airport Manager, Sundowner Aviation Glenn Burns, President, Fairfield County Airport Authority
Biologist Name, Company/Agency, and Date of Wildlife Hazard Site Visit: Jeremy Sheets, Orbis environmental consulting, October 14, 2014
<i>After preparing this Adoption of WHSV Recommendations, please submit to the FAA Airports District Office or Regional Office, or associated block grant state.</i>

Table 1 contains the recommendations contained in the Wildlife Hazard Site Visit (WHSV) that have been accepted by the Airport Owner/Operator. Table 2 contains the recommendations contained in the Wildlife Hazard Site Visit that were **not accepted** by the Airport Manager and Airport Sponsor and the reason why.

More detail on each of the recommendations can be found in the WHSV.

TABLE 1: ACCEPTED RECOMMENDATIONS FROM WILDLIFE HAZARD SITE VISIT

Note: The items listed here are examples of typical wildlife mitigation measures that often appear in WHSV reports. The airport owner/operator must revise the form to reflect the wildlife mitigation measures included in the specific site visit report and adopted by the airport.

Recommendation from Wildlife Hazard Site Visit	Responsibility	Frequency
Modify Habitat on the Airport:	Airport.	Monthly
Modify Habitat on the Airport: Limit or eliminate agriculture within the AOA	Airport.	Annual
Resident Species Management: Monitor wildlife on airfield and movements	Airport.	Daily
Resident Species Management: Pursue permits and harass or remove wildlife on the airfield	Airport.	Ongoing
Wildlife Exclusion from Airfield: Fencing around AOA	Airport. (FAA AIP Funding)	Phased Installation
Report Wildlife Encounters: Report all wildlife strikes	Airport.	As needed

TABLE 2: RECOMMENDATIONS NOT ACCEPTED FROM WILDLIFE HAZARD SITE VISIT

Note: The items listed here are examples of typical wildlife mitigation measures. The airport owner/operator must revise the form to reflect the wildlife mitigation measures included in the specific site visit report but not adopted by the airport.

Recommendation from Wildlife Hazard Site Visit	Reason for Not Accepting the Recommendation

I hereby certify that this is a complete and accurate listing of responses to the foregoing items and have prepared documentation attached hereto for any item marked “no”.

(Name of Airport Owner/Operator)

(Signature of Sponsor's Designated Official Representative)

(Typed Name of Sponsor's Designated Official Representative)

(Typed Title of Sponsor's Designated Official Representative)

(Date)