SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT:

BIRD DAMAGE MANAGEMENT AT AIRPORTS, MUNICIPALITIES, INDUSTRIAL SITES, AGRICULTURAL SITES, AND PRIVATE LANDS WITHIN INDIANA

United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

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I. INTRODUCTION

In 2002, the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) completed an environmental assessment (EA) on alternatives for the management of conflicts and damage cause by birds in Indiana (USDA 2002*a*)[1]. The EA's Decision and Finding of No Significant Impact (FONSI) allowed for the implementation of an Integrated Bird Damage Management (IBDM) program to respond to requests for bird damage management (BDM) at municipalities, industrial sites, agricultural sites, and private land within Indiana to protect property, agriculture, natural resources, and human health and safety at these locations. The IBDM approach involves the use of the full range of BDM techniques, either singly or in combination, to resolve conflicts with birds. Those requesting assistance are provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used or recommended by WS include shooting, trapping, toxicants, or euthanasia following live capture or trapping. Non-lethal methods used or recommended by WS include, but are not limited, to habitat alteration, chemical immobilization, repellents, fencing, barriers and deterrents, netting, capture and relocation, and harassment or scaring devices. BDM assistance is provided by WS when requested, where a need has been documented, and upon completion of an *Agreement for Control* with the landowner/manager. All WS BDM actions comply with applicable Federal, State, and local laws. An amendment[2] to the EA was completed in 2006 which updated and augmented the original analysis (USDA 2006). Need for BDM was increased to include bird hazard management at airports. The chemosterilant nicarbazin (OvoControl-G) for management of local populations of resident Canada geese (*Branta canadensis*) was evaluated for inclusion as a management technique. The amendment also reviewed the environmental impacts of increasing annual take of Mourning Doves (from 20 to 100 birds per year) and Rock Pigeons (from 250 to 2,000 birds per year). A Decision and FONSI for the amendment was issued in 2006.

The EA analyzes the effects of WS' activities to reduce damage and threats associated with several bird species. Bird species addressed in the EA and this supplement include house sparrow (*Passer domesticus*), red-winged blackbird (*Agelaius phoeniceus*), European starling (*Sturnus vugaris*), brown-headed cowbirds *(Molothrus ater*), Eastern meadow lark *(Sturnella magna*), horned lark *(Eremphila aalpestris*), killdeer (*Charadrius vociferous*), Canada goose (*Branta canadensis*), snow goose (*Chen caerulescens*), mallard (*Anas platyrhynchos*), other ducks (*Anatinae*), terns (*Sterninae*), gulls (*Larinae*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), barred owl (*Strix varia*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), American kestrel (*Flaco sparverius*), Swanson's hawk (*Buteo swainsoni*), Northern harrier (*Circus cyaneus*), wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), feral pigeon *(Columbia livia*), purple finch (*Carpodacous purpureus*), house finch (*Carpodaacous mexicanus*), barn swallow (*hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*) , American crow (*Corvus brachyrhnchos*), turkey vulture (*Cathartes aura*), black vulture (*Coragyps atratus*), common grackle (*Quicalus quiscula*), blue jay (*Cyabicutta crustat*), Eastern bluebird (*Sialia sialis*), Northern cardinal (*Cardinalis cardinalis*), upland sandpiper (*Bartramia longicaude*), common snipe (*Capella gallinago*), and mute swan (*Cygnus olor*). In addition to those avian species specifically addressed, WS could also address threats associated with other avian species but the number of individuals of each of those species would be of low number and are likely to occur infrequently.

[1] The EA may be obtained from the State Director, USDA/APHIS/WS, 901 W. State St., Purdue University, West Lafayette, IN 47907-2089.
[2] The 2006 Supplement to the EA was titled as an Amendment. The terms Supplement and Amendment are used interchangeably in these NEPA documents.

II. PURPOSE

The purpose of the EA will remain as addressed in section 1.2 of the EA (USDA 2002). This supplement to the EA examines the potential environmental impacts of WS' program as it relates to: 1) new information that has become available from research findings and data gathering since the issuance of the Decision and FONSI in 2006, 2) conducting disease surveillance and monitoring in avian populations, 3) an increase in the number of requests for assistance to manage bird damage threats in Indiana, particularly request for assistance at airports in Indiana, and 4) analyses of WS' bird damage management activities in Indiana since the 2006 Decision/FONSI was issued to ensure program activities are within the impact parameters analyzed in the EA and the amendment to the EA.

WS monitors the impacts of its BDM actions annually to determine if the impacts of the proposed action are within the parameters analyzed in the EA. Indiana WS has received increasing requests for assistance with bird damage management at airports in Indiana. This increase in WS operational damage management activities is anticipated to result in increases in annual take of some species, specifically: house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, black vultures, mute swans, and rock doves. This supplement includes reviews the potential environmental impacts of increasing WS operational BDM programs. This supplement adds to the analysis in the 2002 EA and 2006 Amendment and all information and analyses in the EA and Amendment remain valid unless otherwise noted below.

III. NEED FOR ACTION AND PROPOSED SUPPLEMENT

A description for the need for action to address damage and threats associated with birds in Indiana is provided in section 1.3 of the 2002 EA and in the 2006 amendment to the EA (USDA 2002, 2006). The need for action addressed in the EA and in the amendment remains applicable to this supplement to the EA. The need for action to manage bird damage in Indiana arises from requests for assistance[3] received by WS to reduce and prevent damage from occurring to four primary categories: property, threats to human health and safety, agriculture, and natural resources. As shown in Table 1, WS has conducted 4,700 technical assistance projects involving bird damage to human safety, property, agriculture, and natural resources between federal fiscal year[4] (FY) 2007 through FY 2011 in Indiana. Technical assistance provides those persons requesting assistance with information on wildlife identification, damage identification, and methods available to resolve wildlife damage without WS' direct involvement.

Table 1 – Technical assistance projects conducted by WS in Indiana, FY 2007 – FY 2011*

Species	Projects	Species	Projects
Red-winged blackbird	**3**	**Sandhill crane**	**18**
Blackbird (mixed species)	**19**	**American crow**	**54**
Eastern bluebird	**5**	**Mourning dove**	**60**
Northern cardinal	**86**	**Feral duck**	**39**
American coot	**11**	**Mallard**	**686**
Double-crested cormorant	**2**	**Northern pintail**	**1**
Brown-headed cowbird	**3**	**Wood duck**	**11**
Bald eagle	**26**	**American goldfinch**	**3**
Golden eagle	**4**	**Common grackle**	**17**

[3] WS only conducts damage management activities after receiving a request for assistance. Before initiating activities, a Memorandum of Understanding, cooperative service agreement, or other comparable document must be signed between WS and the cooperating entity which lists all methods the property owner or manager will be allowed to be used on the property they own/manage.
[4] The federal fiscal year begins on October 1 and ends on September 30 the following year.

Great egret	**1**	**Eared grebe**	**1**
Snowy egret	**1**	**Pied-billed grebe**	**3**
American kestrel	**13**	**Herring gull**	**20**
Peregrine	**44**	**Ring-billed gull**	**10**
House finch	**33**	**Broad-winged hawk**	**2**
Northern flicker	**2**	**Cooper's hawk**	**135**
Canada goose	**1,416**	**Northern goshawk**	**4**
Feral goose	**16**	**Northern harrier**	**8**
Greater snow goose	**4**	**Red-shouldered hawk**	**10**
Lesser snow goose	**1**	**Red-tailed hawk**	**394**
Greater white fronted goose	**1**	**Rough-legged hawk**	**1**
Sharp-shinned hawk	**21**	**Blue jay**	**30**
Great blue heron	**84**	**Dark-eyed junco**	**1**
Green heron	**1**	**Killdeer**	**15**
Night heron	**1**	**Belted kingfisher**	**2**
Ruby throated hummingbird	**46**	**Common loon**	**2**
White ibis	**1**	**Purple martin**	**4**
Northern mockingbird	**7**	**Snowy owl**	**1**
Nighthawk	**7**	**Monk parakeet**	**1**
Osprey	**1**	**American while pelican**	**1**
Barred owl	**24**	**Ring-necked pheasant**	**9**
Common barn owl	**15**	**Feral pigeon**	**104**
Eastern screech owl	**76**	**Quail**	**5**
Great horned owl	**92**	**American robin**	**256**
Long-eared owl	**1**	**Least sandpiper**	**1**
Short-eared owl	**2**	**White-rumped sandpiper**	**1**
House sparrow	**143**	**Turkey vulture**	**115**
European starling	**185**	**Yellow-rumped warbler**	**1**
Barn swallow	**25**	**Cedar waxwing**	**3**
Tree swallow	**3**	**Downy woodpecker**	**28**
Mute swan	**90**	**Hairy woodpecker**	**7**
Tundra swan	**2**	**Pileated woodpecker**	**16**
Swift	**19**	**Red-headed woodpecker**	**2**
Common tern	**1**	**Yellow-bellied sapsucker**	**1**
Wild turkey	**62**	**House wren**	**1**
Black vulture	**15**	**Greater yellowleg**	**1**
		Total	**4,700**

*Does not reflect the number of direct operational assistance projects conducted by WS in which WS was directly involved with resolving damage or threats when requested

During requests for assistance received by WS, cooperators often report or WS verifies through site visits, damage associated with various species of birds in the State. Since FY 2007, damage has been reported to WS or WS has verified over $1,400,000 in damages caused by birds in the State (see Table 2). Damages have been reported or verified as occurring primarily to property and agricultural resources. Nearly $480,000 in damage to agriculture has been reported or verified to WS in the state since 2007 with damage to property exceeding $1,400,000 in damages.

Table 2 – Reported or verified monetary damage by resource caused by birds in Indiana

Resource Type	Fiscal Year					Total
	2007	2008	2009	2010	2011	
Agriculture	$59,169	$105,340	$48,482	$7,050	$257,630	**$477,671**
Human Safety	$5,975	$3,215	$11,435	$25	n/r	**$20,650**
Natural Resources	$2,100	$1,500	$1,450	n/r	$100	**$5,150**
Property	$965,984	$263,840	$166,154	$41,910	$2,810	**$1,440,698**

Table 2 only reflects damage that has been reported to or verified by WS based on requests received for assistance. Assigned monetary damage to natural resources can be difficult especially when factoring in the lost aesthetic value when natural resources are damage by birds. Similarly, placing a monetary value on threats to human safety can be difficult. Monetary damage reported in Table 2 reflects damage that has occurred and that has been reported to WS, but is not reflective of all bird damage occurring in the State since not all bird damage or threats are reported to WS. Additionally, WS experience a reduction in the number of requests for assistance and reports for damage received due to the elimination of State funding for a toll-free hotline in 2009. Although the reports and assistance are still available to residents, the loss of the well-known centralized information center and free phone call provided by the toll-free hotline has reduced the overall number of citizens contacting our office.

WS continues to receive requests for assistance to manage damage and threats to human health and safety caused by birds in Indiana. Since the federal fiscal year[5] (FY) 2006, WS has responded to an increase in requests for assistance to manage damage to property, human health and safety, agricultural resources, natural resources caused by birds. WS is also being requested to participate in disease surveillance and monitoring programs to detect and evaluate risks associated with avian diseases. Since the completion of the EA and the amendment to the EA, the number of requests for assistance has increased associated with damage caused by house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and feral pigeons at airports, municipalities, and private properties. This supplement to the EA analyzes the affected environment and potential impacts as the proposed activities relate to the need for an increase in damage management activities to address the increasing populations of these species.

Need for BDM to Protect Human Health and Safety

Threat of Aircraft Striking Wildlife at Airports and Military Bases

Many of the avian species addressed in the EA (USDA 2002), the amendment to the EA (USDA 2006), and this supplement are gregarious (i.e., form large flocks), especially during the fall and spring migration periods. Although damage and threats can occur throughout the year, damage and threats of damage are highest during those periods when birds are concentrated into large flocks such as migration periods and winter months when food sources are limited. For some bird species, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists, such as swallows and gulls. The flocking behavior of many bird species during migration periods can pose increased risks when those species occur near or on airport properties. Aircraft striking multiple birds not only increases the chances of causing damage to the aircraft and the amount of damage, but also increases the risk that a catastrophic failure of the aircraft might occur, especially if multiple birds are ingested into aircraft engines.

Recently, the U.S. Department of Transportation (USDOT), Office of Inspector General (OIG) issued an audit report to the FAA in which they indicate that in the past two decade, wildlife strikes have steadily

[5] The federal fiscal year begins October 1 and ends on September 31 the following year.

and dramatically increased, from 1,770 reported in 1990 to 9,840 reported in 2011, a five-fold increase (USDOT 2012). The report further indicates that the rise in strikes is due in part to increases in large bird populations. Wildlife strikes have resulted in at least 24 deaths and 235 injuries in the United States, and since 1988, 229 deaths worldwide. They have also caused nearly 600,000 hours of aircraft downtime and $625 million in damages annually (USDOT 2012).

The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions is increasing (Dolbeer 2000, MacKinnon et al. 2001). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transport community as a whole (Conover et al. 1995). The emergency landing of U.S. Airways Flight 1549 in the Hudson River in early 2009 after the aircraft ingested Canada geese into both engines (NTSB 2009, Marra et al. 2009) has increased the public's awareness of the dangers associated with aircraft striking wildlife (Dolbeer et al. 2009). In several instances, wildlife-aircraft collisions in the United States have resulted in human fatalities. Bird strikes cause an estimated seven fatalities involving civil and military aircraft each year (Linnell et al. 1996). Since 1988, more than 229 people worldwide have dies in aircraft that have crashed after striking wildlife (Dolbeer et al. 2009). In 1995, and Air Force E-3B AWACS aircraft collided with a flock of Canada geese at Elmendorf Air Force Base, Alaska, killing all 24 passengers and crew. In addition, a $190 million plane was lost (Dolbeer 1997). A recent example occurred in Oklahoma where an aircraft struck American white pelicans (*Pelecanus erythrorhynchos*) causing the plane to crash and killing all five people aboard (Dove et al. 2009). The risk that birds pose to aircraft is well documented with the worst case reported in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European starlings (Terres 1980). More recently, on 19 April, 2012, Air Force Two, with the Vice President on board, sustained a wildlife strike while approaching Santa Barbara Municipal Airport when birds hit the right side of the aircraft (USDOT 2012).

From 1990 to 2011, 117,283 wildlife strikes were reported to the Federal Aviation Administration (FAA) (FAA 2012) in the United States. This number is likely to be much greater since an estimated 80% of civil bird strikes go unreported (Cleary et al. 2005, Wright and Dolbeer 2005). From January 1990 through December 2011, 1,661 wildlife strikes were reported to the FAA in Indiana (FAA 2012). Between 1990 and 2008, 97% of all reported aircraft strikes with wildlife involved birds (Dolbeer et al. 2009). During 2011, in Indiana, 143 strikes were reported to the FAA (FAA 2012). Of these, four resulted in minor damage to civil aircraft and one results in Class C[6] damage to a military aircraft.

Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway. From 1990 through 2008, approximately 60% of reported bird strikes to United States civil aviation occurred when the aircraft was at an altitude of 100 feet above ground level or less. Additionally, 72% occurred less than 500 feet above ground level and approximately 92% occurred under 3000 feet above ground level (Dolbeer et al. 2009).

Waterfowl were involved in the greatest number of damaging strikes (31%) in which the bird species was identified as compared to all other bird groups (Dolbeer et al. 2009). Nationally, the resident Canada goose population probably represents the single most serious bird threat to aircraft safety (Alge 1999, Seubert and Dolbeer 2004, Dolbeer and Seubert 2006). Resident Canada geese are of particular concern to aviation because of their large size (typically 8-15 lbs which exceeds the 4-lb bird certification standard for engines and airframes); flocking behavior (which increases the likelihood of multiple strikes); attraction to airports for grazing; and year-around presence in urban environments near airports (Seubert

[6] Class C damage is defined as damage occurring to military aircraft resulting in at least $50,000, but less than $500,000 in losses (FAA 2012).

and Dolbeer 2004). From 1990 through 2008, there were 1,181 reported strikes involving Canada geese in the United States, resulting in nearly $51 million in damages and associated costs to civil aircraft (Dolbeer et al. 2009). Dolbeer et al (2009) reported that gulls were the most commonly struck bird group from 1990 through 2008.

Request for assistance to address threats to aviation have increased significantly since the completion of the EA (USDA 2002) and amendment (USDA 2006). In Indiana, between FY 2002 and FY 2006, WS personnel responded to request for direct assistance from four airports. However, from FY 2007 through FY 2011 WS personnel have responded to requests for both technical and direct assistance from 16 municipal, regional, international, and military airports to alleviate threats and damage associated with birds.

Threat of Disease Transmission

Further, several municipalities and major metropolitan areas have requested assistance from WS in Indiana to address threats to human health and safety associated with unsanitary conditions created by accumulations of droppings from European starlings and pigeons. Feral pigeons and starlings have been suspected in the transmission of 29 different diseases to humans (Weber 1979 and Dvais et al. 1971). These include viral diseases such as meningitis and seven different forms of encephalitis; bacterial diseases such as erysipeloid, salmonellosis, blastomycosis, candidiasis, cryptococcosis, histoplasmosis, and sarcosporidiosis; protozal diseases such as American trypansomaisis and toxoplasmosis; and rickettsial/chlamydial diseases such as chlamydiosis and Q fever. As many as 65 different diseases transmittable to humans or domestic animals have been associated with feral pigeons, starlings, and house sparrows (Weber 1979).

The risk of disease transmission from birds to humans is likely very low. However, human exposure to fecal dropping through direct contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. The gregarious behavior of bird species leads to accumulations of fecal droppings that can be considered a threat to human health and safety due to close association of those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often in areas where humans may come into direct contact with fecal droppings. The Ohio River Valley, including all of Indiana, is endemic for Histoplasmosis (CDC 2012a). Histoplasmosis is a fungal disease that is transmitted to humans through inoculation by fungal spores that grow readily in decomposed bird droppings. As flock numbers of these gregarious bird species have increased in attractive urban habitats in Indiana, the concerns regarding excessive accumulations of droppings and associated zoonotic diseases have also increased. Municipalities initially involved in a bird damage management project have discovered that this is not a one-year problem and BDM has become a necessary routine maintenance activity for their cities for both public health and protection of property.

Additional Human Safety Concerns Associated with Birds

Industrial facilities experience requesting assistance to address threats to human health and safety have increased since the 2006 amendment to the EA, particularly due to populations of pigeons roosting and nesting in the operational areas of these facilities. Substantial accumulations of feces on or near critical equipment and in areas used by employees creates multiple hazards. Slipping hazards can be created by the buildup of feces from birds on docks, walkways, or other foot traffic areas. If fecal dropping occur in areas with foot traffic, slipping could occur resulting in injuries to people. To avoid those conditions, regular clean-up is often required to alleviate threats of slipping on fecal matter which can be economically burdensome.

Need to Resolve Bird Damage Occurring to Property

The Indiana WS program has experience an increase in the number of request for assistance to manage damage to property caused by birds since the 2002 EA and 2006 amendment. Property encompasses a wide range or resources that are damaged by birds. Much of the damage is from bird droppings. Feral pigeons congregate under bridges and on buildings causing damage to these. Accumulation of fecal droppings can cause damage to buildings and statues.

Birds frequently damage structures on private property, or public facilities, with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on automobiles, can occur because of uric acid from bird droppings. Birds can also roost on or enter electrical substations and power generation facilities and threaten the interruption of power. Electrical utility companies frequently have problems with birds and bird droppings causing power outages by shorting out transformers and substations. Fecal droppings can be corrosive to the metal support towers of transmission lines.

Property damage from vultures can include tearing and consuming latex window caulking or rubber gaskets sealing window panes, rubber roof linings, asphalt and cedar roof shingles, vinyl seat covers from boats, tractors, and ATVs, and plastic flowers at cemeteries (Lowney 1999). While black vultures subsist principally on carrion, but at times this species is predatory (Avery and Cummings 2004). Damage by black vultures to livestock and poultry has been reported for decades. Black vultures have been observed preying on livestock, including calves, goats, horses, cats, dogs, and turkeys (Lowney 1999, Lovell 1947, Lovell 1952, Parmalee 1954, Roads 1936, Sprunt 1946).

Pigeons, starlings, sparrows and other nesting and roosting birds cause damage to aircraft in hangars. Accumulation of feces on airplanes, helicopters, maintenance equipment, and hangar floors results in unscheduled maintenance to clean planes and buildings to protect painted surfaces from acidic fecal droppings and to maintain a sanitary work environment. Birds may also build nests in engines of idle aircraft which may cause engine damage or cause a fire. Furthermore, Aircraft striking birds can also cause substantial damage requiring costly repairs and downtime.

Disease Surveillance and Monitoring

The Indiana WS program currently conducts an ongoing passive avian disease surveillance program and regularly investigates dead bird reports and collects biological samples at the request of the Indiana Department of Natural Resources (IDNR). Upon a request for assistance, avian disease surveillance activities could be conducted on private, federal, state, county, municipal, or private property. WS submits avian biological samples to the Purdue University Animal Disease and Diagnostic Laboratory for analysis. In addition to the diseases discussed in section 1.3 of the EA (USDA 2002) the following avian diseases present further need for action:

West Nile Virus

Public awareness and health risks associated with avian zoonoses have increased in recent years. One of the first avian zoonoses to gain public attention was West Nile Virus (WNV) with outbreaks of the virus first reported in the United States in 1999. Since 1999, more than 30,000 people in the U.S. have reported getting sick with WNV (CDC 2012b) Today, WNV has been documented to occur in all 48 conterminous States. In 2011, the Centers for Disease Control and Prevention (CDC) reported 712 documented cases of WNV infections in humans in 44 States with 43 deaths. In Indiana, the CDC reported 9 total cases with 1 death in 2011 (CDC 2012b). WS continues to provide technical assistance to those individuals requesting information in WNV and provides information on current WNV monitoring activities.

Avian Influenza

Recently, the occurrence of highly pathogenic (HP) H5N1 avian influenza (AI) virus has raised concern regarding the potential impact on wild birds, domestic poultry, and human health and safety should it be introduced into the United States. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by a further change into HP H5N1 AI. HP H5N1 AI has been circulating in Asian poultry and fowl resulting in death to those species. HP H5N1 AI likely underwent further change allowing infection in additional species of birds, mammals, and humans. More recently, this virus moved back into wild birds resulting in mortality of some species of waterfowl and other birds. This is only the second time in history that the HP form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the United States exist including: illegal movement of domestic or wild birds, contaminated products, infected travelers, and the migration of infected wild birds.

There are three known subtypes of influenza viruses that are currently known to be circulating in the human population that are generically termed human influenza viruses. These three subtypes are H1N1, H1N2, and H3N2 influenza viruses. Current information indicates that those three subtypes of influenza virus commonly infecting humans likely originated from birds based on the genetic similarities of the human and avian influenza subtypes. The primary concern of influenza viruses is that selection processes are constantly changing the virus and that those changes may lead to an adaptation of AI viruses into highly contagious zoonoses (CDC 2012c).

The current HP H5N1 AI outbreak among poultry in some countries is not expected to diminish significantly in the short term. Thus sporadic human infections with HO H5N1 AI resulting from direct or close contact with infected sick or dead poultry are expected to continue to occur and some of those cases will likely be fatal (CDC 2012c). Influenza A viruses circulating among poultry have the potential to recombine with human influenza A viruses and become more transmissible among humans. If HP H5N1 AI viruses gain the ability for efficient and sustained transmission among humans, an influenza pandemic could result, with potentially high rates of illness and death worldwide. Therefore, the HP H5N1 AI epizootic continues to pose an important public health threat (CDC 2012c).

So far, the spread of HP H5N1 AI virus from person-to-person has been very rare, limited, and not sustained. There has also been no indication that these viruses are becoming more transmissible to humans or from human to human. Even though HP H5N1 AI viruses are spreading among poultry and wild birds and this increased the possibility of human exposures to infected birds or poultry, it has not increased the ability of HP H5N1 viruses to infect and transmit between people (CDC 2012c).

Despite the current inefficiency of transmission from human to human, the ability of the virus to change from external pressures has raised the concern that the highly virulent H5N1 virus could change to a form that readily infects humans with a high likelihood of human to human transmission (CDC 2012c). Since AI subtypes do not readily infect humans, an immune response to the AI subtypes does not currently exist in the majority of the human population. If the high pathogenic H5N1 virus gains the ability to readily be transmitted from human to human, the lack of immune protection in humans could lead to a pandemic that could result in a large number of deaths (CDC 2012c).

Numerous potential routes for introduction of the virus into the United States exists including illegal movement of domestic or wild birds, contaminated products, and the migration of infected wild birds. Given the occurrence of high pathogenic H5N1 AI in wild birds, there is concern that migrating birds will introduce the virus into new regions of the world, including North America. Many bird species that nest in Arctic Siberia, Alaska, and Canada follow migratory flyways southward to wintering areas in the United States, Central America, and South America. Birds from both Eastern Siberia and Alaska

intermingle in several of the established flyways. The overlap at the northern ends of those flyways establishes a geographic location for potential disease transmission across continents and for mixing, change, and exchange of genetic material among strains from Eurasia and North America. If high pathogenic H5N1 AI virus spreads to North America by migratory birds, the virus would most likely arrive first in Alaska and spread south through the flyways by this route (USDA 2005).

Therefore, at the request of the Homeland Security Council's Policy Coordinating Committee for Pandemic Influenza Preparedness, the USDA and the United States Department of Interior (DOI) were requested to develop and coordinate a National Strategic Plan (USDA 2005) for early detection of high pathogenic H5N1 AI into North America by wild birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the high pathogenic H5N1 virus in North America.

WS will continue to work as part of an interagency team in conducting surveillance for AI and WNV in bird species. Based on WS' participation in conducting disease surveillance and monitoring as part of an interdisciplinary team, WS' anticipates a need to continue efforts to monitor and detect the presence of avian zoonoses to determine threats and risks to human health and safety. This supplement to the EA will address WS' avian disease monitoring and surveillance activities, as related to sample collecting under surveillance and monitoring activities. Other communicable diseases addressed in section 1.3 of the EA will remain as addressed.

Addressing Increasing Requests for Assistance Received by WS in Indiana

The need for an increase in damage management activities associated with house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures and rock doves in the State is based on an increase in the number of requests received to manage damage caused by those species. As part of the requests for assistance, WS reasonably anticipates an increase in the number of birds requested to be lethally removed as part of an integrated damage management strategy to reducing damage and threats. WS also anticipates an increase in non-lethal harassment and dispersal of those bird species addressed in the proposed supplement as part of the increasing requests for assistance.

To assist with communicating with the public the individual and cumulative impacts associated with managing increasing damage and threats associated with house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and rock doves in Indiana; those activities are being further analyzed and addressed in this supplement to the EA. Information regarding the need for action to manage damage associated with house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and rock doves are evaluated by species below.

House sparrows

The house sparrow is a common resident in urban and suburban areas. Introduced from Europe, the sparrow has spread over the entire United States and is found almost everywhere in Indiana. It is an aggressive, adaptable bird that nests in or on man-made structures, such as building vents, window ledges and advertising signs, as well as in trees. Sparrows do not migrate, although some birds may travel several miles to seasonal feeding sites (Perdue 2012).

Most damage caused by sparrows results from their nesting and feeding habits. Sparrows often nest on houses and buildings and their droppings can hill ornamental vegetation and can damage the finish on vehicles (Perdue 2012). Accumulated bird dropping can reduce the functional life of some building roofs

by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on aircraft and automobiles parked at terminals, can occur because of uric acid from bird droppings. Sparrows can cause structural damage to the inside of hangars and buildings where they roost or nest in the rafters by damaging the insulation and wiring. Also, sparrows build their nests in engines and other compartments of parked aircraft. In addition, sparrows can be a factor in the dissemination of several diseases such as chlamydiosis, salmonellosis, Newcastle disease, toxoplasmosis and transmissible gastroenteritis (Perdue 2012).

House sparrows were introduced in the United States from England in 1850 and, thus, are not native to Indiana (Fitzwater 1994). Like European starlings and pigeons, because of their negative effects on and competition with native bird species, house sparrows are considered by many wildlife biologists, ornithologists, and naturalists to be an undesirable component of North American ecosystems. Because house sparrows are an introduced rather than a native species, they are not protected under the Migratory Bird Treaty Act (MBTA) or Indiana state law.

Based on requests for assistance at municipalities, industrial sites, and private lands received when the EA was developed, the EA evaluated a lethal take of up to 20 house sparrows annually. To address an increasing number of requests, primarily to alleviate damage at airports, WS may take up to 200 house sparrows in the State to alleviate damages and reduce threats.

Killdeer

Similar to other bird species addressed in this supplement, requests for assistance to manage damage and threats associated with killdeer in Indiana occur primarily at airports where killdeer can cause damage to aircraft or threaten human safety from aircraft strikes. In Indiana airports, there have been 110 reported strikes involving killdeer since 1990 (FAA 2012). Nearly $2.4 million in damages to civil aircraft have been reported from aircraft striking killdeer with nearly 280 hours of aircraft downtime after a strike occurs for repairs (Dolbeer and Wright 2008).

The nesting habitat of killdeer has been described as open areas with grass or forbs less than 1 cm tall (Jackson and Jackson 2000). Nesting occurs on sandbars, mudflats, pastures, cultivated fields, airports, golf courses, parking lots, and graveled rooftops (Jackson and Jackson 2000). Airports often provide ideal nesting habitat for killdeer with nesting often occurring along the edges of runways and taxiways. As additional airports request assistance with managing threats and damage associated with aircraft potentially striking killdeer, the number of killdeer addressed by WS annually is also likely to increase.

Based on request for assistance received when the EA was developed, the EA evaluated a lethal take of up to 50 killdeer annually, primarily to alleviate damage and threats at airports. To address an increasing number of requests for assistance, WS may take up to 200 killdeer and 200 killdeer nests annually in the State to alleviate damages and reduce threats.

Mallards

The presence of mallards on or near airport properties has been an increasing concern for several airports in Indiana. The flocking behavior of mallards, especially during spring and fall migrations, can pose threats to aircraft when those flocks are present on airport property or near airport property. Aircraft striking birds can cause extensive damage to the aircraft. Bird strikes can also lead to catastrophic failure of the aircraft which can lead to a crash which threatens human safety. Since 1990, at least 4 aircraft strikes have been reported in Indiana involving mallards with at least 633 reported strikes with mallards across the United States (Dolbeer et al. 2012). From 1990 through 2011, aircraft strikes associated with

mallards in the United States have resulted in 9,996 hours of aircraft downtime and almost $13 million in damages to aircraft (Dolbeer et al. 2012).

Mallards are protected by the USFWS under the MBTA and their take is limited by permit. Therefore, all mallard ducks are taken in accordance with applicable state and federal laws and regulations authorizing the take of migratory birds and their nests and eggs, including the UFWS and IDNR permitting processes. The USFWS, as the agency with management responsibilities, could impose restrictions on depredation harvest has needed to ensure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on mallard populations would have no significant adverse impact on the quality of the human environment. During FY 2011 (October 2010 through September 2011), the USFWS issued depredation permits to Indiana entities to take a combined total of 350 mallards and/or mallard nests to protect human health and safety, and other resources.

Under the proposed action addressed in the EA, WS would implement an integrated approach to resolving requests for assistance to manage damage and threats associated with mallards in the State. If the number of requests for assistance increases, the number of mallards addressed by WS to manage damage and threats is also likely to increase. Since both lethal and non-lethal methods could be employed under the proposed action, the number of birds lethally taken and the number of birds dispersed using non-lethal methods is also likely to increase. The EA evaluated the take of up to 20 mallards annually by WS to alleviate damage and threats when lethal methods were deemed appropriate to resolve the request for assistance using the WS Decision Model. The estimated take in the EA was based on requests received prior to the development of the EA. If the number of requests to provide assistance with managing damage and threats associated with mallards increases, an estimated 100 mallards could be lethally taken by WS annually using those methods described in the EA. In addition, up to 100 mallard nests could also be destroyed to discourage nesting in areas where damage has occurred.

Eastern meadowlarks

Eastern meadowlarks are most common in native grasslands and prairies, but they also occur in pastures, hayfields, agricultural fields, airports, and other grassy areas. Populations tracked in the Breeding Bird Survey (BBS) have dropped 70% since 1970 in conjunction with their disappearing grassland habitat. According to the State of the Birds 2011 report, more than 95% of the Eastern meadowlark's distribution is on private lands, meaning farmland conservation practices are vital to this species.

The open areas found at airports makes the habitat ideal for meadowlarks to forage and nest while providing ample perching areas. Most requests for assistance to reduce threats associated with Eastern meadowlarks occur at airports in Indiana. Eastern meadowlarks found on and adjacent to airport property can pose a hazard to aircraft from being struck causing damage to the aircraft and potentially threatening passenger safety. Since 1990, there have been 29 strikes reported at Indiana airports (FAA 2012). Based on request for assistance received when the EA was developed, the EA evaluated a lethal take of up to 20 Eastern meadowlarks annually, primarily to alleviate damage and threats at airports. To address an increasing number of requests for assistance, WS may take up to 100 Eastern meadowlarks annually in the State to alleviate damages and reduce threats.

Mourning doves

Mourning doves are a migratory bird with substantial populations throughout much of North America. Many states, including Indiana, have a regulated hunting season for mourning doves.

The number of requests for assistance to reduce threats and damage associated with mourning doves has increased, primarily at airports. Threats associated with mourning doves at airports occur primarily

during the spring and fall migration periods when doves congregate into large flocks. Since 1990, 118 mourning doves have been involved in aircraft strikes at Indiana airports (FAA 2012). The flocking behavior associated with mourning doves increases the likelihood of ingesting multiple doves into aircraft engines which can cause catastrophic failure of aircraft systems which can threaten passenger safety.

To reduce threats and damages associated with mourning doves using an integrated approach, the 2006 amendment to the EA (USDA 2006) evaluated that during implementation of the proposed action that WS could lethally take up to 100 doves in addition to the dispersal of doves using non-lethal methods. Based on requests for assistance from airports to address mourning dove threats to aircraft and the anticipation of additional requests for assistance from airports, WS reasonably anticipates the number of mourning doves addressed by WS to increase. A combination of both lethal and non-lethal methods could be employed in an integrated approach to resolve damage and threats.

WS anticipates the number of doves harassed using non-lethal methods and the number of doves lethally taken to increase annually based on increasing requests for assistance. Based on current and the potential for additional requests for assistance, WS' lethal take of doves could increase to 1,000 annually.

Red-tailed hawks

From 1990 through 2003, 52,493 wildlife collisions were reported to the FAA; 97% of these incidents involved birds. Strikes with raptors (Flaconidae and Accipitridae) accounted for approximately 28% of reported aircraft down time resulting from known-species bird strikes and represented a $12.9 million loss to U.S. civil aviation (Cleary et al. 2004).

Because of their size and flight behavior (e.g., flocking and soaring), strikes with raptors pose a substantial threat to air safety relative to FAA airworthiness standards for airframes, windshields, and engines (Seamans et al. 1995, Dolbeer and Eschenfelder 2003). More specifically, strikes involving red-tailed hawks comprised 24.5% of reported raptor strikes to civil aircraft from 1990 through 2003. Together, strikes of red-tailed hawks and vultures accounted for 93.4% of civilian aircraft down time associated with raptor strikes and represented a loss of approximately $7 million to U.S. civil aviation over the 14 year period (Cleary et al. 2004). Similarly, in an analysis of U.S. Air Force (USAF) strike data, Kelly (1999) reported that red-tailed hawks and turkey vultures accounted for the majority (64%) of damaging raptor strikes by USAF aircraft.

Blackwell and Wright (2006) for red-tailed hawks from 1990 through 2004, found 508 strike reports comprising 515 individuals struck by aircraft across 40 states and the District of Columbia; 7 strikes involved at least 2 birds. Most (63%) strikes involving red-tailed hawks, during this time period, occurred on the ground (Blackwell and Wright 2006). Further, strikes occurred more frequently during summer months, corresponding to a period when newly fledged birds were common in the population (Preston and Beane 1993, Dolbeer 2006).

Requests for assistance to manage damage and threats associated with red-tailed hawks received by WS in Indiana are associated with threats or aircraft striking red-tailed hawks at airports. Since the completion of the EA and 2006 amendment, WS has received several requests for assistance associated with red-tailed hawks at airports in Indiana. To assist with requests, WS has employees both technical assistance and direct operational assistance. Technical and operational assistance are described in the EA (USDA 2002). WS has responded to most request for operational assistance by employing mainly non-lethal harassment methods to disperse red-tailed hawks from areas where threats were occurring. WS has been requested to lethally remove red-tailed hawks that were posing a direct threat to aircraft and passenger safety. Since 1990, there have been 32 reported aircraft strikes involving red-tailed hawks at Indiana airports. Based on previous requests for assistance to manage damage threats associated with red-

tailed hawks in the State, WS reasonably anticipates that up to 40 red-tailed hawks may be taken annually to resolve requests for assistance. Red-tailed hawks are abundant in Indiana and their population increase is reflected in significantly increased numbers of hawks observed on or near airport property, in particular. WS tracks red-tailed hawk activity on airports using WS' Management Information System (MIS) and these data records have justified amending current IDNR and USFWS Depredation permit take levels to meet increased red-tailed hawk pressure on and near airport runways.

Turkey Vultures

Turkey vultures can be found throughout Mexico, across most of the United States, and along the southern tier of Canada (Wilbur 1983, Rabenhold and Decker 1989 SC). Indian is home to a large population of turkey vultures and, as social birds, they are found frequently in extended family groups from later summer through winter (Perdue 2012). Turkey vultures can be found in virtually all habitats but are most abundant were forested areas are interrupted by open land (Brauning 1992 SC). Turkey vultures nest on the ground in thickets, stumps, hollow logs, or abandoned buildings (Walsh et al. 1999 SC). Turkey vultures often roost in large groups near homes or other buildings where they can cause property damage from droppings or by pulling and tearing shingles. Turkey vultures prefer carrion but will eat virtually anything including insects, fish, tadpoles, decayed fruit, pumpkins, and recently hatched heron and ibis chicks (Brauning 1992). Turkey vultures have been reported to live up to 16 years of age (Henry 1990 SC).

Based on request for assistance received when the EA was developed, the EA evaluated a lethal take of up to 10 turkey vultures annually. As the population of turkey vultures in the State has increased (Sauer et al. 2011), the number of requests for assistance to alleviate damage associated with turkey vultures has also increased. Based on current population trends for turkey vultures in the State, the number of requests for assistance with managing damage associated with turkey vultures and the number of turkey vultures that could be addressed to meet those requests is also likely to increase. Therefore, based on previous requests for assistance and the anticipation of an increasing number of requests for assistance, up to 30 turkey vultures could be lethally taken annually by WS to alleviate damage and threats.

Pigeons

Domestic pigeons, or rock doves, are a non-indigenous species that were first introduced into the United States by European settlers as a domestic bird to be used for sport, carrying messages, and as a food source (USFWS 1981 NJ). Many of these birds escaped and eventually formed the feral pigeon populations that are now found throughout the United States, southern Canada, and Mexico (Williams and Corrigan 1994 NJ). However, because pigeons are an introduced rather than a native species, they are not protected by federal or Indiana state law.

Pigeons are highly dependent on humans to provide them with food and sites for roosting, loafing, and nesting (Williams and Corrigan 1994), and their nesting is usually associated with man-made structures, particularly bridges and building ledges (Walsh et al 1999). Thus, they commonly found around city buildings, bridges, parks, farm yards, grain elevators, feed mills, and other manmade structures (Williams and Corrigan 1994). Additionally, although pigeons are primarily grain and seed eaters, they will readily feed on garbage, livestock manure, spilled grains, insects, and any other available bit of food (Williams and Corrigan 1994).

Based on requests for assistance received when the EA amendment was developed, the amendment evaluated a lethal take of up to 2,000 rock doves annually. Based on the increasing number of request for assistance, particularly at municipal and industrial facilities, WS may take up to 4,000 rock doves to alleviate damage and reduce threats.

Mute Swans

Mute swans are native to Eurasia, and were introduced from Europe into the United States in the late 19th and early 20th centuries for use in ornamental ponds and lakes, zoos, and aviculture collections (Maryland Mute Swan Task Force 2001, Ciaranca et al. 1997). Feral breeding is believed to have first started among escaped birds in the lower Hudson valley in 1910 and on Long island in 1912 (Atlantic Flyway Council 2003). Since that time mute swans have expanded their range to many Eastern states and several Midwestern states and portions of western U.S. and Canada. Free-flying mute swans were first noted in Indiana in the 1950s, and feral pairs have been reported since the 1970s. Intentional releases and escapes from waterfowl hobbyists and landowners have contributed to the wild populations (IDNR 2006).

Mute swans are not native to North America, but some have questioned their status as an introduced species (Alison and Burton 2008). However, multiple subsequent reviews of Alison and Burton (2008) have refuted their assertion that mute swans are a native species (Warnock 2009, Askins 2009, Elphick 2009, Seymour and Peck 2009). Review by the USFWS also supports the conclusion that mute swans are not native to North America (FR 70(2):372-377 and FR 70(49):12710-12719).

The primary conflicts with and damage by mute swans in Indiana include, degradation of natural habitat, competition with and aggressive behavior toward native wildlife, and threats to human safety from aggressive swans. Mute swans can impact ecosystems by foraging on native plants and competing with native species for food and habitat (MDNR 2002, Allin and Husband 2003, Tatu et al. 2007, Bailey et al. 2008). Mute swans forage primarily on submerged aquatic vegetation (SAV), and each swan can consume approximately 4-8 pounds of vegetation per day (Owen and Cadbury 1975, Allin 1981, Fenwick 1983). Mute swans are known for their highly territorial behavior during breeding season and may compete with State and federal threatened and endangered species such as trumpeter swans, black rails, Virginia rails, common moorhens, American bitterns, and least bittern, as well as other native wildlife, for space and associated resources.

Although WS has not previously addressed mute swans through direct assistance, the increasing population of mute swans in Indiana has resulted in a recent increase in the number of requests for assistance received by WS to address damage and threats associated with mute swans, Based on this recent increase in request, WS anticipates a maximum annual take of up to 200 mute swans. In addition, up to 200 mute swans nests could be destroyed to discourage nesting in areas where damage has occurred.

Issuance of Depredation Permits by the USFWS to Lethally Take Birds in the State

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, nests, or eggs (16 U.S.C 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13.

The MBTA does allow for the lethal take of those bird species listed in 50 CFR 10.13 when depredation occurs through the issuance of depredation permits or the establishment of depredation orders. Under authorities in the MBTA, the USFWS is the federal agency responsible for the issuance of depredation permits or the establishment of depredation orders for the take of those protected bird species when damage or threats of damage are occurring. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21.

Legal Status of Mute Swans

Prior to 2001, the USFWS did not consider the MBTA to apply to mute swans because they are not native to North America and authority for mute swans was held by the states and tribes. In 1999, the state of Maryland appointed a task force to make recommendations regarding the increasing population of mute swans and potential adverse impacts on submerged aquatic vegetation (SAV) in Chesapeake Bay. Lethal removal of mute swans was included in the recommendations presented by the task force. In July 1999, a complaint was filed in federal district court in an effort to block the proposed swan removals. The plaintiff asserted the USFWS decision to not include mute swans in the list of species protected by the MBTS was arbitrary and capricious and that the U.S. Department of the Interior (USDI) had failed to comply with NEPA because it had not prepared an EIS on the decision (Hill vs. Norton). The U.S. District Court in the District of Columbia decided in favor of the USDI on both counts. The finding of the District Court was appealed. The U.S. Court of Appeals for the District of Columbia Circuit reversed the decision of the District Court. The appeals court concluded that there was nothing in the MBTA regarding native or non-native status of the species and that the treaties only make reference to "swans" and the family Anatidae. Consequently, management authority for mute swans was transferred to the USFWS under the MBTS in 2001.

In 2003, several state agencies applied the USFWS for depredation permits to address conflicts with mute swans. In accordance with NEPA, the USFWS prepared an EA to address potential impacts from the proposed action. Shortly after the Finding of No Significant Impact (FONSI) was issued, the Fund for Animals and two citizen plaintiffs filed suit challenging the FONSI and requesting a preliminary injunction. The preliminary injunction was granted. The Service opted to withdraw the EA and the depredation permits. In 2004, Congress provided clarification of the intent of the MBTA, stipulating that the act only applies to migratory bird species that are native to the U.S. Congress also directed the USFWS to prepare a list of species to which the act does not apply. The list was finalized on March 15, 2005 and mute swans were included on the List and management authority returned to the states and tribes.

The Indiana Department of Natural Resources (IDNR), under Indiana Code is empowered to "protect and properly manage the fish and wildlife resources of Indiana" [IC 14-22-1-1 (b)]. In addition, IC 14-22-1-1 (a) states, "All wild animals, except those that are legally owned or being held in captivity under a license or permit as required by this article; or otherwise excepted in this article; are the property of the people of Indiana. Although mute swans are not afforded protection under the MBTA a permit is required by the IDNR, as per 312 IAC 9-10-11 (n) (1), to lethally remove mute swans in Indiana.

IV. RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

WS' Programmatic Final Environmental Impact Statement: WS has developed a programmatic FEIS[7] that addresses the need for wildlife damage management in the United States (USDA 1997). The FEIS contains detailed discussions of potential impacts to the human environment from wildlife damage management methods used by WS. Pertinent information available in the FEIS has been incorporated by reference into the EA, this proposed supplement to the EA, and the summary report.

***Resident Canada Goose Management Final Environmental Impact Statement*:** The USFWS has issues a FEIS addressing the need for and potential environmental impacts associated with resident goose damage management activities titled "*Resident Canada Goose Management*" (USFWS 2005). The FEIS also contains detailed analyses of the issues and methods used to manage Canada goose damage. A ROD

[7]Copies of WS' programmatic FEIS are available from USDA/APHIS/WS-Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

and Final Rule were published by the USFWS on August 10, 2006 (71 FR 45964-45993). On June 27, 2007, WS, as a cooperating agency, issued a ROD and adopted the USFWS FEIS (72 FR 35217).

Light Goose Management Final Environmental Impact Statement: The USFWS has also prepared a FEIS to address the management of snow geese and Ross's geese (USFWS 2007)[8]. The preferred alternative in the FEIS modified existing regulations to allow additional hunting methods to harvest snow geese and Ross's geese within the current migratory bird hunting season frameworks. The preferred alternative also created a conservation order for the management of overabundant snow goose populations (50 CFR 21.60).

Double-crested Cormorant Management in the United States Final Environmental Impact Statement: The USFWS has prepared a FEIS on the management of double-crested cormorants (USFWS 2003). WS was a formal cooperating agency in the preparation of the FEIS and has adopted the FEIS to support WS' program decisions for its involvement in the management of cormorant damage. WS completed a Record of Decision (ROD) on November 18, 2003 (68 FR 68020). Pertinent and current information available in the FEIS have been incorporated by reference into the EA and this document.

Extended Management of the Double-Crested Cormorants under 50 CFR 21.47 and 21.48 Final Environmental Assessment:

The FEIS developed by the USFWS is cooperation with WS established a Public Resource Depredation Order (PRDO; 50 CFR 21.48) and made changes to the 1998 Aquaculture Depredation Order (AQDO; 50 CFR 21.47). To allow for an adaptive evaluation of activities conducted under the PRDO and the AQDO established by the FEIS, those Orders would have expired on April 30, 2009 (USFWS 2003a). The EA determined that a five-year extension of the expiration date of the PRDO and the AQDO would not threaten cormorant populations and activities conducted under those Orders would not have a significant impact on the human environment (74 FR 15394-15398; USFWS 2009).

2012 Mississippi Flyway Council Policy – Management of Mute Swans (MFC 2012)

The Mississippi Flyway Council was established in 1952 to coordinate the management of migratory game and non-game birds in the Flyway and to promote activities of its members that serve the long-term benefit to the resources and the Flyway as a whole. Administratively, the Mississippi Flyway includes the states of Alabama, Arkansas, Indiana, Illinois, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin and the Canadian Provinces of Saskatchewan, Manitoba, and Ontario. The policy briefly reviews the history, status, and management concerns pertaining to mute swans in the Mississippi Flyway and provides direction for the cooperative management of mute swans by natural resources agencies within the flyway. The management goal of the Flyway is to maintain mute swan populations at levels that will minimize or eliminate their harmful ecological impacts to native waterfowl species and habitats. Primary objectives of the plan include reducing the Flyway population of mute swans to 4,000 birds or fewer by 2030 and preventing mute swans from establishing new breeding populations in areas where they currently do not exist.

[8]The FEIS can be obtained from the USFWS website at http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/snowgse/FinalEIS2007/Light%20goose%20EIS.pdf.

V. SCOPE

Actions Analyzed

The amended EA evaluates alternatives for WS involvement in bird damage management to protect property, agriculture, natural resources, and human health and safety at municipalities, industrial sites, agricultural sites, airports and private land within Indiana wherever such management from the WS program is requested.

Period for which this EA is Valid

Unless it is determined that an Environmental Impact Statement is needed, the amended EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WS's BDM activities.

Site Specificity

The amended EA analyzes potential impacts of WS' BDM activities that could occur in municipalities, industrial sites, agricultural sites, airports, and private land within Indiana. This EA analyzes the potential impacts of such efforts wherever and whenever they might occur. The EA emphasizes significant issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of bird damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS on the aforementioned sites (See USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and Standard Operating Procedures (SOPs) described herein and adopted or established as part of the decision.

VI. Public Involvement

The pre-decisional EA was made available to the public for review and comment during a 37-day public comment period by a legal Notice of Availability (NOA) published in the *Indianapolis Star* on November 2, 2002. NOA letters for the pre-decisional EA were also mailed directly to agencies, organizations, and individuals with probable interest in the proposed program. The pre-decisional EA was made available for review by request through the U.S. mail. All comments were to be received within the 37-day period as advertised in the newspaper. WS received no request for copies of the pre-decisional EA. Upon the closing date, December 13, 2002, no comments were received.

After consideration of the analysis contained in the pre-decisional EA, a Decision and Finding of no Significant Impact (FONSI) for the EA was issued on December 19, 2002. The Decision and FONSI selected the proposed action which implemented an integrated bird damage management program in Indiana using multiple methods to adequately address the need to manage damage caused by birds.

The EA and amendment were made available for public review and comment for a 30-day period on July 11, 2006, using the same methods as for the EA. WS received no requests for copies of the EA or amendment. Additionally, WS received no comments during the comment period ending August 15,

2006. After consideration of the analysis contained in the EA and amendment, WS issued a Decision and FONSI selecting the proposed action on November 9, 2006.

This supplement to the EA, along with the EA, amendment, and corresponding Decisions/FONSIs, will be made available for public review and comment through the publication of a NOA announcing a minimum of a 30-day comment period. The legal notice will be published in the state-wide edition of the *Indianapolis Star*, a daily newspaper with geographic coverage of all of the proposed area, for three days and will be posted on the APHIS website located at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml according to WS' public notification requirements (72 FR 13237-13238). A NOA for this supplement to the EA will also be mailed directly to agencies, organizations, and individuals with probable interest in the proposed program. Comments received during the public involvement process will be fully considered for new substantive issues and alternatives.

WS's BDM activities are reviewed and discussed annually during state and federal cooperating agencies meetings and during citizen cooperator meetings. Feedback from these meetings is used during the decision process for all WS' BDM activities and for future planning purposes.

VII. AUTHORITY AND COMPLIANCE

Wildlife Services Legislative Authority

USDA is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 946 Stat. 1468; 7 U.S.C. 426-426b as amended, and the Act of December 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can damage agricultural resources, pose risks to human health and safety, and affect other natural resources. The WS program provides Federal leadership in helping to solve problems that occur when human activity and wildlife are in conflict with one another.

United States Department of the Interior, Fish and Wildlife Service (USFWS)

The primary responsibility of the United States Department of the Interior, Fish and Wildlife Service (USFWS) is fish, wildlife, and plant conservation. While some of the USFWS's responsibilities are shared with other Federal, State, Tribal, and local agencies, the USFWS has special authorities in managing the National Wildlife Refuge System; conserving migratory birds, endangered species, certain marine mammals, and nationally significant fisheries; and enforcing Federal wildlife laws. The Migratory Bird Treaty Act (MBTA) gives the USFWS primary statutory authority to manage migratory bird populations in the U.S. The USFWS is also charged with implementation and enforcement of the Endangered Species Act of 1973, as amended and with developing recovery plans for listed species.

Indiana Department of Natural Resources Legislative Authority

The Indiana Department of Natural Resources (IDNR), under the direction of the Conservation Commission, is specifically charged by the General Assembly with the management of the state's wildlife resources. The primary statutory authorities include the protection, reproduction, care, management, survival, and regulation of wild animal populations regardless of whether the wild animals are present on public or private property in Indiana (IC 14-22-2-3).

National Environmental Policy Act (NEPA)

All federal actions are subject to NEPA (42 U.S.C. §§ 4321 *et seq*.). WS follows CEQ regulations implementing NEPA (40 CFR 1500 *et seq*.) and USDA (7 CFR 1b) and APHIS implementing regulation (7 CFR 372) as part of the decision-making process. These laws and regulations generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts.

Pursuant to NEPA and CEQ regulations, this EA documents the analysis for potential impacts of a proposed federal action, informs decision-makers and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of NEPA are infused into federal agency actions. This EA was prepared by integrating as many of the natural and social sciences as warranted, based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

Migratory Bird Treaty Act of 1918 (16 USC 703-711; 40 Stat. 755), as amended

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase or barter, any migratory bird, or their parts, nests, or eggs (16 USC 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13. The MBTA also provides the USFWS regulatory authority to protect families of migratory birds. The law prohibits any "*take*" of migratory bird species by any entities, except as permitted by the USFWS. Under the permitting guidelines of the Act, the USFWS may issue depredation permits to requesters experiencing damage caused by bird species protected under the Act. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21.

In addition to the issuance of depredation permits for the take of migratory birds, the Act also allows for the establishment of depredation orders that allow migratory birds to be taken without a depredation permit when certain criteria are met.

Depredation Order for Blackbirds, Cowbirds, Grackles, Crows, and Magpies (50 CFR §21.43)

Pursuant to the MBTA under 50 CFR §21.43, a depredation permit is not required for lethal take of red-winged blackbirds, common grackles, boat-tailed grackles, brown-headed cowbirds, and American crows when those species are found committing or about to commit depredation 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.

Bald and Golden Eagle Protection Act (16 USC 668)

Congress enacted the Bald Eagle Protection Act (16 USC 668) in 1940; thereby, making it a criminal offense for any person to "*take*" or possess any bald eagle or any part, egg, or nest. The Act contained several exceptions which permitted take under select circumstances. The Secretary of the Interior could take and possess bald eagles for scientific or exhibition purposes of public museums, scientific societies, and zoological parks; possession of any bald eagle (or part, nest, or egg) taken prior to 1940 was not prohibited; and the terms of the Act did not apply to Alaska. Since its original enactment, the Act has been amended several times to increase protections for eagles and/or provide exemptions for specific types of activities. For example, the amendment in 1962 was designed to give greater protection to immature bald eagles, and to include golden eagles. The 1962 amendment also created two exceptions to

the Act: first, it allowed the taking and possession of eagles for the religious purposes of Native American tribes and second, it provided that the Secretary of the Interior, on request of the governor of any State, could authorize the taking of golden eagles to seasonally protect domesticated flocks and herds in that State.

While bald eagles were federally listed as a threatened species, the ESA was the primary regulation governing the management of bald eagles in the lower 48 states. Now that bald eagles have been removed from the federal list of T&E species, the Bald and Golden Eagle Protection Act is the primary regulation governing bald eagle management. Under the Bald and Golden Eagle Protection Act (16 USC 668-668c), the take of bald eagles is prohibited without a permit from the USFWS. Under the Act, the definition of "*take*" includes actions that can "*molest"* or *"disturb"* eagles. For the purposes of the Act under 40 CFR 22.3, the term "*disturb"* as it relates to take has been defined as "*to agitate or bother a bald……eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."*

Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). For actions that "may affect" listed species, APHIS-WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)). WS obtained a Biological opinion (BO) from the USFWS in 1992 describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F).

National Historic Preservation Act (NHPA) of 1966, as amended

The NHPA and its implementing regulations (36 CFR 800) require federal agencies to initiate the Section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under Section 106. None of the bird damage management methods described in this EA that might be used operationally by WS causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance wildlife have the potential for audible effects on the use and enjoyment of historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage problem, which means such use, would be to the benefit of the historic property. A built-in mitigating factor for this issue is that virtually all the methods involved would only have temporary effects on the audible nature of a site and can be ended at

any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by the Section 106 of the NHPA would be conducted as necessary in those types of situations.

Investigational New Animal Drug (INAD)

The FDA can grant permission to use investigational new animal drugs commonly known as INAD (see 21 CFR 511). The sedative drug alpha-chloralose is registered with the FDA to capture waterfowl, coots, and pigeons. The use of alpha-chloralose by WS was authorized by the FDA which allows use of the drug as a non-lethal form of capture. Alpha-chloralose as a method for resolving waterfowl damage and threats to human safety are discussed in Appendix B of this EA.

Environmental Justice - Executive Order 12898

Executive Order 12898, entitled "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental justice is a priority within APHIS and WS. Executive Order 12898 requires federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minorities and persons or populations of low income. APHIS implements Executive Order 12898 principally through its compliance with the NEPA. All WS' activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS' personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

Protection of Children - Executive Order 13045

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed bird damage management program would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

Responsibilities of Federal Agencies to Protect Migratory Birds - Executive Order 13186

Executive Order 13186 requires each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations, is directed to develop and implement, a MOU with the USFWS that shall promote the conservation of migratory bird populations. WS has developed a draft MOU with the USFWS as required by this Executive Order and is currently waiting for USFWS approval. WS would abide by the MOU once it is finalized and signed by both parties.

Invasive Species - Executive Order 13112

Executive Order 13112 establishes guidance to federal agencies to prevent the introduction of invasive species, provide for the control of invasive species, and to minimize the economic, ecological, and human

health impacts that invasive species cause. The Order states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations and provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education of invasive species.

The Native American Graves and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods available under the alternatives that would be available in South Carolina, including the use of or recommendation of repellents are registered with and regulated by the EPA and the CUDPR, and used or recommended by WS in compliance with labeling procedures and requirements.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280).

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to States to develop their programs. Subsequent to federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity.

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected*." This standard includes birds that may cause safety and health concerns at workplaces.

Permit to Take, Kill, or Capture Wild Animals Damaging Property [IC 14-22-28-1 (1)]

A permit is required from the IDNR to remove damaging wildlife, including birds, "*the director may issue to a person that owns or has an interest in property being damaged or threatened with damage by a wild animal protected by this article a free permit to take, kill, or capture the wild animal*."

Indiana Permit to Remove Mute Swans [312 IAC 9-10-11 (n) (1)]

A permit is required from the IDNR to remove damaging mute swans. The Indiana Administrative Code states that "*no permit shall be issued under this section for the control of a migratory bird except a mute swan*".

VIII. AFFECTED ENVIRONMENT

Upon receiving a request for assistance, the alternatives could be conducted on private, federal, State, and municipal lands in Indiana to reduce damages and threats associated with birds where a request for assistance is received. The analysis in the EA, the 2006 amendment, and this supplement are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. The EA, 2006 amendment, and this supplement analyze the potential impacts of bird damage management in the State and addresses those activities currently being conducted in areas that are currently under a MOU or cooperative service agreement with WS. The EA, amendment, and this supplement also address the impacts of bird damage management in the State where additional agreements may be signed in the future between WS and a cooperating entity.

More specific locations could include areas in and around commercial, industrial, public, and private buildings, facilities, and properties at other sites were birds may roost, loaf, feed, nest, or otherwise occur. Examples of areas where bird damage management activities could be conducted are, but are not necessarily limited to: industrial sites, municipal properties, corporate properties, airports, military bases, agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, rail yards, waste handling facilities, natural areas, government properties and facilities, private properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, and wildlife management areas.

IX. ISSUES ANALYZED IN DETAIL

Issues are concerns raised regarding the potential environmental problems that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic FEIS (USDA 1997) and were considered in the preparation for the EA. Issues related to managing damage and threats associated with birds in Indiana were developed by WS in consultation with USFWS-Ecological Services, USFWS-Migratory Bird Permit Office, IN Dept. Natural Resources, IN State Dept. Health, and Purdue University.

The issues analyzed in detail are discussed in detail in Chapter 2 of the EA (USDA 2002). Alternatives developed and identified during the development of the EA to address those issues are discussed in Chapter 3 of the EA (USDA 2002). Potential impacts of Alternatives 2, 3, and 4 on the human environment related to major issues have not changed from those described in the EA and thus do not require additional analyses in this supplement. Chapter 4 of the EA contains a detailed discussion and comparison of the identified alternatives and the issues (USDA 2002). The following issues were identified during the scoping process for the EA:

- Issue 1 – Effects on target bird species populations
- Issue 2 – Effects on non-target species populations, including T&E species
- Issue 3 – Economic losses to property as a result of bird damage
- Issue 4 – Effects on human health and safety

- Issue 5 – Effects on aesthetics
- Issue 6 – Humaneness and animal welfare concerns of lethal methods used by WS

XI. ALTERNATIVES FOR BIRD DAMAGE MANAGEMENT

The EA developed and analyzed four alternatives for bird damage management in Indiana. A detailed discussion of the alternatives and specific bird damage management techniques is provided in the EA. The EA also provided a discussion of an additional alternative, "Technical Assistance Only," that was considered but not analyzed in detail. The following is a discussion of the alternatives analyzed in detail. An additional alternative, Modified Integrated Bird Damage Management Program (Alternative 5) has been in this supplement to address the proposed changes in BDM activities in Indiana.

Alternative 1 – Implement an Integrated Bird Damage Management Program (No Action).

As defined by the CEQ, the no action alternative can be interpreted as the continuation of current CDM practices (CEQ 1981). The Illinois WS program responds to requests for BDM at municipalities, industrial sites, agricultural sites, airports, and private land within Indiana to protect property, agriculture, natural resources, and human health and safety at these locations. An IBDM approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet request or needs for resolving conflicts with birds affecting the aforementioned properties (EA Appendix B). Individuals requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used or recommended by WS may include shooting, trapping, toxicants, or euthanasia following live capture by immobilization drugs or trapping. Non-lethal methods used or recommended by WS may include habitat alteration, chemical immobilization, repellents, fencing, barriers and deterrents, netting, capture and relocation, and harassment or scaring devices. In many situations, the implementation of non-lethal methods such as habitat alteration, structural modifications, and exclusion-type barriers would be the responsibility of the property managers to implement. BDM by WS would be allowed on the aforementioned sites, when requested, where a need has been documented and upon completion of an Agreement for Control. All management actions would comply with appropriate Federal, State, and local laws.

The 2006 Amendment to the EA expanded the need for action to include reduction of bird damage to property and risks to human health and safety at airports. The chemosterilant, nicarbazin was added to the methods which could be used for bird damage management and the annual lethal take of mourning doves and rock pigeons was increased to 100 and 2,000 birds respectively.

Alternative 2 - Non-lethal BDM Only, By WS.

This alternative would require WS to only use and recommend non-lethal methods to resolve bird damage problems. Requests for information regarding lethal management approaches would be referred to IDNR, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS' non-lethal recommendations, implement lethal methods or other methods not recommended by WS, contract for WS operational assistance with non-lethal methods, use contractual services of private businesses, or take no action. Currently, the toxicant DRC-1339 and the bird sedative alpha-chloralose are only available for use by WS employees. United States Drug Enforcement Agency (DEA) regulated immobilizing/euthanasia drugs are available only to licensed veterinarians or other authorized users such WS personnel. Therefore, use of these chemicals by private individuals would be illegal. Under this alternative, alpha-chloralose or other approved capture drugs would be used by WS personnel to capture and relocate birds. WS would be unable to use the toxicant DRC-1339 under this alternative. However, a similar product, Starlicide, would be available to licensed pesticide applicators,

but its use would be limited to agricultural applications/sites. Appendix B in the EA describes a number of non-lethal methods available for use by WS under this alternative.

Alternative 3 - Lethal BDM Only, by WS.

This alternative would require WS to only use and recommend lethal methods to resolve bird damage problems. Technical assistance would include making recommendations to the USFWS and IDNR regarding the issuance of permits to resource owners to allow them to take birds by lethal methods. Requests for information regarding non-lethal management approaches would be referred to IDNR, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS' lethal BDM recommendations, implement non-lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, or take no action. Appendix B in the EA describes a number of lethal methods available for use by WS under this alternative. Under this alternative, WS could still use the non-lethal bird capture methods discussed in Appendix B, but all birds would have to be euthanized after capture.

Alternative 4 - No Federal WS BDM.

This alternative would eliminate Federal WS involvement in BDM at municipalities, industrial sites, agricultural sites, and private land within Indiana. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own BDM without WS input. Requests for information would be referred to IDNR, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to conduct BDM themselves, use contractual services of private businesses, or take no action. DRC-1339 and alpha-chloralose are only available for use by WS employees. Therefore, use of these chemicals as well as U.S. Drug Enforcement Agency controlled substances by private individuals would be illegal. However, as with Alternative 2, Starlicide, would be available to licensed pesticide applicators, but its use would be limited to agricultural applications/sites.

Changes in Blackbird Depredation Order

Blackbird populations are healthy enough, and the problems they cause great enough, that in 1974 the USFWS has established a depredation order (50 CFR 21.43) to facilitate management of blackbird damage. Under this "order", no Federal permit was required to remove blackbirds (defined as Yellow-headed, Red-winged, Rusty, and Brewer's blackbirds, cowbirds, grackles, crows, and magpies) when 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. However, declines in the Rusty Blackbird (*Euphagus carolinus*) and Tamaulipas (Mexican) Crow (*Corvus imparatus*) populations throughout much of their range led the USFWS to remove these species from the depredation order. Additionally, the USFWS added reporting requirements, a requirement to use nontoxic shot[9], and clarified the species to which the order applied. The revised depredation order also requires that nonlethal methods be attempted prior to using lethal methods.

Wildlife Services IBDM actions addressed in the EA, the amendment and this supplement include actions taken under the depredation order. Tamaulipas Crows are not found in Indiana and are not a concern. Rusty Blackbirds generally nest in Canada, and overwinter in the Southern U.S. However, each year, some birds are reported in the Indiana Audubon Christmas Bird Counts (National Audubon Society

[9] Requirement to use nontoxic shot does not apply if an air rifle, an air pistol, or a 22 caliber rimfire firearm is used for control of depredating birds.

2011). WS does not anticipate specifically targeting Rusty Blackbirds for damage management actions with the exception of nonlethal harassment of any birds which might pose a risk to aircraft safety. However, Rusty Blackbirds may be mixed in among larger groups of species such as Grackles, Red-winged Blackbirds or Brown-headed Cowbirds which WS may lethally remove for damage management. To address this issue, we have included an analysis of potential risks to and management of Rusty Blackbirds in the analysis of target species impacts below.

XII. METHODS

A description of the wildlife damage management methods that could be used or recommended by WS is provided in Appendix B of the EA (USDA 2002) and in Appendix J of WS' programmatic FEIS (USDA 1997). Since the completion of the EA, the avian reproductive inhibitor nicarbazin has been registered for use to manage damage associated with pigeons. Under the proposed action in the EA, nicarbazin could be used or recommended as part of an integrated damage management strategy to alleviate bird damage. Nicarbazin is a restricted-use pesticide that requires a pesticide applicators license to purchase and use.

Since nicarbazin is registered for use in Indiana, anyone with the appropriate pesticide applicators license can purchase and use nicarbazin to manage pigeon damage. Nicarbazin would be available for use by pesticide applicators under any of the alternatives analyzed in the EA. Similarly, the potential impacts on the identified issues would be similar amongst those issues. The use of nicarbazin is discussed in relationship to the use of the product under the proposed action as related to the six identified issues.

Nicarbazin

Since the completion of the EA, a product with the reproductive inhibitor known as nicarbazin has been registered for use in New Jersey to manage pigeon populations by reducing the likelihood that eggs laid by pigeons will hatch. Nicarbazin is a complex of two compounds, 4,4'-dinitrocarbanilide (DNC) and 4,6-dimethyl-2-pyrimidinol (HDP) which interferes with the formation of the vitelline membrane that separates the egg yolk and egg white which prevents the development of an embryo inside the egg (EPA 2005). The active component of nicarbazin is the DNC compound with the HDP compound aiding in absorption of DNC (EPA 2005). Nicarbazin was first developed to treat coccidiosis[10] outbreaks in broiler chickens and has been approved as a veterinary drug by the Food and Drug Administration (FDA) since 1955 for use in chicken feed to prevent the fungal disease coccidiosis (EPA 2005).

Nicarbazin, as a reproductive inhibitor for pigeons, has been registered with the Environmental Protection Agency (EPA) as a pesticide pursuant to the Federal Insecticide, Fungicide, Rodenticide Act under the trade name OvoControl® P (Innolytics, LLC, Rancho Sante Fe, CA). OvoControl® P (EPA Reg. No. 80224-1) is a restricted use pesticide registered for use in New Jersey for reducing the egg hatch of urban pigeons. The formulation for pigeons contains 0.5% of the active ingredient nicarbazin by volume as a ready-to-use bait for pigeons in urban areas only. Urban areas have been defined by the EPA as municipalities and surrounding areas with a population of 50,000 or more people. Baiting can only occur by applicators certified by the State and only on rooftops or other flat paved or concrete surfaces such as buildings, office parks, malls, hospitals, bridges, airports, tunnels, and commercial sites.

Since OvoControl® P is commercially available to those with a certified applicators license, the use of the product could occur under any of the alternatives discussed in the EA and therefore, the effects of the use would be similar across all the alternatives. Under the proposed action, WS could use or recommend nicarbazin under the trade name OvoControl® P as part of an integrated approach to managing damages

[10]Coccidiosis is a fungal pathogen known to infect birds and livestock causing diarrhea, dehydration, and can prevent proper growth of livestock. For more information on coccidiosis, see the EA (USDA 2003).

associated with pigeons. WS' use of nicarbazin under the proposed action would not be additive since the use of the product could occur from other sources, such as private pest management companies or those experiencing damage could become a certified applicator and apply the bait themselves.

Population management from the use of reproductive inhibitors occurs through a reduction in the recruitment of new birds into the population by limiting reproductive output. A reduction in the population occurs when the number of birds being recruited into the population cannot replace those individuals that die from other causes each year which equates to a net loss in the number of individuals in the population leading to a reduction in the population. Although not generally considered a lethal method since no direct take occurs, reproductive inhibitors can result in the reduction of a target species' population. WS' use or recommendation of nicarbazin would target local pigeon populations identified as causing damage or threatening human safety. Although a reduction in pigeon populations would likely occur from constant use of nicarbazin, the actual reduction in the population annually would be difficult to derive prior to the initiation of the use of nicarbazin.

One of the difficulties in calculating an actual reduction in a targeted population prior to application of the bait is that consumption of nicarbazin treated bait as currently formulated does not appear to completely eliminate egg hatch in pigeons. Current studies on nicarbazin as a reproductive inhibitor for pigeons has shown variability in hatch rates of pigeons fed treated baits. In addition, pigeons must consume bait treated with nicarbazin daily in the correct dosage throughout the breeding season to achieve the highest level of effectiveness in reducing egg hatch. Pigeons can breed year-around with peak breeding occurring from February through October (Johnston 1992). Giunchi et al. (2007) found that when pigeons were fed treated baits (800 parts per million (ppm)) the number of hatchlings produced declined between 13% and 48% compared to a control group. When pigeons were fed doses of nicarbazin treated bait daily in cage studies at the levels currently found in OvoControl® P (5,000 ppm), Avery et al. (2008) found that the rate of egg hatch was reduced by 59% in captive pigeons. In simulating a 50% reduction in egg hatch, Giunchi et al. (2007) predicted through modeling that a population of 5,000 pigeons would be reduced by half if a 50% reduction in pigeon egg hatch occurred annually over a five-year period. The same population would rebound back to 5,000 individuals within five years if egg hatch returned to normal.

Since the effects of nicarbazin on egg hatch are reversible if no longer provided for consumption (Avery et al. 2006, Giunchi et al. 2007, Avery et al. 2008), the reduction in the local pigeon population from the use of nicarbazin can be maintained at appropriate levels where damages or threats are resolved by increasing or decreasing the amount of nicarbazin treated bait available to target pigeons. Although localized pigeon populations would likely be reduced from the use of nicarbazin, the extent of the reduction would be variable given the uncertainty in effectiveness of nicarbazin to reduce egg hatch in pigeons. When pigeons were provided nicarbazin in cage trials at dosage levels found formulated in OvoControl® P (5,000 ppm), not all eggs laid were infertile with 41% of the eggs producing apparently healthy chicks (Avery et al. 2008).

Label requirements of OvoControl® P restrict the application of the product to urban areas where treated bait can be placed on rooftops or other flat, concrete surfaces which further limits the extent of the products use for reducing pigeon populations. Based on current information, WS' use or recommendation of nicarbazin formulated under the trade name OvoControl® P will not adversely affect pigeon populations in New Jersey since WS' activities will not be additive to those activities that could occur in the absence of WS' use of the product. The use of nicarbazin by WS would only occur when permitted under State statutes. The resultant reduction in the pigeon population from the use of nicarbazin would be highly variable given the variability in the effectiveness of the product to reduce egg hatch in pigeons. However, given that the effects of nicarbazin are only temporary if birds are not fed an appropriate dose of nicarbazin daily, the reduction in the population could be fully reversed if treated bait is no longer supplied and other conditions (*e.g.*, food, disease) are favorable for population growth. As discussed

previously, any reduction in local pigeon populations could be viewed as benefitting other native wildlife since pigeons can compete with native bird species for food and shelter.

The potential adverse effects to non-target wildlife are also a concern from the use of nicarbazin to manage pigeon populations. Exposure of non-target wildlife to nicarbazin could occur either from direct ingestion of the bait by non-target wildlife or from secondary hazards associated with wildlife consuming birds that have eaten treated bait. Several label restrictions of OvoControl® P are intended to mitigate risks to non-target wildlife from direct consumption of treated bait (EPA 2005). Daily observation of bait sites for pigeon and non-target activity must occur during a five to fourteen day acclimation period. The required acclimation period habituates pigeons to feeding in one location at a certain time period. Once pigeons are acclimated and no non-targets are observed feeding on the bait, observations for non-targets must occur once weekly until application of treated bait ends. During the observation periods, the applicator must be present on site until all bait has been consumed. Non-target risks are further minimized by requirements that bait only be placed on rooftops in urban areas and if not practical, baiting is limited to paved and/or on hard concrete surfaces. All unconsumed bait must also be retrieved daily which further reduces threats of non-targets consuming treated bait.

In addition, nicarbazin is only effective in reducing the hatch of eggs when blood levels of DNC are sufficiently elevated in a bird species. When consumed by birds, nicarbazin is broken down into the two base components of DNC and HDP which are then rapidly excreted. To maintain the high blood levels required to reduce egg hatch, birds must consume nicarbazin daily at a sufficient dosage that appears to be variable depending on the bird species (Yoder et al. 2005, Avery et al. 2006). For example, to reduce egg hatch in Canada geese (*Branta canadensis*), geese must consume nicarbazin at 2,500 ppm compared to 5,000 ppm required to reduce egg hatch in pigeons (Avery et al. 2006, Avery et al. 2008). In pigeons, consuming nicarbazin at a rate that would reduce egg hatch in Canada geese did not reduce the hatchability of eggs in pigeons (Avery et al. 2006). With the rapid excretion of the two components of nicarbazin (DNC and HDP) in birds, non-targets birds would have to consume nicarbazin daily at sufficient doses to reduce the rate of egg hatching.

Secondary hazards also exist from wildlife consuming pigeons that have ingested nicarbazin. As mentioned previously, once consumed, nicarbazin is rapidly broken down into the two base components DNC and HDP. DNC is the component of nicarbazin that limits egg hatchability while HDP only aids in absorption of DNC into the bloodstream. DNC is not readily absorbed into the bloodstream and requires the presence of HDP to aid in absorption of appropriate levels of DNC. Therefore, to pose a secondary hazard to wildlife, ingestion of both DNC and HDP from a pigeon carcass would have to occur and HDP would have to be consumed at a level to allow for absorption of the DNC into the bloodstream. In addition, an appropriate level of DNC and HDP would have to be consumed from a pigeon carcass daily to produce any negative reproductive affects to other wildlife since current evidence indicates a single dose does not limit reproduction. To be effective nicarbazin (both DNC and HDP) must be consumed daily during the duration of the reproductive season to limit the hatchability of eggs. Therefore, to experience the reproductive effects of nicarbazin, a pigeon that had consumed nicarbazin would have to be consumed daily and a high enough level of DNC and HDP would have to be available in the pigeon carcass and consumed for reproduction to be affected. Based on the risks and likelihood of wildlife consuming a treated pigeon daily and receiving the appropriate levels of DNC and HDP daily to negatively impact reproduction, secondary hazards to wildlife from the use of nicarbazin are extremely low (EPA 2005).

Although some risks to other non-target species besides bird species does occur from the use of OvoControl® P, those risks are likely to be minimal given the restrictions on where bait can be applied (*e.g.*, on rooftops, on pavement at airports). Although limited toxicological information for nicarbazin exists for wildlife species besides certain bird species, available toxicology data indicates nicarbazin is

relatively non-toxic to other wildlife species (World Health Organization 1998, EPA 2005, California Department of Pesticide Regulation 2007). Given the use restriction of OvoControl® P and the limited locations where bait can be applied, the risks of exposure to non-targets would be extremely low.

WS has reviewed the list of threatened and endangered species listed in New Jersey and determined that the use of nicarbazin under the trade name OvoControl® P will have no effect on those species listed in the State. Restricting the use of the product to use on rooftops and paved concrete areas where pigeons are conditioned to feed along with the bait-type (pellets) of the product and the limited availability of the product during application ensures the use of nicarbazin will have no effect on threatened and endangered species. WS' will continue to monitor pigeon damage management activities and those species listed in the State to ensure compliance with the Endangered Species Act.

Threats to human safety from the use of OvoControl® P will likely be minimal if labeled directions are followed. The use pattern of OvoControl® P will also ensure threats to public safety are minimal. Label requirements require treated bait to be applied on rooftops of buildings or other areas restricted to public access (*e.g.*, airports). The EPA has characterized OvoControl® P as a moderate eye irritant. The FDA has established a tolerance of nicarbazin residues of 4 parts per million allowed in uncooked chicken muscle, skin, liver, and kidney (21 CFR 556.445). The EPA characterized the risks of human exposure as low for a similar product used to reduce egg hatch in Canada geese. The EPA also concluded that if human consumption occurred, a prohibitively large amount of nicarbazin would have to be consumed to produce toxic effects (EPA 2005). Based on the use pattern of the OvoControl® P and if label instructions are followed, risks to human safety will be low with the primary exposure occurring to those handling and applying the product. Safety procedures required by the label, when followed, will minimize risks to handlers and applicators.

The use of nicarbazin on the aesthetic values of pigeons occurs primarily from the inability of those interested in viewing, feeding, and photographing pigeons along with knowing pigeons are free-ranging. The aesthetic value of a local pigeon population would likely lessen from a reduction in a population that would result from the use of nicarbazin. As previously mentioned, the rate of population decline would be variable from the use of nicarbazin since effectiveness of the product varies. However, the rate of decline in a localized pigeon population is likely to occur at a gradual rate compared to other lethal removal programs that target localized pigeon populations. Giunchi et al. (2007) predicted through modeling that a population of 5,000 pigeons would be reduced by half if a 50% reduction in pigeon egg hatch occurred annually over a five-year period. However, damage would continue to occur from those pigeons which could affect the aesthetic value of property and threaten human safety if pigeon populations remain sufficient for extended periods of time. Overall, the aesthetic value of a localized pigeon population would be similar to the use of other lethal methods discussed in the EA since a population decline would occur.

The use of nicarbazin would generally be considered as a humane method of managing local populations of pigeons. Nicarbazin reduces the hatchability of eggs laid by pigeons and appears to have no adverse effects on pigeons consuming bait daily and does not appear to adversely affect those chicks that do hatch from parents fed nicarbazin (Avery et al. 2006, Avery et al. 2008). Nicarbazin has been characterized as a veterinary drug since 1955 by the FDA for use in broiler chickens to treat outbreaks of coccidiosis with no apparent ill effects to chickens. Based on current information, the use of nicarbazin would generally be considered humane based on current research.

Overall, the use of nicarbazin would have no effect on non-target wildlife that may consume bait or consume pigeons that have consumed bait, will not adversely affect human safety given the use restriction of the product that are found on the label, which if followed, will minimize human exposure to the product, will not adversely affect the aesthetic values of pigeons since pigeons are common in the State

and the population decline would be gradual, and the product would likely be considered humane since only the hatching rate of eggs laid would be reduced after consumption with no apparent adverse effects to the pigeons consuming bait or the chicks that do hatch from eggs. WS' potential use of OvoControl® P under the proposed action would not adversely affect any aspect of the issues analyzed in detail in the EA and would allow for additional methods to be available for use in an integrated approach to managing damage caused by pigeons.

XI. ENVIRONMENTAL IMPACTS

The following analysis is intended to update sections of the environmental impact analysis in the EA. Consequently, it only provides analysis for Alternative 1, the current program (implement an integrated bird damage management program). Impacts of the other three alternatives remain as analyzed in the EA.

The major issues are discussed in detail in Chapter 2 of the EA (USDA 2002). Alternatives developed and identified during the development of the EA to address those issues are discussed in Chapter 3 of the EA (USDA 2002). Potential impacts of Alternatives 2, 3, and 4 on the human environment related to the major issues have not changes from those described in the EA and thus do not require additional analysis in this supplement. Chapter 4 of the EA contains a detailed discussion and comparison of the identified alternatives and the major issues (USDA 2002). The issues were identified as important to the scope of the analysis in the EA (40 CFR 1508.25). Alternative 1 (proposed action/no action), as described in the EA, addresses requests for bird damage at municipalities, industrial sites, agricultural sites, airports, and private land within Indiana to protect property, agriculture, natural resources, and human health and safety at these locations. The following is an analysis of potential impacts for each of the issues analyzed in the EA since the completion of the EA (USDA 2002) and the amendment to the EA (USDA 2006) as related to Alternative 1 (proposed action/no action)

Issue 1 - Effects on target bird species populations

The issue of the effects on target bird species arises from the use of non-lethal and lethal methods identified in the EA to address the need for reducing damage and threats associated with those bird species addressed in the EA. Methods employed in an integrated approach to reduce damage and threats are categorized into non-lethal and lethal methods. Non-lethal methods are employed to exclude, harass, and/or disperse wildlife from areas where damage or threats are occurring. Lethal methods are often employed to reinforce non-lethal methods and to remove birds that have been identified as causing damage or posing a threat to human safety. Both non-lethal and lethal methods have the potential to impact bird populations. The EA evaluated those potential impacts and found that when WS' activities are conducted within the scope analyzed in the EA, those activities would not adversely impact bird populations in Indiana (USDA 2002). WS' mitigation measures and Standard Operating Procedures (SOP) are designed to reduce the effects on bird populations and are discussed in section 3.4 of the EA (USDA 2002).

WS has provided direct damage management and technical assistance in response to requests for assistance in Indiana since the completion of the EA. Descriptions and application of direct damage management and technical assistance projects are discussed in detail in section 3.2 of the EA (USDA 2002). All bird damage management activities conducted by WS were pursuant to federal, State, and local laws and regulations.

Information on bird populations and trends are often derived from several sources including the breeding Bird Survey (BBS), the Christmas Bird Count (CBC), the Partners in Flight (PIF) Landbird Population database, published literature, trends, surveys, and harvest data.

The following is a summary of WS' activities to manage damage and threats caused by birds in Indiana as requested by those seeking assistance since the completion of the EA amendment in 2006.

Bird Damage Management Conducted in Indiana by WS during FY 2007

WS continued to implement and employ an integrated damage management approach to reducing threats and damage caused by birds in FY 2007 through the recommendation and use of multiple methods. WS conducted 1,232 technical assistance projects in FY 2007 involving bird species through the recommendation of methods to resolve damage and threats without WS' direct involvement (see Table 3). Requests for assistance involved damage and threats to a variety of resources and often involved multiple resources (e.g., vultures can cause damage to property by tearing shingles and can pose a risk to human safety from fecal droppings in areas used by people. WS conducted 349 technical assistance projects involving Canada geese in FY 2007 which was the highest of any bird species followed by 207 technical assistance projects involving mallards. WS provided technical assistance to those requesting assistance involving at least 59 species of birds In Indiana during FY 2007. Technical assistance was provided primarily to alleviate damage and threats to human safety in FY 2007 with 98% of the projects conducted by WS involving damage and threats to human safety. WS verified or cooperators reported bird damage to property, agricultural resources, human safety, and natural resources totaling $1,040,728 primarily to property.

Requests for assistance associated with Canada geese and mallards arose primarily from damage to property from feeding and threats to human safety associated with fecal droppings in public-use areas. Fecal dropping in public-use areas are aesthetically displeasing, requiring constant cleaning, and pose threats of disease transmission. WS continued to provide technical assistance through the recommendation of an integrated approach to resolving damage and threats that included lethal and non-lethal methods.

Table 3 – WS' technical assistance projects conducted in Indiana during FY 2007 by species and resource

Species	Resource[a]				Total	Species	Resource				Total
	A	N	P	H			A	N	P	H	
Red-Winged Backbird				3	3	**Turkey Vulture**			2	17	19
Black Bird Mixed			1	3	4	**Northern Cardinal**				25	25
American Crow			1	17	18	**American Coot**				4	4
Mourning Dove				19	19	**Feral duck**				8	8
Mallard			3	204	207	**Bald Eagle**				4	4
American Kestrel				5	5	**Peregrine**				13	13
Canada Geese			5	344	349	**House Finch**				9	9
Herring Gull			3	6	9	**Sharp-Shinned Hawk**				7	7
Ring-Billed Gull			1	8	9	**Great Blue Heron**				16	16
Red-Tailed Hawk			1	76	77	**Ruby-Throated Hummingbird**				18	18
Killdeer				5	5	**Blue Jay**				12	12
Great Horned Owl				18	18	**American Robin**				68	68
Rock Pigeon				24	24	**European Starling**		1		70	71
House Sparrow			1	39	40	**Barn Swallow**				8	8
Common Grackle				4	4	**Downy Woodpecker**				4	4
Cooper's Hawk		1	1	35	37	**Pileated**				7	7

						Woodpecker					
Northern Harrier			1	4	5	**Ring-Necked Pheasant**				5	5
Barred Owl				8	8	**Mute Swan**				19	19
Eastern Screech Owl				22	22	**Swift**				8	8
Wild Turkey				15	15	**Other***		1	1	27	29
						TOTAL	**0**	**3**	**21**	**1,208**	**1,232**

[a]A=Agricultural Resources, N=Natural Resource, P=Property, H=Human Safety

* Other Property = Black Vulture; Other Human Safety = Snow Geese, White-Fronted Geese, American Goldfinch, Pied-Billed Grebe, Broad-Winged Hawk, Red-Shouldered Hawk, American White Pelican, Eastern Bluebird, Double-Crested Cormorant, Brown-Headed Cowbird, Sandhill Crane, Northern Pintail, Feral Geese, Green Heron, Common Loon, Northern Mockingbird, Nighthawk, Osprey, Tree Swallow, Red-Headed Woodpecker

As shown in Table 4, WS employed, through direct operational assistance, non-lethal techniques to harass and disperse birds identified as causing damage or threats in the State. Dispersal occurred through the use of those non-lethal methods described in Appendix B of the EA, primarily from the use of pyrotechnics and other noise producing methods (USDA 2002). A total of 157,483 birds were addressed using non-lethal methods in FY 2007. Nearly 99% of the birds dispersed were European starlings and brown-headed cowbirds. Of those birds addressed in FY 2007 by WS, 90% were dispersed using non-lethal harassing techniques.

WS received requests for direct operational assistance to alleviate damage and reduce threats associated with at least 21 species of birds in Indiana during FY 2007. WS addressed 169,082 European starlings in FY 2007 primarily to alleviate damage to agricultural resources and property. Over 90% of the European starlings were addressed were non-lethally dispersed using pyrotechnics and other noise-producing methods. Additionally, 3,027 brown-headed cowbirds, 904 mourning doves, and 548 feral pigeons were addressed using lethal and non-lethal methods by WS during 2007 primarily to alleviate threats to human safety at industrial sites and to reduce safety risks and property damage from bird strikes at airports.

As part of an integrated approach to resolving requests for assistance to manage damage and threats, WS also employed lethal methods to reinforce non-lethal techniques and to remove those birds identified as causing damage or threats. As shown in Table 4, WS employed those methods described in the EA to lethally take 17,260 birds in FY 2007. Nearly 94% of those birds lethally taken were European starlings which are non-native species in North America. A total of 16,259 European starlings were lethally removed in Indiana during FY 2007 using primarily live-trapping and the avicide DRC-1339. Live-captured starlings were euthanized using carbon dioxide or cervical dislocation, which are euthanasia methods considered acceptable by the American Veterinary Medical Association (AVMA) for wild birds (AVMA 2007). The number of starlings lethally taken by WS using DRC-1339 was estimated based on a bait consumption mathematical model developed by NWRC in FY 2007.

Table 4 – Number of birds dispersed and taken in Indiana by WS during FY 2007

Species	Dispersed	Take	Species	Dispersed	Take
American Bittern	1	0	**Brown-headed Cowbird**	2,500	527
American Crow	0	2	**Canada Goose**	200	9
American Robin	9	0	**Common Snipe**	0	1
Blackbirds (Mixed)	400	0	**European Starling**	152,823	16,259
Grackle	30	6	**Mourning Dove**	860	44
Great Blue Heron	20	2	**Pectoral Sandpiper**	0	1
House Sparrow	0	14	**Rock Pigeons**	208	340
American Kestrel	9	0	**Red-Tailed Hawk**	35	1
Killdeer	108	18	**Red-Winged Blackbird**	95	8

Mallard	76	16	**Turkey Vulture**	24	1
Eastern Meadowlark	68	11	**Upland Sandpiper**	17	0
			TOTAL	**157,483**	**17,260**

Many of the birds taken using lethal methods occurred at the request of airport authorities to reduce risks of aircraft striking birds which can cause damage to the aircraft and threaten passenger safety. Many of the species of birds addressed at airports occur during the spring and fall migrations of those species when large flocks pose threats to aircraft. Lethal methods were employed to reinforce non-lethal methods to decrease habituation and to remove those birds identified as posing an immediate or chronic threat to aircraft. WS continued to work with airports in Indiana to identify attractants to birds on airport properties and to reduce threats of aircraft being struck by birds. All take by WS in Indiana occurred pursuant to the MBTA through the issuance of depredation permits by the USFWS or through depredation orders which allow take when damage is occurring or about to occur without the need for a depredation permit. WS' take of birds is reported to the USFWS annually to ensure WS' take is considered as part of management objectives for those species.

WS addressed a total of 174,743 birds in FY 2007 that were identified as causing damage or posing threats to agricultural resources, natural resources, and property, and posing threats to human safety in Indiana using an integrated approach (both non-lethal and lethal methods) as described in the proposed action. Nearly 90% of those birds addressed were non-lethally harassed and dispersed from areas where damages or threats were occurring.

Bird Damage Management Conducted in Indiana by WS during FY 2008

WS' activities continued in FY 2008 with the use of an integrated approach to manage bird damage and threats. WS provided both technical assistance and direct operational management in FY 2008. Similar to FY 2007, WS continued to provide technical assistance through bird identification, through the identification of bird damage, and by demonstrating the proper use of methods to alleviate damage and threats associated with birds (see Table 5). Direct operational management was provided by WS through the use of those methods described in Appendix B of the EA to alleviate damage or reduce threats in the State. WS verified or cooperators reported bird damage to property, agricultural resources, human safety, and natural resources totaling $534,395 during FY 2008.

During FY 2008, WS received requests for technical assistance involving at least 62 different bird species in the State. In total, WS conducted more than 1,514 technical assistance projects in FY 2008 in the State. Approximately, 93% of the requests for assistance involved threats or damage cause by birds to human safety. A further 7% were for requests for assistance to alleviate bird damage to property. Of the technical assistance projects received by WS during FY 2008, Canada geese, mallards and red-tailed hawks accounted for 52% of the total requests. Requests for assistance to alleviate damage and threats to human safety and property caused by mallards and Canada geese arose primarily from concerns regarding fecal droppings and damage turf and other landscaping. Damage and concerns associated with red-tailed hawks included predation on game and domestic fowl and threats to human safety.

Table 5 – WS' technical assistance projects conducted in Indiana during FY 2008 by species and resource

Species	Resource[a]				Total	Species	Resource				Total
	A	N	P	H			A	N	P	H	
Blackbirds (mixed)			1	7	8	**Pea Fowl**				4	4
Northern Cardinal			1	26	27	**Canada Goose**			44	413	457
American Coot				6	6	**Feral Goose**				6	6

Sandhill Crane				5	5	**Common Grackle**				4	4
American Crows			2	14	16	**Herring Gull**			3	7	10
Mourning Dove				23	23	**Ring-billed Gull**				5	5
Feral Duck				10	10	**Cooper's Hawk**				45	45
Mallard			2	219	221	**Red-tailed Hawk**			1	111	112
Wood Duck				5	5	**Sharp-shinned Hawk**				7	7
Bald Eagle				8	8	**Great Blue Heron**				13	13
American Kestrel				4	4	**Ruby-throated Hummingbird**				14	14
Peregrine Falcon		1		15	16	**Blue Jay**				9	9
House Finch				10	10	**Killdeer**				9	9
Barred Owl				9	9	**Eastern Screech Owl**				21	21
Great Horned Owl				25	25	**Feral Pigeon**			6	42	48
Ring-necked Pheasant				3	3	**American Robin**			1	76	77
Quail				3	3	**European Starling**			5	48	53
House Sparrow				3	35	**Swift (all)**				4	4
Barn Swallow				5	5	**Black Vulture**			1	7	7
Mute Swan				18	18	**Yellow-bellied Sapsuckers**			2	1	3
Wild Turkey			2	18	20	**Downy Woodpecker**			26	10	36
Turkey Vulture			4	34	38	**Other***			3	23	26
Pileated Woodpecker			8	4	12						
						TOTAL		1	112	1,401	1,514

[a]A=Agricultural Resources, N=Natural Resource, P=Property, H=Human Safety
*Other property = Dicksissel, Northern Flicker, Guinea Fowl; Other Human Safety = Red-winged Blackbird, Eastern Bluebird, Brown-headed Cowbird, Great Egret, Northern Mockingbird, Lesser Snow Goose, Broad-winged Hawk, Northern Goshawk, Northern Harrier, Red-shouldered Hawk, Belted Kingfisher, Nighthawk, Common Barn Owl, Tree Swallow, Cedar Waxwing, Hairy Woodpecker.

WS continued to receive requests for direct operational assistance in which WS was directly involved with employing methods to alleviate damage and threats. As described in the proposed action, WS continued to employ methods in an integrated approach to address damage in FY 2008. WS employed both lethal and non-lethal methods which were described in Appendix B of the EA (USDA 2002). As shown in Table 6, WS addressed 727,685 birds in Indiana during FY 2008 to alleviate damage and threats.

Table 6 – Number of birds dispersed and taken in Indiana by WS during FY 2008

Species	Dispersed	Take	Species	Dispersed	Take
American Crow	9	0	**Horned Lark**	21	0
American Robin	54	1	**House Finch**	0	2
Blackbirds (Mixed)	1,100	0	**House Sparrow**	70	5
Blue-winged Teal	6	0	**American Kestrel**	18	0
Brown-headed Cowbird	4,926	4	**Killdeer**	187	9
Canada Goose	1,886	24	**Mallards**	602	12
Canvasback	4	0	**Meadowlark**	54	1
European Starling	679,549	32,499	**Mourning Dove**	5,001	65

Great Blue Heron	11	2	**Feral Pigeon**	51	184
Great Egret	1	0	**Red-tailed hawk**	33	2
Hooded Merganser	2	0	**Red-winged Blackbirds**	1,073	23
Ring-Necked Duck	20	0	**Sharp-shinned Hawk**	7	0
Swallows (all species)	20	0	**Turkey Vultures**	22	0
White-throated Sparrow	125	0			
			TOTAL	**694,852**	**32,833**

WS employed lethal methods to take a total of 32,833 birds during FY 2008 to alleviate damage and threats. Almost 99% of those birds lethally taken in FY 2008 were European starlings which are a non-native species in Indiana. Starlings were taken using DRC-1339 and firearms by WS in FY 2008. Starlings were primarily taken to alleviate damage to agricultural resources from the consumption of livestock feed and the contamination of livestock feed and water from fecal droppings. Starlings are afforded no protection under the MBTA.

Additional bird species lethally removed by WS during FY 2008 using live traps and firearms included feral pigeons which were removed to alleviate damage to property, including utility plants and buildings caused by fecal droppings and nesting practices. Remaining bird species were lethally removed primarily to alleviate strike threats associated with these bird species at airports in Indiana. All take of birds by WS in Indiana occurred pursuant to the MBTA.

Similar to previous years, WS continued to address damage and threats associated with birds using primarily non-lethal harassment methods to disperse birds from areas where damage or threats were occurring. At least 25 species of birds were addressed by WS using non-lethal methods in FY 2008. During FY 2008, WS dispersed 694,852 birds in the State using non-lethal methods, primarily pyrotechnics and other auditory deterrents. Of the 694,852 birds addressed using non-lethal methods, nearly 98% were European starlings. Approximately 95% of the birds addressed by WS in Indiana during FY 2008 were non-lethally dispersed using harassment methods. Of those bird species in which lethal take also occurred, over 95% of those birds were dispersed using non-lethal methods. WS addressed 712,048 European starlings in FY 2008 of which 679,549 were dispersed using non-lethal methods. WS continued to apply an integrated approach to managing bird damage during FY 2008.

Bird Damage Management Conducted in Indiana by WS during FY 2009

WS' bird damage management activities in FY 2009 were similar to the implementation of the proposed action in previous years. WS continued to provide both technical assistance and direct operational assistance to those requesting assistance. WS provided technical assistance on resolving damage caused by at least 63 species of birds in FY 2009 (see Table 7).

WS conducted a total of 1,468 technical assistance projects in FY 2009. As in FY 2008, the greatest number of requests for assistance received by WS in Indiana during FY 2009 was associated with Canada geese, mallards, and red-tailed hawks in Indiana with 486, 220, and 142 requests, respectively. In 2009 WS conducted a total of 848 technical assistance projects involving Canada geese, mallards, and red-tailed hawks in Indiana compared to 790 in FY2008 and 633 in FY 2007. Technical assistance projects often involve damage or threats of damage to multiple resources (e.g., hawks can pose a threat of damage to property from being struck by aircraft which could also threaten human safety). WS verified of cooperators reported bird damage to property, agricultural resources, human safety, and natural resources totaling $247,411 in FY 2009.

Table 7 – WS' technical assistance projects conducted in Indiana during FY 2009 by species and resource

Species	Resource[a]				Total	Species	Resource				Total
	A	N	P	H			A	N	P	H	
Northern Cardinal			3	25	28	**Herring Gull**				6	6
Sandhill Crane	1			5	6	**Cooper's Hawk**	2		4	31	37
American Crow			3	10	13	**Red-shouldered Hawk**				3	3
Mourning Dove			3	19	22	**Red-tailed Hawk**	2	1	17	122	142
Feral Ducks				15	15	**Sharp-shinned Hawk**				4	4
Mallard			4	216	220	**Great Blue Heron**			6	20	26
Wood duck				3	3	**Ruby-throated Hummingbird**				10	10
Bald Eagle				7	7	**Blue Jay**				8	8
American Kestrel			1	3	4	**Killdeer**				3	3
Peregrine Falcon				11	11	**Nighthawk**				3	3
House Finch				12	12	**Barred Owl**			1	5	6
Northern Flicker			1	2	3	**Common Barn Owl**			1	10	11
Pea Fowl				6	6	**Eastern Screech Owl**			3	22	25
Canada Geese	6		42	438	486	**Great Horned Owl**			6	24	30
Feral Goose				4	4	**Barn Swallow**				10	10
Feral Pigeon			5	26	31	**Mute Swan**				44	44
House Sparrow			3	26	29	**Swifts (all)**				4	4
European Starling	7		17	51	75	**Wild Turkey**			1	8	9
Downy Woodpecker			12	11	23	**Black Vulture**	1			5	6
Hairy Woodpecker			4	2	6	**Turkey Vulture**			6	34	40
Pileated Woodpecker			2	2	4	**Common Grackle**				4	4
						Other*			2	27	29
						TOTAL	19	1	147	1,301	1,468

[a]A=Agricultural Resources, N=Natural Resource, P=Property, H=Human Safety

*Other Property = Double-crested Cormorant, Red-headed Woodpecker; Other Human = Blackbird (mixed), Eastern Bluebird, American Coot, Double-crested Cormorant, Greater Snow Goose, American Goldfinch, Long-eared Owl, Snowy Owl, Ring-necked Pheasant, Least Sandpiper, White-rumped Sandpiper, Eared Grebe, Pied-billed Grebe, Rough-legged Hawk, White Ibis, Belted Kingfisher, Purple Martin, Northern Mockingbird, Yellow-rumped Warbler, Cedar Waxwing, Red-headed Woodpecker, Greater Yellowlegs.

WS continued to provide direct operational assistance in Indiana during FY 2009 to those requesting assistance with reducing or preventing damage caused by at least 33 species of birds. WS continued to employ an integrated damage management program as described in the EA during FY 2009.

WS continued to employ lethal methods that resulted in the take of 2,618 birds in Indiana during FY 2009 (see Table 8). Over 90% of those birds lethally taken were European starlings and feral pigeons. Of the European starlings addressed in FY 2009, nearly 99% were dispersed using non-lethal methods. Of the 1,906 European starlings addressed by WS in Indiana during FY 2009, 1,816 were removed using DRC-1339 to alleviate damage to agricultural resources. The remaining 89 European starlings were lethally removed using firearms primarily to reduce strike threats at airports. A total of 468 feral pigeons were lethally removed by WS during FY 2009 using firearms and live-traps primarily to alleviate damage to

property and human health associated with accumulations for fecal droppings, as well as to reduce strike threats at Indiana airports.
Firearms are selective for target species and the noise associated with the discharge of a firearm also effectively disperses birds during application. Firearms are also effective at targeting birds that are habitually identified as causing damage or posing a threat to human safety. Live-traps are also selective for target species since non-targets can be released unharmed. Target bird species that were live-captured were euthanized using cervical dislocation or carbon dioxide which are methods considered appropriate by the AVMA for wild birds (AVMA 2007).

Table 8 – Number of birds dispersed and taken in Indiana by WS during FY 2009

Species	Dispersed	Take	Species	Dispersed	Take
American Crow	39,023	2	**Horned Lark**	1,084	3
American Robin	12	0	**House Finch**	30	0
American Kestrel	46	5	**House Sparrow**	0	3
Barn Swallow	113	2	**Killdeer**	458	27
Blackbirds (mixed)	5,050	0	**Lesser Snow Goose**	75	0
Brown-headed Cowbird	12,211	40	**Mallard**	164	19
Canada Goose	841	17	**Meadowlark**	102	6
Common Grackle	24	2	**Mourning Dove**	3,816	50
Common Snipe	12	0	**Northern Harrier**	1	0
Coopers Hawk	1	0	**Pectoral Sandpiper**	275	0
Double-crested Cormorant	2	0	**Feral Pigeon**	183	468
European Starling	154,184	1,906	**Red-tailed Hawk**	174	8
Great Blue Heron	18	9	**Red-winged Blackbird**	235	47
Hooded Merganser	2	0	**Ring-billed Gull**	0	1
Ring-necked Duck	125	0	**Snow Bunting**	20	0
Rough-legged Hawk	4	0	**Turkey Vulture**	139	3
Sharp-shinned Hawk	1	0	**Upland Sandpiper**	2	0
			TOTAL	**218,427**	**2,618**

As part of the integrated approach to managing damage and threats, WS also employed non-lethal harassment techniques to disperse 218,427 birds in the State. At least 31 species of birds were addressed using non-lethal methods during FY 2009. Over 98% of the birds addressed in Indiana during FY 2009 were non-lethally harassed using primarily pyrotechnics. Similar to FY 2008, European starlings were the primary species addressed during direct operational assistance by WS. WS employed non-lethal methods to disperse 154,184 European starlings in the State to alleviate damage and threats. In addition WS dispersed 39,023 American crows and 12,211 brown-headed cowbirds to alleviate damage and threats in the State.

All take of birds by WS in FY 2009 occurred pursuant to the MBTA and only after a request for assistance was received by WS. All methods employed by WS in FY 2009 were discussed in Appendix B of the EA (USDA 2002). WS continued to address requests for assistance to alleviate damage and threats using lethal and non-lethal methods in an integrated approach described in the EA.

Bird Damage Management Conducted in Indiana by WS during FY 2010

As described in the EA, WS continued to provide technical assistance and direct operational damage management to those requesting assistance with managing damage caused by birds during FY 2010. WS continued to receive requests for assistance with several bird species in Indiana. WS received request for

technical assistance involving at least 32 species of birds in FY 2010 while requests for direct operational assistance by WS involved at least 31 species of birds. Requests for technical assistance received by WS during FY 2010 are shown in Table 9 by resource category.

A total of 197 technical assistance projects were conducted by WS in Indianan during FY 2007. Similar to previous years, the highest number of technical assistance projects conducted by WS in FY 2010 involved damage management associated with Canada geese and red-tailed hawks. WS conducted 38 and 23 technical assistance projects involving Canada geese and red-tailed hawks, respectively. WS verified of those requesting assistance reported $49,285 in damages to property, agricultural resources, and human safety in FY 2010.

WS experience a reduction in the number of requests for assistance and reports for damage received due to the elimination of State funding for a toll-free hotline in 2009. Although the reports and assistance are still available to residents, the loss of the well-known centralized information center and free phone call provided by the toll-free hotline has reduced the overall number of citizens contacting our office.

Table 9 – WS' technical assistance projects conducted in Indiana during FY 2010 by species and resource

Species	Resource[a]				Total	Species	Resource				Total
	A	N	P	H			A	N	P	H	
Blackbird (mixed)			1	4	5	**Short-eared Owl**			2	2	4
Northern Cardinal				7	7	**Feral Pigeon**			2	1	3
Sandhill Crane				3	3	**European Starling**	1		5	3	9
American Crow			1	5	6	**Mute Swan**				5	5
Feral Duck				4	4	**Turkey Vulture**	1		2	8	11
Mallard			1	9	10	**Downy Woodpecker**			11	1	12
Peregrine Falcon			2	4	6	**Great Blue Heron**			2	7	9
Canada Goose			8	30	38	**Eastern Screech Owl**				4	4
Cooper's Hawk			2	8	10	**Great Horned Owl**			4	6	10
Red-tailed Hawk			2	21	23	**Other***			7	11	
						TOTAL	2		52	143	197

[a]A=Agricultural Resources, N=Natural Resource, P=Property, H=Human Safety
*Other Property = Northern Flicker, Northern Goshawk, House Sparrow, Hairy Woodpecker, Red-headed Woodpecker; Other Human = Bald Eagle, Feral Goose, Herring gull, Sharp-shinned Hawk, Dark-eyed Junco, Common Barn Owl, House Sparrow, Swift, Wild Turkey, House Wren.

WS continued to receive requests to conduct direct operational assistance in FY 2010 involving damage and threats associated with birds in the State. WS addressed at least 31 bird species during direct operational assistance activities in FY 2010 (see Table 10). Similar to FY 2009, European starlings and American crows were the two bird species most often addressed. WS used non-lethal methods described in Appendix B of the EA (USDA 2002) to disperse 418,080 American crows and 50,611 European starlings. Overall, WS dispersed 548,977 birds in FY 2010 primarily using pyrotechnics and other noise producing methods.

Table 10 – Number of birds dispersed and taken in Indiana by WS during FY 2010

Species	Dispersed	Take	Species	Dispersed	Take
American Coot	1	1	**American Crow**	418,080	17
American Robin	85	5	**American Kestrel**	94	2
Barn Swallow	249	0	**Belted Kingfisher**	1	0
Blackbird (mixed)	10,875	0	**Blue-winged Teal**	4	0

Brown-headed Cowbird	19,776	12	**Canada Goose**	1,920	30
Common Goldeneye	1	0	**Cooper's Hawk**	3	0
Eastern Kingbird	1	0	**European Starling**	50,611	7,958
Common Grackle	25,604	11	**Great Blue Heron**	31	4
Herring Gull	65	0	**Horned Lark**	159	4
House Sparrow	1	45	**Killdeer**	912	56
Mallard	450	30	**Meadowlark**	265	23
Mourning Dove	12,144	426	**Northern Harrier**	4	0
Pectoral Sandpiper	25	0	**Peregrine Falcon**	3	0
Feral Pigeon	448	138	**Red-tailed Hawk**	246	17
Red-winged Blackbird	6,830	86	**Ring-billed Gull**	41	5
Sharp-shinned Hawk	2	0	**Turkey Vulture**	46	12
			TOTAL	**548,977**	**8,882**

In FY 2010, WS used lethal methods to remove 8,882 birds. WS used lethal methods to remove 7,958 European starlings to alleviate damage and reduce threats which accounted for nearly 90% of the birds taken by WS in FY 2010. European starlings are considered a non-native species in Indiana that often compete with native species for food and nesting habitat. Mourning doves continued to pose threats to aircraft at several airports in Indiana. To reduce threats of aircraft strikes, WS employed an integrated approach to resolving those threats that included dispersing 12,144 mourning doves and lethally removing 426. Of the doves addressed in FY 2010, nearly 97% were dispersed from airfields using non-lethal harassment techniques. Over 91% of the birds lethally taken by WS in FY 2010 were non-native bird species in Indiana.

WS continued to employ methods in an integrated approach to resolving bird damage and threats in the State. WS continued to employ primarily non-lethal methods to address requests for bird damage management in the State. Of the 557,859 birds addressed by WS in FY 2010, 98% were addressed using non-lethal methods. Similar to previous years, requests for assistance were received primarily to alleviate damage to property and threats to human safety in FY 2010. All birds lethally removed in FY 2010 by WS occurred pursuant to the MBTA.

Bird Damage Management Conducted in Indiana by WS during FY 2011

During FY 2011, WS continued to receive and respond to requests for assistance to manage damage associated with birds in the State. To address those requests for assistance, WS continued to provide both technical assistance and direct operational assistance. Technical assistance provides those seeking assistance with information on damage identification, bird identification, available methods, and how to utilize available methods to resolve or prevent damage. Direct operational assistance involves the direct application of available methods and techniques by WS to alleviate damage caused by birds when a request for such assistance is received. Those persons requesting assistance reported to WS or WS verified damage associated with birds totaling $264,040 in FY 2011. Monetary damages occurred primarily to agricultural resources in FY 2011.

WS conducted 35 technical assistance projects in Indiana involving requests to alleviate damage and threats associated with birds during FY 2011 (see Table 11). The number of request for technical assistance has decreased significantly compared to previous years due to the elimination of State funding in 2009 which had previously supported a toll-free hotline. Similar to previous years, requests for technical assistance were received primarily to reduce damage and threats to property and human safety.

Table 11 – WS' technical assistance projects conducted in Indiana during FY 2011 by species and resource

Species	Resource[a]				Total	Species	Resource				Total
	A	N	P	H			A	N	P	H	
Blackbird (mixed)			1		1	**Blue Jay**				1	1
Northern Cardinal				1	1	**Feral Pigeon**			1	1	2
American Crow				3	3	**European Starling**	1		1	2	4
Mallard				1	1	**Mute Swan**				1	1
Canada Goose			1	4	5	**Turkey Vulture**				4	4
Ring-billed Gull			1		1	**Pileated Woodpecker**			1		1
Cooper's Hawk		1		2	3	**Red-headed Woodpecker**			3		3
Red-tailed Hawk	1		2		3	**Great Blue Heron**			1		1
						TOTAL	**2**	**1**	**12**	**20**	**35**

[a]A=Agricultural Resources, N=Natural Resource, P=Property, H=Human Safety

In FY 2011, WS employed lethal methods to take 516 birds (see Table 12) in the State to alleviate damage and reduce threats of damage. Of those birds lethally taken by WS in FY 2011, nearly 49% were non-native species in Indiana. To reduce damage to buildings and risks to human health from accumulations of fecal droppings, WS lethally removed 69 house sparrows in FY 2011. Fecal droppings can pose a threat to human safety from the possibility of disease transmission. A total of 106 European starlings were removed primarily to reduce threats to human safety at airport, although 5 were removed to reduce damage to buildings cause by fecal droppings. Feral pigeons were lethally removed by WS in FY 2011 primarily to reduce damage to buildings and utilities caused by fecal droppings and nesting behavior, as well as to reduce damage and threats at airports. American crows, American kestrels, Canada geese, great blue herons, brown-headed cowbirds, common grackles, horned larks, killdeer, mallards, mourning doves, red-tailed hawks, meadowlarks, and red-winged blackbirds were all removed to reduce threats to aviation and human safety at airports in Indiana.

Table 12 – Number of birds dispersed and taken in Indiana by WS during FY 2011

Species	Dispersed	Take	Species	Dispersed	Take
American Crow	367,593	6	**American Robin**	17	0
American Kestrel	34	2	**Barn Swallow**	80	0
Blackbird (mixed)	1,500	0	**Brown-headed Cowbird**	1,515	6
Canada Goose	2,551	32	**Dark-eyed Junco**	13	0
European Starling	26,795	106	**Common Grackle**	50	1
Great Blue Heron	12	2	**Green Heron**	2	0
Herring Gull	10	0	**Hooded Merganser**	5	0
Horned Lark	509	1	**House Sparrow**	45	69
Killdeer	278	30	**Lesser Scaup**	108	0
Mallards	652	26	**Meadowlarks**	91	8
Mourning Dove	5,329	99	**Northern Harrier**	8	0
Peregrine Falcon	1	0	**Feral Pigeon**	33	76
Red-tailed Hawk	79	4	**Red-winged Blackbird**	1,036	48
Ring-billed Gull	5	0	**Ring-necked Duck**	27	0
Song Sparrow	49	0	**Turkey Vulture**	44	0
Upland Sandpiper	4	0	**Wilson's Snipe**	9	0
			TOTAL	**408,484**	**516**

Lethal take of birds by WS in FY 2011 occurred primarily through the use of firearms and live-capture traps. Those target bird species live-captured in traps by WS during FY 2011 were euthanized by cervical dislocation or carbon dioxide which are methods of euthanasia considered appropriate by the AVMA for free-ranging birds (AVMA 2007). All lethal take of birds by WS in FY 2011 occurred pursuant to the MBTA through the issuance of a depredation permit or under depredation orders.

As a part of an integrated approach to resolving requests for assistance to manage damage caused by birds in the State, WS continued to apply non-lethal methods to resolve damage or threats. During direct operational assistance provided by WS at the request of a cooperator, WS dispersed 408,484 birds during FY 2011 to alleviate damage (see Table 11). Overall, more than 99% of all birds addressed by WS in Indiana during FY 2011 were dispersed to alleviate damage using non-lethal methods.

Bird Population Impact Analysis from WS' Activities in Indiana from FY 2007 through FY 2011

A common concern when addressing damage associated with wildlife species are the effects on the populations of those species from methods used to manage damage. The integrated approach of managing damage associated with birds described in the EA under the proposed action alternative uses both non-lethal and lethal methods to resolve requests for assistance. Although non-lethal methods can disperse wildlife from areas where application occurs, wildlife is generally unharmed. Therefore, adverse effects are not often associated with the use of non-lethal methods. However, methods used to lethally take birds can result in local reductions in those species' populations in the area where damage or threats of damage were occurring.

The analysis for magnitude of impact on populations from the use of lethal methods generally follows the process described in WS' programmatic FEIS (USDA 1997). Magnitude is described in WS' programmatic FEIS as "*...a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997). All lethal take of wildlife by WS occurs at the requests of a cooperator seeking assistance and only after the appropriate permit has been issued by the USFWS and IDNR, when appropriate.

WS' cumulative take of birds by species from FY 2007 through FY 2011 is shown in Table 13. Total take of the majority of species in Indiana did not exceed the anticipated annual take as analyzed in the EA (USDA 2002) and the amendment (USDA 2006) during the five year period, however take of house sparrows, killdeer, mallards, meadowlarks, mourning doves, red-tailed hawks, and turkey vultures did exceed anticipated maximum take. However, only the average annual take of house sparrows, mallards, and mourning doves exceeded the anticipated annual take.

The permitting of the take by the USFWS pursuant to the MBTA ensures cumulative take by WS and other entities does not adversely affect populations and that cumulative take is considered as part of population management objectives established by the USFWS for those species, including population trend data and mortality factors. Nearly 97% of the birds lethally taken by WS in the State since FY 2007 were from species that are not native to Indiana.

Take of birds can also occur when authorized by the USFWS through the issuance of depredation permits or through depredation orders by other entities besides WS. To ensure WS' take and take by other

entities does not adversely affect those species' populations, further population impact analysis would occur for house sparrows, killdeer, mallards, meadowlarks, mourning doves, red-tailed hawks, and turkey vultures.

Table 13 – WS' take of bird by species from FY 2007 through FY 2011

Species	Fiscal Year					Total	Maximum take analyzed in the EA and amendment	Average Annual Take
	2007	2008	2009	2010	2011			
American Crow	2	0	2	17	6	**27**	**372,000**	**5.4**
American Robin	0	1	0	5	0	**6**	**20**	**1.2**
American Kestrel	0	0	5	2	2	**9**	**10**	**1.8**
Barn Swallow	0	0	2	0	0	**2**	**20**	**0.4**
Brown-headed Cowbird	527	4	40	12	6	**589**	**372,000**	**117.8**
Canada Goose	9	24	17	30	32	**112**	**100**	**22.4**
Common Grackle	6	0	2	11	1	**20**	**372,000**	**4**
Common Snipe	1	0	0	0	0	**1**		**0.2**
European Starling	16,259	32,499	1,906	7,958	106	**58,728**	**372,000**	**11,745.6**
Great Blue Heron	2	2	9	4	2	**19**	**20**	**3.8**
Horned Lark	0	0	3	4	1	**8**	**20**	**1.6**
House Finch	0	2	0	0	0	**2**	**20**	**0.4**
House Sparrow	14	5	3	45	69	**136**	**20**	**27.2**
Killdeer	18	9	27	56	30	**140**	**50**	**28**
Mallard	16	12	19	30	26	**103**	**20**	**20.6**
Meadowlark	11	1	6	23	8	**49**	**20**	**9.8**
Mourning Dove	44	65	50	426	99	**684**	**100**	**136.8**
Pectoral Sandpiper	1		0	0	0	**1**	**20**	**0.2**
Rock Dove	340	184	468	138	76	**1,206**	**2,000**	**241.2**
Red-tailed Hawk	1	2	8	17	4	**32**	**10**	**6.4**
Red-winged Blackbird	8	23	47	86	48	**212**	**372,000**	**42.4**
Ring-billed Gull	0	0	1	5	0	**6**	**20**	**1.2**
Turkey Vulture	1	0	3	12	0	**16**	**10**	**3.2**

BBS trend data (Sauer et al. 2011), the CBC trend data (NAS 2011), and population estimates from the Partners in Flight Landbird Database (Rich et al. 2004) which were derived from several sources are presented in Table 14 for those species that were lethally taken during WS' damage management activities from FY 2007 through FY 2011 in Indiana. As shown in Table 14, BBS data reflects trends from 1966 through the 2010 survey, the CBC data reflects trend data from Count Number 67 during 1966-1967 through Count Number 111 during 2010-2011, and the population estimates in Indiana which

were derived from BBS data based on guidelines published in Rich et al. (2004) expect for waterfowl species as noted.

The EA (USDA 2002) and amendment to the EA (USDA 2006) concluded that the effects of WS' damage management activities at airports, municipalities, industrial sites, agriculture sites, and private lands would not negatively impact those populations of bird species addressed in the EA when damage management activities occurred within the scope analyzed. WS' lethal take of bird species to alleviate damage and threats to human safety were within the estimated level of lethal take analyzed in the EA and amendment from FY 2007 through FY 2011, except for the lethal take of house sparrows, killdeer, mallards, meadowlarks, mourning doves, red-tailed hawks, and turkey vultures during FY 2010; and house sparrows and mallards during FY 2011.

Analyses determined that WS' increased take of these species did not adversely affect their populations based on the best available information on those species' populations. The USFWS and IDNR permitting those activities pursuant to the MBTA provides additional analyses and outside review that WS' activities since FY2006 have not negatively impacted populations of those birds addressed.

Table 14 – Population data for bird species which may be lethally taken in Indiana by WS

Species	IN BBS	Eastern U.S. BBS	U.S. BBS	IN CBC	U.S. CBC	IN Population Estimate†
American Crow	0.2	0.5	0.5	Increasing	Increasing	360,000
American Robin	2.4	0.4	0.4	Increasing	Stable	4,900,000
American Kestrel	0.0	-2.0	-0.9	Increasing	Decreasing	50,000
Barn Swallow	-0.4	-1.7	-0.3	N/A	Increasing	640,000
Brown-headed Cowbird	0.9	-1.5	-0.4	Stable	Decreasing	490,000
Canada Goose	18.8	13.6	10.4	Increasing	Increasing	130,000
Common Grackle	-0.4	-1.8	-1.6	Increasing	Decreasing	3,400,000
Common Snipe	N/A	-0.5	0.2	Stable	Decreasing	N/A
European Starling	0.4	-1.3	-0.9	Increasing	Decreasing	4,500,000
Great Blue Heron	4.9	0.9	1.3	N/A	N/A	N/A
Horned Lark	-1.8	-2.8	-1.7	Stable	Decreasing	670,000
House Finch	16.7	9.6	0.2	Decreasing	Decreasing	290,000
House Sparrow	-3.9	-3.7	-3.7	Decreasing	Decreasing	3,000,000
Killdeer	2.5	-1.4	-0.3	Increasing	Stable	N/A
Mallard	4.4	-1.2	1.9	Increasing	Decreasing	29,433*
Meadowlark	-2.0	-3.5	-3.2	Stable	Decreasing	170,000
Mourning Dove	0.1	0.5	-0.4	Stable	Increasing	1,800,000
Pectoral Sandpiper	N/A	N/A	N/A	N/A	Stable	N/A
Feral Pigeon	-3.9	-1.2	-1.3	Increasing	Increasing	700,000
Red-tailed Hawk	3.3	1.1	2.0	Increasing	Increasing	17,000
Red-winged Blackbird	-1.2	-1.4	-0.9	Increasing	Decreasing	3,500,000
Ring-billed Gull	33.6	5.9	3.4	Increasing	Stable	N/A
Turkey Vulture	3.9	3.6	2.2	Stable	Increasing	9,200
Black Vulture	12.1	3.3	4.5	Stable	Increasing	300
Mute Swan	N/A	4.0	3.9	Increasing	Stable	2,500‡

* Information obtained from Chodachek 2003
† PIF Landbird Population Estimates Database (Rich et al. 2004)
‡ IDNR unpublished data 2012

WS' bird damage management activities were site specific, and although local populations of target bird species may have been reduced, there was no probable adverse impact on statewide, regional, or national populations of those species from WS' activities from FY 2002 through FY 2011. The potential impact of program activities on bird species have not changed from those analyzed in the EA and amendment. All take occurred under a depredation permit or order issued by the USWFS and/or the IDNR, when applicable. Therefore, based on the analyses in the EA and amendment of the proposed action alternative and WS' activities being within the scope analyzed in the EA and amendment, except for the species stated, WS' activities have not had an adverse impact on bird populations in Indiana. To ensure WS' activities in Indiana continue to have no adverse effects on the populations of those species analyzed, further population impact analyses will occur for house sparrows, killdeer, mallards, meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and pigeons.

House Sparrow Population Impact Analysis

House sparrows were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). House sparrows are found in nearly every habitat except dense forest, alpine, and desert environments. They prefer human-altered habitats, and are abundant on farms and in cities and suburbs (Robbins 1973).

BBS trend data from 1966-2010 indicate that house sparrow populations have decreased at a rate of -3.9, -3.7, and -3.7 throughout Indiana, the eastern BBS region, and the United States, respectively (Sauer et al. 2011). The PIF Landbird Population Estimates Database (Rich et al. 2004) estimates the house sparrow population in Indiana to be approximately 3,000,000. Indiana CBC data from 1966 through 2011 shows a declining population trend for wintering populations of house sparrows throughout the state (NAS 2011).

The change in farming practices may have been a factor for their recent population decrease. The considerable decline in small farms and associated disappearance of a multitude of small feed lots, stables, and barns, may have reduced house sparrow populations, as these sites were a primary source of food in the early part of the 20th century. Ehrlich et al. (1988) suggested that the house sparrow population declines might be linked to the dramatic decrease during the 20th century in the presence of horses as transport animal. Grain rich droppings were apparently a major food source for this species.

House sparrows are non-indigenous and often have negative impacts on and competition with native birds. Therefore, house sparrows are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in house sparrow populations in North America, even to the extent of complete eradication, could be considered a beneficial impact to native bird species. Federal or state law does not protect this species. Any BDM involving lethal control activities by WS for this species would be restricted to isolated, individual sites, or communities. In those cases where sparrows are causing damage or are a nuisance, complete removal of local population could be achieved. This would be a considerable beneficial impact on the human environment.

Table 15 – House sparrow take and dispersal by WS from FY 2007 through FY 2011

Year	Dispersed by WS	Take by WS
FY 2007	0	14
FY 2008	70	5
FY 2009	0	3
FY 2010	1	45
FY 2011	45	69
Total	**116**	**136**

The EA evaluated an annual take of up to 20 house sparrows by WS in Indiana to alleviate damage and threats. In FY 2010 and FY 2011, as shown in Table 15, WS exceeded the anticipated annual take of house sparrows in Indiana by 25 and 49 birds, respectively. This was due to WS' observation of hazards associated with house sparrows during operational management projects. Based upon an anticipated increase in requests for services, WS' lethal management of house sparrows in Indiana would be expected to be no more than 200 house sparrows in any one year under the proposed action. This equates to 0.007% of the total estimated house sparrow population in Indiana. Based on the above information, WS' limited lethal take of house sparrows in Indiana should have only minimal effects on local, statewide, regional, or continental house sparrow populations.

Killdeer Population Impact Analysis

Killdeer occur over much of North America from the Gulf of Alaska southward throughout the United States with their range extending from the Atlantic coast to the Pacific coast (Hayman et al. 1986). Although killdeer are technically in the family that includes other shorebirds, they are unusual shorebirds in that they often nest and live far from water. Killdeer are commonly found in a variety of open areas, even concrete or asphalt parking lots at shopping malls, as well as fields, beaches, ponds, lakes, road-side ditches, mudflats, airports, pastures, and gravel roads and levees but are seldom seen in large flocks. The clutch of up to four eggs is laid in a ground scrape in open habitats (Leck 1984).

Requests assistance associated with killdeer occur primarily at airports in the State. As the number of airports requesting assistance from WS to manage damage and threats associated with killdeer increases, the number of killdeer lethally taken annually is also likely to increase when lethal methods are deemed appropriate for use to resolve damage and threats. To address an increasing number of requests for assistance, up to 200 killdeer could be taken lethally by WS under the proposed action.

The EA analyzed an annual take of up to 50 killdeer in Indiana. During FY 2010, WS' exceeded the anticipated annual take and lethally removed 56 killdeer (see Table 16). Although the anticipated annual take of killdeer was exceeded in FY 2010, annual take averaged 28 killdeer during the five-year period from FY 2007 through FY 2011. This represents only 56% of the anticipated maximum annual take analyzed for killdeer.

Table 16 – Killdeer take and dispersal by WS from FY 2007 through FY 2011

Year	Dispersed By WS	Take by WS	Nests Destroyed	Eggs Destroyed
FY 2007	108	18		
FY 2008	187	9		
FY 2009	458	27		
FY 2010	912	56	1	
FY 2011	278	30		5
Total	**1,943**	**140**		

Since 1966, the number of killdeer observed during the breeding season in the State has shown an increasing trend estimated at 2.5% annually (Sauer et al. 2011). Killdeer observed on BBS routes in the eastern United States are showing a declining trend estimated at -1.4% annually since 1966 and a declining trend across the United States estimated at -0.3% annually, which are both statistically significant trend (Sauer et al. 2011). However, from 2000 to 2010, the number of killdeer observed during the BBS conducted across all routes in the United States has shown an increasing trend estimated at 0.4% annually (Sauer et al. 2011). No current population estimates are available for the number of killdeer residing in the State.

With a relative abundance of 14.0 killdeer per route in Indiana (Sauer et al. 2011), the killdeer population could be estimated at approximately 50,000 birds based on the land area of the State (USDC 2012) estimated at 35,826 mi^2. Using a killdeer population estimated at 50,000 birds in Indiana, WS' increased lethal take of up to 200 birds annually would constitute 0.4% of the estimated population in the State. WS' impacts are likely much lower given the number of killdeer in South Carolina is likely more than 50,000 birds as a result of the bias associated with the BBS data for certain species. Survey data from the CBC indicates the number of killdeer overwintering in the State has shown a general increasing trend since 1966 (NAS 2011).

Killdeer are protected by the USFWS under the MBTA and their take is limited by permit. Therefore, killdeer are taken in accordance with applicable State and federal laws and regulations authorizing take of migratory birds and their nests and eggs, including the USFWS and the IDNR permitting processes. The USFWS, as the agency with management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations of killdeer. This should assure that cumulative impacts on killdeer populations in Indiana would have no significant adverse impact on the quality of the human environment.

Based on the above information, USFWS oversight, and WS' limited lethal take of killdeer in Indiana, WS should have minimal effects on local, statewide, regional, or continental killdeer populations.

Mallard Population Impact Analysis

Mallards are one of the most abundant waterfowl species in North American being widely distributed across most of the continent (Drilling et al. 2002). In Indiana, mallards can be found year around with densities dependent on open water during the winter months (Drilling et al. 2002). The number of mallards observed in the State during the BBS has increased an estimated 4.4% annually since 1966 (Sauer et al. 2011). Indiana waterfowl population survey results indicated peak mallard migration counts of 29,975 ducks during the 2002-2003 season, 14,092 in 2003-2004, 8,684 in 2004-2005, 20,064 in 2006-2007, 18,865 in 2006-2007, and 25,832 in 2007-2008 (Phelps, A.W. 2008). The estimated population of mallards in Indiana derived from spring breeding duck surveys was 29,433 in 2003 compared with 18,233 in 2001 (Chodachek 2003).

Although the mallard population trend has decreased slightly across the eastern BBS since 1966 by -1.2%, it has increased across the United States by 1.9% during the same time period, which is statistically significant (Sauer et al. 2011). Additionally, the CBC indicates an increasing trend in the overwintering population of mallards (NAS 2011) in the State.

As with many other waterfowl species, mallards can be harvested annually during regulated seasons which are implemented by the IDNR under frameworks established by the USFWS pursuant to the MBTA. During the 2010 hunting season in the State, an estimated 41,658 mallards were harvested with an estimated 61,158 mallards harvested during the 2011 season (Raftovich et al. 2012). In the Mississippi Flyway, which includes Indiana, an estimated 2,228,872 mallards were harvest during the 2010 season with 2,240,248 mallards harvested during the 2011 season (Raftovich et al. 2012). Since 2007, an estimated 286,313 mallards have been harvested in the State during the regulated season (see Table 17), which is an average of 57,263 mallards harvested annually from 2007 through 2011 (Raftovich, 2012, 2011, 2010, and 2009).

Table 17 – All mallard take in Indiana including take authorized by the USFWS through depredation permits from FY 2007 through FY 2011

Year	WS*		Hunter Harvest†		Take by Other Entities	
	Take	Nests Destroyed	Mallard Take	Domestic Mallard Take	Take	Nests Destroyed
2007	16		76,139	341	18	20
2008	12		72,365	982	47	16
2009	19	1	34,993	171	114	16
2010	30		41,658	0	31	0
2011	26		61,158	0	61	0
Total	**103**	**1**	**286,313**	**1,494**	**271**	**0**

*Data reported by federal fiscal year
†Data reported by calendar year

In addition to the take of mallards during the hunting season, a total of 103 mallards have been lethally taken by WS in Indiana from FY 2007 through FY 2011. WS' take from 2007 through 2011 represents 0.04% of the total mallard take during this time period.

Mallards can also be taken in the State to alleviate damage and threats through the issuance of depredation permits by the USFWS. Table 17 shows the reported take by other entities as authorized by depredation permits. Since 2007, 271 mallards have been lethally removed by entities other than WS to alleviate damage and threats. Mallard nests were also authorized to be taken through the issuance of depredation permits. A total of 52 mallard nests have been destroyed since 2007 as authorized by the USFWS. WS removed one mallard nest in FY 2009. Nest and egg destruction methods are considered non-lethal when conducted before the development of an embryo. Although there may be reduced fecundity for the individual mallards affected, this activity has no long term effect on breeding populations when limited destruction of nests and/or eggs occurs. Nest and egg removal is not used by WS as a population management method. This method is used by WS and authorized by the USFWS to inhibit nesting in an area where damage or threats could occur.

Based on the number of requests for assistance previously received and in anticipation of an increase in the number of requests for assistance that could be received annually, an annual take of up to 100 mallards and up to 50 nests could occur under this proposed action as a part of an integrated approach to address requests for assistance. WS anticipates the number of airports requesting assistance with managing threats associated with mallards on or near airport property could increase. Based on the average take of mallards from 2007 through 2011 during the hunting season, take of up to 100 mallards by WS would have represented 0.2% of the estimated take of mallards in the State. WS will continue to employ an integrated approach to managing damage using lethal and non-lethal methods. Non-lethal methods are generally regarded as having no adverse effect on wildlife populations since target species are only dispersed from an area. Therefore, an increase in the number of mallards dispersed annually will not adversely affect populations in the State.

Since all take of mallards in the State occurs under the authorities of the USFWS and take of mallards is monitored by the USFWS, all sources are considered by the USFWS when establishing population objectives for mallards. Based on the known take of mallards in the State, take of up to 100 mallards annually by WS to alleviate damage would not adversely affect mallards populations in Indiana. All take by WS would occur under a depredation permit issued by the USFWS and the IDNR for the take of those mallards which ensures the cumulative take of mallards from all known sources would be considered when establishing population objectives for mallards.

Eastern Meadowlark Population Impact Analysis

The eastern meadowlark epitomizes the open habitats of the eastern United States, where the conspicuous nature and the call of the meadowlark is easily recognizable (Lanyon 1995). Eastern meadowlarks can be found throughout the eastern United States but their range can be highly dependent on the weather. In Indiana, eastern meadowlarks can be found year-round in the open, grassy areas of the State where they feed primarily on invertebrates and some plant material, such as weed seeds, grains, and some fruits (Lanyon 1995).

The open areas found at airports makes the habitat ideal for meadowlarks to forage and nest while providing ample perching areas. Most request for assistance to reduce threats associated with meadowlarks occur at airports in Indiana. Meadowlarks found on or adjacent to airport property can pose a hazard to aircraft from being struck causing damage to the aircraft and potentially threatening passenger safety.

As reported by the BBS, populations of eastern meadowlarks in Indiana have decreased in Indiana since 1966 at an estimated rate of -2.0% annually (Sauer et al. 2011). In the United States, BBS data indicates meadowlarks are showing a statistically significant declining trend estimated at -3.2% annually since 1966 (Sauer et al. 2011). However, CBC data from 1966 through 2011 shows a stable to slightly increasing trend for meadowlarks wintering in Indiana (NAS 2011). The Partners in Flight landbird database estimated the population of eastern meadowlarks in Indiana to be 170,000 birds (Rich et al. 2004).

From FY 2007 through FY 2011, a total of 580 meadowlarks were dispersed by WS using non-lethal methods. During this same time period a total of 49 meadowlarks were taken to alleviate damage and threats associated with airports (see Table 18). The annual maximum anticipated take of meadowlarks as analyzed in the EA (USDA 2002) is 20. WS exceed this amount during FY 10 with an annual take of 23. However, WS' annual average take of meadowlarks from FY 2007 through FY 2001 was 10 birds, far below the maximum anticipated annual take. Based on the number of requests received to alleviate the threat of damage associated with meadowlarks and the number of meadowlarks addressed previously to alleviate those threats, WS anticipates that up to 100 meadowlarks could be taken annually in the State. WS also anticipates that meadowlarks will continue to be addressed using primarily non-lethal harassment methods, with lethal methods employed to reinforce the use of non-lethal methods to prevent habituation.

Table 18 – Eastern meadowlark take and dispersal by WS from FY 2007 through FY 2011

Year	Dispersed by WS	Take by WS
2007	68	11
2008	54	1
2009	102	6
2010	265	23
2011	91	8
Total	**580**	**49**

Based on the estimated population, WS' take of up to 100 meadowlarks would represent 0.01% of the estimated population in Indiana. Although take could occur by other entities when authorized by the USFWS through the issuance of a depredation permit, the take of meadowlarks would not likely reach a magnitude where adverse effects to meadowlark populations would occur from take to alleviate damage or threats.

The permitting of the take by the USFWS and the IDNR through the issuance of depredation permits pursuant to the MBTA ensures cumulative take of meadowlarks would be considered as part of population management objectives for meadowlarks.

Mourning Dove Population Impact Analysis

Based on the number of requests received prior to the development of the EA, an annual take of up to 100 mourning doves in the State by WS to alleviate damage using an integrated approach was analyzed in the EA amendment (USDA 2006). As the number of requests for assistance to manage threats to property and human safety increases, the number of mourning doves addressed in the State at airports is also likely to increase. Similar to the other bird species addressed in this supplement to the EA, an increase in the number of mourning doves addressed using non-lethal methods will not adversely affect mourning dove populations since those birds are generally unharmed. Dispersal activities will not occur over large geographical areas of that State that would prevent access to food, shelter, or nesting resources that would lead to an adverse effect on statewide populations.

Many states have regulated annual hunting seasons for doves, including Indiana. In 2011, the preliminary mourning dove harvest in Indiana was estimated at 216,900 doves compared with a preliminary estimate of 185,700 doves harvested in 2010 (see table x) (Raftovich 2012). Across the United States, the preliminary mourning dove harvest in 2011 was an estimated 16,580,900 doves (Raftovich 2012).

According to BBS trend data provided by Sauer et al. (2011), mourning dove populations have increased slightly since 1966 at 0.1% annually. BBS routes across the eastern region of the United States are showing a statistically significant annual increase estimated at 0.5% since 1966 (Sauer et al. 2011). The Partners in Flight landbird population database estimated the mourning dove population in Indiana to be 1.8 million doves (Rich et al. 2004). CBC data gathered in Indiana from 1966 through 2011 shows a relatively stable wintering population of mourning doves in the State.

From FY 2007 through FY 2011, WS has addressed 21,998 doves to alleviate damage and threats (see Table 19). Of those doves addressed by WS in the State from FY 2007 through FY 2011, 587 were addressed using lethal methods while 21,411 were addressed using non-lethal methods. Over 97% of the doves addressed by WS from FY 2001 through FY 2011 were dispersed using non-lethal methods. The number of doves addressed by WS has increased since FY 2007. Requests for assistance received by WS often arise from airports were the gregarious flocking behavior of doves can pose risks to aircraft at or near airports. Based on the number of requests to manage damage associated with doves received previously and the increasing need to address damage and threats associated with doves in the State, up to 1,000 mourning doves could be lethally taken by WS annually in the State to address damage or threats.

Table 19 - All mourning dove take in Indiana including take authorized by the USFWS through depredation permits from FY 2007 through FY 2011

Year	Number of Mourning Doves Addressed by WS		Hunter Harvest	Take by Other Entities
	Dispersed	Take	Take	Take
2007	68	11	258,400	199
2008	54	1	255,700	162
2009	3,816	50	243,200	416
2010	12,144	426	185,700	171
2011	5,329	99	216,900	321
Total	**21,411**	**587**	**1,159,900**	**1,269**

As mentioned previously, mourning doves maintain sufficient population levels to sustain annual harvest. Annual hunting seasons in the State are established by the IDNR under frameworks developed by the USFWS pursuant to the MBTA. Under those frameworks, an estimated 1,159,900 doves have been harvested in Indiana from 2007 through 2011 (Raftovich et al. 2012, 2011, 2010, 2009) during the hunting season.

If WS had taken 1000 mourning doves in 2011, the take by WS would have represented 0.5% of the number of doves harvested in the State. An annual take of up to 1000 mourning doves would represent 0.06% of the estimated breeding population of 1.8 million mourning doves. Local populations of mourning doves in the State are likely to be augmented by migrating birds during the migration periods and during the winter months. Like other native bird species, the take of mourning doves by WS to alleviate damage would only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits. Therefore, the take of mourning doves by WS would only occur when a depredation permit has been issued an only at levels authorized by the USFWS and the IDNR which ensures WS' take and take by all entities, including hunter harvest, would be considered to achieve the desired population management levels on doves in Indiana.

Red-tailed Hawk Population Impact Analysis

The red-tailed hawk is one of the most widespread and commonly observed birds of prey in North America. Throughout its range, the red-tailed hawk typically inhabits open areas interspersed with patches of trees or structurally similar features (Preston and Beane 2009). The global population of 2,000,000 or more is considered stable or slightly increasing. Populations increased through much of North America during the mid-to-late 20th century, apparently in response to the widespread establishment of open, wooded parkland in place of grassland or dense forest (Preston and Beane 2009). This species is tolerant of exurban development and agricultural development as long as food is available and the converted landscape includes adequate open space and perch sites for hunting and tall trees or other structures for nesting (Preston and Beane 2009).

Table 20 - All red-tailed hawk take in Indiana including take authorized by the USFWS through depredation permits from FY 2007 through FY 2011

Year	Number Red-tailed Hawks Addressed by WS		Other Entities
	Dispersed	Take	Take
2007	35	1	9
2008	33	1	8
2009	174	8	67
2010	246	17	18
2011	79	4	4
Total	**567**	**31**	**106**

BBS population trends indicate that red-tailed hawk populations have steadily increased in Indiana, the BBS eastern region, and the United States at the rates of 3.3%, 1.1%, and 2.0%, respectively, annually since 1966. Additionally, CBC data gathered annually in Indiana from 1966 through 2011 show increasing trends in wintering populations of red-tailed hawks in both Indiana and the United States. The PIF landbird database estimated the population of red-tailed hawks in Indiana to be approximately 17,000 (Rich et al. 2004).

From FY 2007 through FY 2011, WS has addressed 598 red-tailed hawks to alleviate damage and threats (see Table 20). Of those red-tailed hawks addressed by WS in Indiana during this time period, 567 were addressed using non-lethal methods and 31 were addressed using lethal methods. Nearly 95% of the red-tailed hawks addressed in Indiana from FY 2007 through FY 2011 were dispersed using non-lethal means. WS removed 17 red-tailed hawks during FY 2010, exceeding the anticipated maximum annual take of 10 birds as analyzed in the EA (USDA 2002). However, the average annual take of 6.2 red-tailed hawks in the State by WS was below the anticipated maximum.

To alleviate threats associated with red-tailed hawks, primarily at or near airports, WS anticipates up to 40 red-tailed hawks could be removed annually based on the number of requests to manage damage associated with red-tailed hawks previously and the increasing need to address damage and threats associated with red-tailed hawks in the State. If WS had taken 40 red-tailed hawks in 2011, that take by WS would have represented 0.2% of the estimated population of red-tailed hawks in Indiana.

Red-tailed hawks are protected under the MBTA and WS lethal take of red-tailed hawks would occur only if those activities are approved by the IDNR and the USFWS through the issuance of depredation permits. Take may also occur by other entities when authorized by the USFWS through the issuance of depredation permits. The take of red-tailed hawks by WS would only occur when a depredation permit has been issued an only at levels authorized by the USFWS and the IDNR which ensures WS' take and take by all entities would be considered to achieve the desired population management levels on red-tailed hawks in Indiana. WS will continue to assist airport personal in identifying habitat, food sources, and structures that can act as attractants for red-tailed hawks on airport property. WS will also continue to address threats associated with red-tailed hawks using non-lethal harassment methods. However, red-tailed hawks may be lethally removed when deemed an imminent threat or a continual threat to resources.

Turkey Vulture Population Impact Analysis

The statewide population of turkey vultures is estimated at 9,200 based on BBS data (Rich et al. 2004). Trending data from the BBS indicates the number of turkey vultures observed along BBS routes in the State have shown an increasing trend estimated at 3.9% annually. Across the United States, turkey vulture populations have increased at an estimated 2.2 % (Sauer et al. 2011). The numbers of turkey vultures observed during the CBC in the state show a stable to slightly increasing trend (NAS 2010).

The EA (USDA 2002) analyzed an anticipated maximum take of up to 10 turkey vultures annually. This take allowance was based on the number of requests for assistance to manage threats associated with turkey vultures received prior to the development of the EA. As the number of request for assistance to manage threats to property and human safety increases from both airports and private property, the number of turkey vultures addressed in the state is also likely to increase. During FY 2010, based on requests received to alleviate damage, WS removed 12 turkey vultures and exceeded anticipated maximum take as analyzed in the EA (see Table 21). However, WS annual average take of turkey vultures from FY 2007 through FY 2011 was 3.2, far below the anticipated maximum take.

Table 21 - All turkey vulture take in Indiana including take authorized by the USFWS through depredation permits from FY 2007 through FY 2011

Year	Dispersed by WS	Take by WS	Take by Other Entities
2007	24	1	6
2008	22	0	15
2009	139	3	20
2010	46	12	10
2011	44	0	0

Total	**275**	**16**	**51**

The take of turkey vultures is also prohibited under the MBTA except through the issuance of depredation permits issued by the USFWS and the IDNR. The number of turkey vultures addressed in Indiana by all entities to alleviate damage is shown in Table 21. From FY 2007 through FY 2011, the WS program lethally removed 16 turkey vultures in the State and employed non-lethal methods to disperse 275 vultures. Nearly 95% of the turkey vultures addressed by WS from FY 2007 through FY 2011 have been dispersed using non-lethal methods. A total of 67 turkey vultures have been lethally removed by all entities in the State pursuant to depredation permits issued by the USFWS and IDNR.

As the population of turkey vultures in the State has increased, the number of requests for assistance to alleviate damage associated with turkey vultures has also increased. Based on current population trends for turkey vultures in the State, the increase in requests for assistance received by WS since the completion of the EA (USDA 2002) and the amendment (USDA 2006), and the anticipated continued increase in request for assistance to alleviate damage and threats associated with turkey vultures, up to 30 turkey vultures could be lethally taken annually by WS to alleviate damage and threats.

If up to 30 turkey vultures were take annually by WS, WS' take would represent 0.3% of the estimated statewide population of turkey vultures. From 2007 through 2011, 51 turkey vultures were lethally removed by other entities, which is an average of approximately 10 vultures taken annually. If the take by other entities remains stable, the cumulative take of turkey vultures annually by all entities would be approximately 40. The cumulative take of vultures would represent 0.4% of the statewide population if the population remains stable. The statewide population of turkey vultures is likely higher than the estimate by Rich et al. (2004) given the limitation of the BBS and the behavior of vultures. Therefore, the cumulative take of turkey vultures is likely to represent a smaller percentage of the actual statewide population. The permitting of take by the USFWS and the IDNR ensures that take by WS and other entities occurs within allowable take levels to achieve desired population objectives for turkey vultures in the State. WS would also continue to address requests for assistance associated with turkey vultures using non-lethal dispersal methods.

Pigeon Population Impact Analysis

The rock pigeon was introduced to North America in the early 17th-century by colonists who brought domestic pigeons to Atlantic coast settlements (Schorger 1952). The species is now feral and lives broadly across the continent. Pigeons are found near humans and agriculture, chiefly in cities and towns or at farms with livestock (Johnston 1992).

BBS trend data from 1966 through 2011 indicate that pigeon populations have decreased at an annual rate of -3.9% in Indiana and -1.3% across the United States (Sauer et al. 2011). Using BBS trend data the estimated breeding population of pigeons in Indiana is 700,000 (Rich et al. 2004). CBC data since 1966 indicate a relatively stable wintering population of pigeons throughout Indiana (NAS 2011).

The amendment (USDA 2006) analyzed an anticipated maximum annual take of up to 2,000 pigeons annually. WS did not exceed the anticipated annual take of rock doves from FY 2007 through FY 2011 (see Table 22), however based on past requests for assistance to alleviate damage associated with pigeons and in anticipation of an increase in request for assistance to alleviate damage and threats associated with pigeons, up to 4,000 pigeons could be lethally removed by WS annually.

Table 22 – Feral pigeon take and dispersal by WS from FY 2007 through FY 2011

Year	Dispersed by WS	Take by WS
2007	208	340
2008	51	184
2009	183	468
2010	448	138
2011	33	76
Total	**923**	**1,206**

From FY 2007 through FY 2011, WS average annual take of pigeons was 241. Based on an estimated population of 700,000, WS take during this time period represented 0.03% of the pigeon population in the State. If up to 4,000 Pigeons were removed by WS, this would represent 0.6% of the estimated population of pigeons in Indiana. Any BDM involving lethal control actions by WS for this species would be restricted to isolated, individual sites, or communities. In those cases were feral pigeons are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since the affected property owner or administrator would request it. Although regional impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment of pigeons may consider major population reduction in some localities a negative impact.

Mute Swan Population Impact Analysis

The mute swans in classified as an invasive species in Indiana (IDNR 2012). Indiana had an estimated 2,500 mute swans in the state in 2011 (IDNR unpublished data 2012). The IDNR estimates that from 2000 to 2010 the mute swan population increased at an average rate of9-10% per year (IDNR unpublished data 2012). The Mississippi Council also reports increasing mute swan populations in the Flyway (MFC 2012). BBS trend data from 1966-2011 indicate that mute swans have increased at an annual rate of 4% in the Eastern BBS region and 3% in the U.S. (Sauer et al. 2011). CBC data from 1966-2011 indicate an increasing wintering population of mute swans in Indiana.

A mute swan population model by Ellis and Elphick (2007) indicated that at least 17% of the population must be removed per year to be reasonably certain of a reduction in the mute swan population. A similar population model from the Michigan Department of Natural Resources (MDNR) using data specific to that state indicated that approximately 9.5% of the population would need to be taken per year just to stabilize the population in Michigan at current levels (MDNR, unpublished data).

The Mississippi Flyway Council is concerned about the impacts of mute swans on native waterfowl and ecosystems and has established a management objective of 4,000 or fewer mute swans in the flyway by 2030. The IDNR and Mississippi Flyway management objectives for mute swans are consistent with Executive Order 13122 which directs federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

The Ellis and Elphick (2007) mute swan population model indicated that at least 17% of a mute swan population would need to be taken per year in order to be 90% certain of a decline in the mute swan population. The MDNR model indicated that removal of 9.5% of the Michigan mute swan population could result in population stabilization. Based on an increase in requests for assistance to alleviate damage and threats associated with mute swans, WS anticipates a maximum annual take of up to 200

mute swans and the removal of up to 200 nests. Based on an estimated population of 2,500 mute swans in the State, if 200 mute swans were removed by WS this would account for 8% of the population in Indiana. Nest destruction and egg treatments (destruction, oiling, addling, puncturing, chilling) could also be used to reduce the mute swan population. The mute swan population model by Ellis and Elpick (2007) indicated that reproductive rates for the population would need to be reduced more than 72% to be 90% certain of reducing the mute swan population. The MDNR model mute swan model suggests that 13 times as many eggs would have to be destroyed as adults to achieve a comparable reduction in mute swan population growth.

Based on the analysis above, the cumulative impact of the proposed WS action would aid in stabilizing the mute swan population in Indiana and would not eliminate or jeopardize the viability of the mute swan population in Indiana.

Disease Surveillance and Monitoring

The ability to efficiently conduct surveillance for and detect diseases is dependent upon rapid detection of the pathogen if it is introduced. Effective implementation of a surveillance system will facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It will also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.[11] Current information on disease distribution and knowledge of the mixing of birds in migratory flyways has been used to develop a prioritized sampling approach based on the major North American flyways. Surveillance data from all of those areas will be incorporated into national risk assessments, preparedness and response planning to reduce the adverse impacts of a disease outbreak in wild birds, poultry, or humans.

To provide the most useful information and a uniform structure for surveillance, five strategies for collecting samples in birds have been proposed (USDA 2005). Those strategies include:

Investigation of Illness/Death in Birds: A systematic investigation of illness and death in wild birds may be conducted to determine the cause of the illness or the cause of death in birds. This strategy offers the best and earliest probability of detection if a disease is introduced by migratory birds into the United States. Illness and death involving wildlife are often detected by, or reported to natural resource agencies and entities. This strategy capitalizes on existing situations of birds without additional birds being handled or killed.

Surveillance in Live Wild Birds: This strategy involves sampling live-captured, apparently healthy birds to detect the presence of a disease. Bird species that represent the highest risk of being exposed to, or infected with, the disease because of their migratory movement patterns (USDA 2005), or birds that may be in contact with species from areas with reported outbreaks will be targeted. Where possible, this sampling effort will be coordinated with local projects that already plan on capturing and handling the desired bird species. Coordinating sampling with ongoing projects currently being conducted by state and federal agencies, universities, and others maximizes use of resources and minimizes the need for additional bird capture and handling.

Surveillance in Hunter-harvested Birds: Check stations for waterfowl hunting or other harvestable bird species provide an opportunity to sample dead birds to determine the presence of a disease, and supplement data collected during surveillance of live wild birds. Sampling of hunter-killed birds will focus on hunted species that are most likely to be exposed to a disease; have relatively direct migratory

[11]Data collected by organizations/agencies conducting research and monitoring will provide a broad species and geographic surveillance effort.

pathways from those areas to the United States; commingle in Alaska staging areas with species that could bring the virus from other parts of the world;
Sentinel Species: Waterfowl, gamefowl, and poultry flocks reared in backyard facilities may prove to be valuable for early detection and used as for surveillance of diseases. Sentinel duck flocks may also be placed in wetland environments where they are potentially exposed to and infected with disease agents as they commingle with wild birds.

Environmental Sampling: Many avian diseases are released by waterfowl through the intestinal tract and can be detected in both feces and the water in which the birds swim, defecate, and feed. This is the principal means of virus spread to new birds and potentially to poultry, livestock, and humans. Analysis of water and fecal material from certain habitats can provide evidence of diseases circulating in wild bird populations, the specific types of diseases, and pathogenicity. Monitoring of water and/or fecal samples gathered from habitat is a reasonably cost effective, technologically achievable means to assess risks to humans, livestock, and other wildlife.

Under the disease sampling strategies listed above that could be implemented to detect or monitor avian diseases in the United States, WS' implementation of those sampling strategies would not adversely affect avian populations in the State. Sampling strategies that could be employed involve sampling live-captured birds that could be released on site after sampling occurs. The sampling (*e.g.*, drawing blooding, feather sample, fecal sample) and the subsequent release of live-captured birds would not result in adverse effects since those birds are released unharmed on site. In addition, sampling of sick, dying, or hunter harvested birds would not result in the additive lethal take of birds that would not have already occurred in the absence of a disease sampling program. Therefore, the sampling of birds for diseases would not adversely affect the populations of any of the birds addressed in the EA or this supplement to the EA nor would result in any take of birds that would not have already occurred in the absence of disease sampling (*e.g.*, hunter harvest).

Issue 2 - Effects on Other Wildlife Species, Including Threatened and Endangered Species

The issue of non-target species effects, including effects on threatened and endangered species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. WS' minimization measures and Standard Operating Procedures are designed to reduce the effects of damage management activities on non-target species' populations which were discussed in WS' programmatic FEIS (USDA 1997) and the EA (USDA 2002). To reduce the risks of adverse effects to non-target wildlife, WS selects damage management methods that are as target-selective as possible or applies such methods in ways that reduces the likelihood of capturing non-target species. Before initiating management activities, WS also selects locations which are extensively used by the target species and employs baits or lures which are preferred by those species. Despite WS' best efforts to minimize non-target take during program activities, the potential for adverse effects to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse effects on non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected. Therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by target species are also likely to disperse non-targets in the immediate area where the methods are employed. However, the potential impacts on non-target species are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods.

The lethal take of non-targets from using those methods described in the EA is unlikely with take never reaching a magnitude that a negative impact on populations would occur. Any potential non-targets live-captured using non-lethal methods would be handled in such a manner as to ensure the survivability of the animal when released. The use of firearms is selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method. The use of chemical methods, when used according to label directions, poses minimal hazards to non-target wildlife (USDA 1997).

Non-target Species Analysis from WS' Activities in the State from FY 2007 through FY 2011

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by wildlife, the use of such methods can result in the incidental take of unintended species. Those occurrences are minimal and should not affect the overall populations of any species. Since FY 2007, no non-target species were lethally taken during WS' bird damage management activities in Indiana. WS' take of non-target species during activities to reduce damage or threats to human safety caused by birds is expected to continue to be extremely low to non-existent. WS will continue to monitor annually the take of non-target species to ensure program activities or methodologies used in damage management activities do not adversely impact non-targets.

The EA concluded that WS' damage management activities would have no adverse effects on other wildlife species (non-target), including threatened and endangered species throughout the State when those activities were conducted within the scope analyzed in the EA. Methods used by WS are essentially selective for target species when applied appropriately. In addition, WS adheres to those minimization measures and procedures discussed in the EA to minimize the potential for non-target take. As discussed previously, the primary methods used during direct operational assistance by WS from FY 2007 through FY 2011 to resolve requests for assistance were non-lethal harassment techniques, shooting with firearms, euthanizing birds live-captured in cage traps, and the use of DRC-1339.

Non-target Species Impact Analysis under the Proposed Supplement to the EA

The supplement to the EA evaluates those activities conducted by WS pursuant to the proposed action in the EA to resolve an increasing number of requests to manage damage or threats of damage to resources associated with house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, feral pigeons, and mute swans. WS' response to an increasing number of requests for direct operational assistance will result in the increased use of methods to resolve those requests. The number of methods employed to resolve the increasing requests for assistance could also increase under the proposed supplement to the EA. In addition, the frequency of individual method application to resolve requests for assistance is also likely to increase.

In Indiana, WS' lethal take of killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, and turkey vultures from FY 2007 through FY 2011 has occurred using firearms only. Shooting is essentially selective for target species since identification of the target occurs prior to the application of the method. Therefore, any increase in the use of a firearm to resolve damage and threats associated with those activities described in the supplement to the EA would not result in adverse effects to non-targets since no lethal take of non-targets has occurred previously or is expected to occur from the use of firearms.

Other methods that could be used to lethally take house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, pigeons, and mute swans include euthanasia after those bird species have been live-capture using methods described in Appendix B of the EA (*e.g.*, live-traps, nets). Live-capture methods allow for the release of non-target wildlife if captured

since those methods either require WS' personnel to be present during the application of the methods or are monitored frequently. An increase in the use of live-traps to address increasing requests for assistance would not adversely affect non-target bird species since non-targets could be released on site if live-captured. Euthanasia methods approved by the AVMA for free-ranging birds which are employed by WS are selective for target species.

The chemical method DRC-1339 is also available to lethally take blackbirds, starlings, pigeons, and gulls in the State. WS has not previously used DRC-1339 to take pigeons or gulls in the State. However, DRC-1339 has been used to lethally take brown-headed cowbirds and European starlings by WS. No non-targets were known to be taken during the application of DRC-1339 by WS for brown-headed cowbirds and European starlings in the State. The label registration for DRC-1339 for gulls limits the use of the product to WS' employees only. Several minimization measures are incorporated into the label of DRC-1339 for gulls to reduce risks to non-targets. As required by the label, all sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets were observed feeding on the pre-bait, the plots would be abandoned and no baiting would occur at those locations. All uneaten treated baits must be retrieved to minimize non-target exposure. Following the label requirements of DRC-1339 for gulls ensures risks to non-targets are minimal.

Under the proposed action, WS incorporates lethal and non-lethal methods to resolve damage and threats of damage. As described previously, WS has employed primarily pyrotechnics to disperse birds from areas where damage has occurred or could occur. Under the proposed supplement to the EA, the frequency of pyrotechnic use could increase as WS addresses an increase in the number of requests for assistance. Non-target species are usually not affected by WS' non-lethal management activities, except for the occasional scaring from harassment devices. In those cases, migratory birds and other affected non-target wildlife may temporarily leave the immediate vicinity but would most likely return after conclusion of the action. Because non-lethal methods are intended to disperse wildlife unharmed from areas where those methods are applied, an increase in the use of those methods to disperse birds will not adversely affect non-target wildlife. The increase in use of those methods would not reach a magnitude that would adversely affect non-target wildlife populations.

Rusty Blackbirds

Blackbird populations are healthy enough, and the problems they cause great enough, that in 1974 the USFWS has established a depredation order (50 CFR 21.43) to facilitate management of blackbird damage. Under this "order", no Federal permit was required to remove blackbirds (defined as Yellow-headed, Red-winged, Rusty, and Brewer's blackbirds, cowbirds, grackles, crows, and magpies) when 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. However, declines in the Rusty Blackbird (*Euphagus carolinus*) populations throughout much of their range led the USFWS to remove these species from the depredation order.

The rusty blackbird is one of North America's most rapidly declining species (Avery 1995). BBS trend data indicate the rusty blackbird has declined at a rate of -6% in the eastern BBS region and -2.3% in the United States (Sauer et al. 2011). CBC data indicate a fairly stable wintering population trend in Indiana (NAS 2012), however rusty blackbirds are gregarious and their distribution is spotty throughout its wintering range (Avery 1995), therefore winter population estimates are not available.

The habitat of the rusty blackbird through its winter range typically consists of swamps, wet woodlands, and pond edges, usually not associated with other blackbirds (Rosenberg et al. 1991, Sibley 1993). Small flocks may feed in open fields, often near marshland (Burleigh 1958). Land-use practices that reduce wet woodland adversely affect the species (Avery 1995). In the winter, rusty blackbirds form mixed-species

flocks/roosts with European starlings and other blackbirds. Rusty blackbirds typically constitute <1% of such winter roosts, and effects of control measures on the overall population of the species remain unknown (Avery 1995).

The potential exists for rusty blackbirds to be present in mixed-flocks of wintering blackbirds subject to lethal WS control activities. In Indiana, WS conducts programs to reduce damage and threats associated with blackbirds, primarily European starlings, at industrial sites and dairy farms. When using toxicants or capture devices which have the potential to take rusty blackbirds, WS personnel adhere to the standard operation procedures (SOPs) as described in section 3.4 of the EA (USDA 2002) to prevent or reduce impacts from the action employed on non-target species. Specifically, these include monitoring for the presence of non-target species before using toxicants to control blackbirds to reduce the risk of mortality of non-target species populations and releasing or relocating captured non-targets whenever possible. The use of firearms is highly target-specific and would have no effect on non-target species, including the rusty blackbird.

WS' blackbird damage projects in Indiana involving the use of DRC-1339 or capture devices are typically employed within industrial or agricultural structures (e.g., dairy barns). Given that the winter habitat of rusty blackbirds does not generally include such sites, the careful observation for the presence of any non-target species by WS personnel prior to the initiation of any direct control operations, and the selectivity of control methods, WS BMD activities will have no adverse effect on rusty blackbird populations in the State.

Threatened and Endangered Species Analysis

A review of threatened and endangered (T&E) species listed by the USFWS and the IDNR showed that additional listings of T&E species have occurred since the completion of the EA. Additional species that have been federally-listed in Indiana since the Decision/FONSIs for the EA in 2002 and the amendment to the EA in 2006 include the rayed bean (*Villosa fabalis*), snuffbox mussel (*Epioblasma triquetra*), spectaclecase (*Cumberlandia monodonta*), sheepnose mussel (*Plethobasus cyphyus*) and whooping crane (*Grus americana*). With the exception of the whooping crane, these newly listed species are aquatic organisms. The WS actions proposed in this supplement do not alter aquatic environments, so the current program will have no impact on these species. However, WS does occasionally make recommendations that the airport manager alter/remove aquatic habitat on or near airports even though WS does not conduct the work. When providing technical assistance recommendations that include habitat management, WS also advises the property owner/manager that they will have to assess risks to state and federally-listed species and, if these species are present, consult with the appropriate state or federal Agency. Any whooping cranes found in Indiana are part of a Nonessential Experimental Population (NEP). The Final Rule establishing the NEP was published in the Federal Register on June 26, 2001. The Final Rule designates a whooping crane NEP within a 20-state area in the eastern U.S. The intent is to establish a migratory flock which would summer and breed in central Wisconsin, migrate, and winter in west-central Florida. The FEIS for the APHIS-WS program (USDA 1997) and the USFWS' July 28, 1992 BO (Appendix F in USDA 1997) reviewed and analyzed WS' programmatic activities and those documents support the not likely to adversely affect determination for the whooping crane. A review of the Indiana Department of Natural Resource's T&E species list revealed the additional of the whooping crane to the Indiana T&E list.

WS' program activities in Indiana to manage damage caused by birds have not changed from those described in the EA except for those aspects addressed in the supplement to the EA. Thus, the determination in the EA made by WS for those species listed during the development of the EA is still appropriate (USDA 2002). WS has reviewed those activities addressed in the supplement to the EA and has determined those activities will have no effect on T&E species listed in the State. For those species

listed and proposed for listing in Indiana since the completion of the EA, WS has determined that the proposed action in the EA and the proposed supplement to the EA will have no effect on those species. Program activities and their potential impacts on other wildlife species, including T&E species have not changed from those analyzed in the EA. Impacts of the program on this issue are expected to remain insignificant.

Issue 3 – Economic Losses to Property as a Result of Bird Damage

Many property owners and managers are concerned with the economic cost associated with damage caused by birds to property. Birds can cause severe damage or total loss to property, structural damage to buildings, damage to equipment, manufactured products and food, and obstruction or damage to water control structures. Further, major concern of the aviation industry is the economic impact of bird damage to aircraft and other airport property. The IBDM alternative selected in the EA's Decision/FONSI (Alternative 1) allows for the use of the full range of lethal and non-lethal BDM methods and has the greatest potential of successfully reducing the risk of bird damage.

From FY 2007 through FY 2011, there were 673 bird strikes reported for airports in Indiana to the FAA Wildlife Strike Database. There were 208 strikes with no damage or down time information provided, 417 strikes reporting no damage occurred, and 25 military class E and N strikes with no dollar figures for damage or down time reported. There were 27 reports indicating damage, aircraft down time, or a dollar figure for damage. Damaging strikes to civil aircraft included: 5 uncertain damage, 19 minor damage, and 3 substantial damage. Damaging strikes to military aircraft included 1 military class C strike. No damage estimates were provided for the military strikes, however class E strikes are defined as strikes with damages totaling less than $50,000 and class C strikes are defined as causing damages totaling $50,000 to $500,000. In total, strikes reported during this period resulted in $201,842 in repair costs, $3,838 in other costs, and 588 hours with aircraft out of service.

The proposed increase in the maximum number of house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and rock doves would enable WS to continue to provide effective IBMD assistance. If the current limits are maintained, WS may have to use methods that are less than optimal to resolve damage management situations that may occur after the maximum annual limit on take has been reached.

Issue 4 – Effects on Human Health and Safety

Based on the analyses in the EA and WS' programmatic FEIS, when WS' activities are conducted according to WS' directives and standard operating procedures; federal, state, and local laws; and label requirements, those activities pose minimal risks to human safety (USDA 1997, USDA 2003). The analyses in the EA also concluded that WS' activities to reduce threats and hazards associated with birds were likely to have positive impacts to human health and safety by addressing safety issues and disease transmission associated with those birds. Positive benefits would include reducing threats associated with work place safety caused by accumulations of bird feces under bird roosts in areas where people work and are likely to encounter feces or surfaces contaminated with bird feces. Other positive impacts include reducing potential bird strikes at airports. Bird strikes with aircraft can lead to extensive damage to aircraft sometimes resulting in emergency landings or crashes resulting in injury or death of passengers and crew. Remains of stuck birds may also puncture windshields or cockpits resulting in loss of cabin pressure, injury, or death. Health and safety threats may be caused by accumulations of bird feces under roosts in airport structures such as terminals, hangars, and jet ways where people work and are likely to encounter feces or surfaces contaminated with feces.

The FFA Wildlife Strike Database indicated there were no injuries or fatalities caused by bird strikes with aircraft reported in Indiana from FY 2007 through FY 2011. WS' activities to reduce or alleviate bird threats and damage at or around airports in Indiana did not cause any adverse impacts to human health and safety. Program activities and methods, and their potential impacts on human health and safety have not changed from those analyzed in the EA. Impacts of the program on this issue are expected to remain insignificant.

Human Safety Analysis under the Proposed Supplement to the EA

The supplement to the EA evaluates the implementation of the proposed action to address an increasing number of requests for assistance to manage damage and threats associated with house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and rock doves which could result in methods being employed with more frequency to resolve damage. Those methods described in the EA inherently pose minimal risks to human safety when used appropriately and in consideration of human safety. WS will continue to incorporate those minimization measures described in the Chapter 3 in the EA into the bird damage management activities which will minimize the risks to human safety. Based on the use patterns of the methods available, an incretion in the use of those methods to address those activities described in the supplement to the EA pertaining to an increase in activities involving house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and rock doves will not increase risks to human safety. WS' employees are training in the proper use of methods to ensure the safety of the employee and the public. No adverse effects to human safety have occurred or have been reported to occur from WS' activities conducted from FY 2007 through FY 2011. An increase in the number of methods used or an increase in the frequency that a method is used will not increase risks to human safety since consideration of human safety is always the most important part of the use pattern

Issue 5 - Effects on Aesthetics

As described in the EA, WS would employ methods when requested that would result in the dispersal, exclusion, or removal of individuals or small groups of target bird species to resolve damage and threats. In some instances were birds are dispersed or removed, the ability interested persons to observe and enjoy that wildlife would likely temporarily decline. Some people who routinely view or feed individual birds such as geese and feral pigeons are disturbed by removal of such animals under the current program and would also be disturbed by the proposed increases in the lethal take of house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and pigeons. However, lethal control actions would still generally be restricted to local sites and to small, insubstantial percentages of overall populations. Additionally, the bird populations in those areas would likely increase upon cessation of damage management activities. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would therefore continue to remain available for viewing by persons with that interest.

Even the use of exclusionary devices can lead to dispersal of birds if the resource being threatened or damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, birds would likely disperse to other areas where resources are more vulnerable.

The EA concluded the effects on aesthetics would be variable depending on the damage situation, stakeholders' values towards birds, and their compassion for those who are experiencing damage from birds. The WS program in Indiana only conducts activities at the request of the affected property owner or resource manager. Upon receiving a request for assistance, WS addresses issues/concerns and explanations are given for the reasons why a particular method or group of methods would be the most

effective in reducing damage for the specific situation. Methods employed to reduce or resolve damage is agreed upon by the cooperator according to a cooperative service agreement.

The ability to view and enjoy the aesthetic value of birds at a particular site would be somewhat limited if the birds were removed as part of an integrated approach to managing damage. However, new birds would most likely use the site in the future, although the length of time until new birds arrive is variable, depending on the site, time of year, and population densities of birds in the surrounding areas. The opportunity to view birds is available if a person makes the effort to visit sites outside the damage management area.

The fecal contamination associated with high numbers of birds at parks and other public areas is considered by some to be an adverse impact on their aesthetic enjoyment of these sites. The proposed increase in the maximum number of house sparrows, killdeer, mallards, Eastern meadowlarks, mourning doves, red-tailed hawks, turkey vultures, and rock doves would enable WS to continue to provide effective BDM assistance. If the current limits are maintained, WS may have to use methods that are less than optimal to resolve damage management situations that may occur after the yearly limit on take has been reached.

Program activities and methods, and their potential impacts to stakeholders and aesthetics have not changed from those analyzed in the EA and the amendment to the EA. Impacts of the program on this issue are expected to remain insignificant.

Issue 6 - Humaneness and Animal Welfare Concerns of Lethal Methods used by WS

As discussed in the EA, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the varied attitudes on the meaning of humaneness, the analyses must consider the most effective way to address damage and threats caused by wildlife in a humane manner. WS is challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS is to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS continues to evaluate methods and activities to minimize the potential pain and suffering of wildlife when attempting to resolve requests for assistance.

As mentioned previously, some methods have been stereotyped as "humane" or "inhumane". However, many "humane" methods can be inhumane if not used appropriately. For instance, a cage trap is generally considered by most members of the public as "humane". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, WS' mission is to effectively address requests for assistance using methods in the most humane way possible that minimize the stress and pain of the animal. WS' personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible.

Humaneness Analysis from WS' Activities in the State from FY 2007 through FY 2011

Methods used in bird damage management activities in Indiana from FY 2007 through FY 2011 and their potential impacts on humaneness and animal welfare did not changed from those analyzed in the EA. All methods employed by WS from FY 2007 through FY 2011 to alleviate bird damage were discussed in the EA (USDA 2002). WS continued to employ methods as humanely as possible to minimize distress. Live-captured birds addressed in the EA were euthanized using methods considered appropriate for wild birds by the AVMA. Therefore, the analyses of the humaneness of methods used by WS to manage damage and threats caused by birds from FY 2007 through FY 2011 did not changed from those analyzed in the EA.

Humaneness Analysis under the Proposed Supplement to the EA

Since those methods described in Appendix B of the EA would continue to be available under the proposed supplement to the EA, the issue of humaneness would be similar despite the frequency of the use of methods increasing. Those methods considered inhumane by certain segments of society would be considered inhumane no matter the frequency of the use of those methods. Those methods considered inhumane that were addressed in the EA would continue to be considered inhumane under the supplement to the EA. Therefore, the analyses in the EA for the humaneness of methods would not change under the supplement to the EA. WS will continue to employ methods as humanely as possible and would continue to employ euthanasia methods recommended for wild birds by the AVMA.

XIV. SUMMARY OF CUMMULATIVE IMPACTS

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

No significant cumulative environmental impacts are expected from activities considered under the supplement to the EA. Likewise, no significant cumulative impacts have been identified from the implementation of the proposed action in the EA since FY 2002. Under the proposed action, the reduction of bird damage or threats using an integrated approach employing both non-lethal and lethal methods would not have significant impacts on bird populations in Indiana or nationwide. WS continues to coordinate activities with federal, State, and local entities to ensure activities do not adversely impact bird populations. No risk to public safety is expected when WS' activities are conducted pursuant to the proposed action or the proposed supplement to the EA. The EA further describes and addresses cumulative impacts from the alternatives, including the proposed action.

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XVI. ACRONYMS

APHIS	Animal and Plant Health Inspection Service
BBS	U.S. Geological Survey, Breeding Bird Survey

BDM	Bird Damage Management
EA	Environmental Assessment
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
IBDM	Integrated Bird Damage Management
IDNR	Indiana Department of Natural Resources
MBTA	Migratory Bird Treaty Act
MIS	Management Information System
NWRC	National Wildlife Research Center
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USDA	United States Department of Agriculture
USDEA	United States Drug Enforcement Agency
USFWS	United States Department of the Interior, Fish and Wildlife Service
WS	Wildlife Services

VIII. LITERATURE CITED

Alge, T.L. 1999. Airport bird threat in North America from large flocking birds, (geese) as viewed by an engine manufacturer. Proceeding from the Joint Birdstrike Committee – USA/Canada meeting. Vancover, B.C. pp. 11-12.

Allin, C. C. and T. P. Husband. 2003. Mute Swan (*Cygnus olor*) impact on submerged aquatic vegetation and macroinvertebrates in a Rhode Island coastal pond. Northeast Nat. 10:305-318.

Allin, C. C. 1981. Mute Swans in the Atlantic Flyway. Proc. Int. Waterfowl Sympos. 4:149-152.

Alison, R., and K. S. Burton. 2008. New evidence of early presence of *Cygnus olor*. Picoides 21:36-45

Ankney, C. D. 1996. An embarrassment of riches: too many geese. J. Wildl. Manag. 60: 217-223.

Askins, R. 2009. Historical information on bird distributions indicates that Mute Swans were introduced to North America. Picoides 22(1):16-19.

AFC (Atlantic Flyway Council). 2003. Atlantic Flyway Mute Swan management plan. 17pp.

AVMA. 2007. AVMA guidelines on euthanasia. American Veterinary Medical Association. http://www.avma.org/issues/animal_welfare/euthanasia.pdf. Accessed on October, 2012.

Avery, M.L. and J.L. Cummings. 2004. Livestock depredations by black vultures and golden eagles. Sheep and Goat Res. J. 19: 58-63.

Avery, M.L. 1995. Rusty Blackbird (*Euphagus carolinus*). The Birds of North America Online, (A. Poole ed). Ithaca: Cornell lab of ornithology, Retreived from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/200

Bailey, M., S. A. Petrie, and S. S. Badzinski. 2008. Diet of Mute Swans in the lower Great Lakes coastal marshes. Journal of Wildlife Management 72:726-732.

Blackwell, B.F., and S. F. Wright. 2006. Collisions of red-tailed hawks (*Buteo jamaicensis*), turkey vultures (*Cathartes aura*), and black vultures (*Coragyps atratus*) with aircraft: implications for bird strike reduction.

Bynum, K. S., C. A. Yoder, J. D. Eisman, J. J. Johnston, and L. A. Miller. 2005. Development of nicarbazin as a reproductive inhibitor for resident Canada geese. Proceedings of the Vertebrate Pest Conference 11:179-189.

Blokpoel, H. 1976. Bird Hazards to Aircraft. Books Canada Inc. Buffalo, NY. 236pp.

Caudell, J.N. and S. A. Shwiff. Nicarbazin (Ovocontrol®) analysis. Unpublished data. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services,

CDC (Centers for Disease Control and Prevention). 2012a. Histoplasmosis. http://www.cdc.gov/fungal/histoplasmosis/. Accessed November 2012.

CDC (Centers for Disease Control and Prevention). 2012b. West Nile Virus. http://www.cdc.gov/ncidod/dvbid/westnile/index.htm. Accessed August 2012.

CDC (Centers for Disease Control and Prevention). 2012c. Seasonal Flu: Information on Avian Influenza. http://www.cdc.gov/flu/avianflu/. Accessed August 2012.

Chodachek, K.D. 2003. Spring breeding duck survey; Fish and wildlife research and management notes. Indiana Department of natural Resources http://www.in.gov/dnr/fishwild/3546.htm. Accessed September 2012.

Ciaranca, M., C. C. Allin, and G. S. Jones. 1997. Mute Swan (*Cygnus olor*). Pages 273-300 *in* The birds of North America, No. 273. A. Poole and F. Bill, eds. The Academy of Natural Sciences, Philadelphia, Pennsylvania and The American Ornithologists' Union, Washington, D.C.

Cleary, E. C., R. A. Dolbeer, and S. E. Wright. 2005. Wildlife strikes to civil aircraft in the United States, 1990-2004. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Safety and Standards, Serial Report No. 11, Washington, DC. 53 pages.

Cleary, E. C., R. A. Dolbeer, and S. E. Wright. 2004. Wildlife strikes to civil aircraft in the United States, 1990–2003. Serial Report Number 10. Federal Aviation Administration, Office of Airport Safety and Standards, Washington, DC. 56pp.

Cleary, E. C., and R. A. Dolbeer. 1999. Wildlife hazard management at airports, a manual for airport personnel. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Safety and Standards, Washington, DC. 248pp. (http://wildlife-mitigation.tc.faa.gov/).

Conover, M. R. and G. G. Chasko. 1985. Nuisance Canada geese problems in the eastern United States. Wildl. Soc. Bull. 13:228-233.

Conover, M. R., W.C. Pitt, K.K. Kessler, T.J. Dubow, and W.A. Sanborn. 1995. Review of human injuries, illnesses and economic-based losses caused by wildlife in the United States. Wildl. Soc. Bull. 23:407-414.

Cooper, J.A. and T. Keefe. 1997. Urban Cana goose management: policies and procedures. Trans. 62nd North Americal Wildlife and Natural Resources Conference. pp 412-430.

Cummings, J.L., M.E. Pitzler, P.A. Pochop, H.W. Krupa, T.L. Pugh, and J.A. May. 1997. Field Evaluation of White Mineral Oil to Reduce Hatching in Canada Goose Eggs. In C.D. Lee and S.E. Hygnstrom eds. Thirteenth Great Plains Wildlife Damage Control Workshop Proceedings. Kansas State University Agricultural Experiment Station and Cooperative Extension. pp67-72.

Dolbeer, R.A, S.E. Wright, J. Weller, and M.J. Beiger. 2012. Wildlife strikes to civil aircraft in the United States 1990-2011. Federal Aviation Administration, National Wildlife Strike Database, Serial Report Number 18.

Dolbeer, R.A., S.E. Wright, J. Weller, and M.J. Beiger. 2009. Wildlife strikes to civil aircraft in the United States 1990-2008. Federal Aviation Administration, National Wildlife Strike Database, Serial Report 15.

Dolbeer, R.A, and S.E. Wright. 2008. Wildlife strikes to civil aircraft in the United States 1990-2007. Federal Aviation Administration, national Wildlife Strike Database, Serial Report Number 14.

Dlobeer, R.A. 2006. Height distribution of birds as recorded by collisions with civil aircraft. J. Wild. Manage. *In* Blackwell and Wright 2006.

Dolbeer, R.A. and J.L. Seubert. 2006. Canada geese populations and strikes with civil aircraft: positive trends for aviation industry. Poster presentation for 8th Bird Strike Committee-USA/Canada meeting. St. Louis, Missouri, 21-24 August 2005.

Dolbeer, R.A., and P. Eschenfelder. 2003. Amplified bird-strike risks related to population increases of large birds in North America. Proceedings International Bird Strike Committee 26 (Volume 1):49-67.

Dolbeer, R.A., S.E. Wright, and E.C. Cleary. 2000. Ranking the hazard level of wildlife species to aviation. Wildlife Society Bulletin. 28: 372-378.

Dolbeer, R.A. 1997. Feathered and furry fod – a serious problem at U.S. airports. Bird Strike Briefing. National Aerospace FOD Prevention Conf, 24-26 June 1997, Seattle, WA. USDA/Wild. Serv., National Wildl. Res. Ctr., Ohio Field Sta., 6100 Columbus Ave., Sandusky, OH 44870 USA.

Dove, C.J., N.F. Dahlan, and M. Heacker. 2009. Forensic birdstrike identification technique used in an accident investigation at Wiley Post Airport, Oklahoma, 2008. Human Wildlife Conflicts 3: 179-185.

Drilling, N., R. Titman, and F. Mckinney. 2002. Mallard (*Anas platyrhynchos*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/658doi:10.2173/bna.658. Accessed September 2012.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the nature of North American birds. Simon & Schuster, Inc. New York 785pp.

Ellis, M. M. and C. S. Elphick. 2007. Using a stochastic model to examine the ecological, economic and ethical consequences of population control in a charismatic invasive species: Mute Swans in North America. J. of App. Eco. 44:312-322.

Elphick, C. S. 2009. Evidence that Mute Swans are native to North America is lacking. Piciodes 22(1):20-23.

Eisenmann, E. 1963. Is the back vulture migratory? Wilson Bull. 75:244-249.

FAA (Federal Aviation Administration). 2012. National Wildlife Strike Database. http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx. Accessed on August 2012.

Fenwick, G. H. 1983. Feeding behavior of waterfowl in relation to changing food

resources in the Chesapeake Bay. Ph. D. dissertation, Johns Hopkins University, Baltimore, Maryland, USA.

Fitzwater, W.D. 1994. House Saprrows. Pp E101-108 *in* Prevention and control of wildlife damamge. S. Hygstrom, R. Timm, and G. Larson eds. Coop . Ext. Serv. Univ. of Nebr.-Lincoln.

Hayman, P., J. Marchant, and T. Prateer. 1986. Shorebirds: an identification guide to the waders of the world. Houghton Mifflin Company, Boston, Massachusetts. 412 p.

Henry, C.J. 1990. Mortality. Pages 140-151 *In* Birds of prey. I. Newton, P. Olsen, and T. Pyzralowski, eds. Facts on File, NY, NY. 240p.

Hindman, L. J., and E. Ferrigno. 1990. Atlantic flyway goose populations: status and management. Trans. North Amer. Wildl. & Nat. Res. Conf. 55: 293-311.

IDNR (Indiana Department of Natural Resources). Invasive species. http://www.in.gov/dnr/3123.htm. Accessed October 2012.

IDNR (Indiana Department of Natural Resources). 2006. Director's Annual Report, October 27, 2006. Forwarded to: Legislative Council Indiana Economic Development Corporation. 212p.

IDNR (Indiana Department of Natural Resources). 2003. Spring breed duck survey abstract. http://www.in.gov/dnr/fishwild/3546.htm.

Jackson, B.J., and J.A. Jackson. 2000. Killdeer (*Charadrius vociferus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/517 doi:bna.517. Accessed August 2012.

Johnston, R.F. 1992. Rock pigeon (Columbia livia), The Birds of North America Online (A. Poole Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/013.

Kelly, T.A. 1999. Seasonal variation in birdstrike rate for two North American raptors: Turkey vulture (*Cathartes aura*) and red-tailed hawk (*Buteo jamaicensis*). J. Raptor. Res. 38:19-25. *In* Blackwell and Wright 2006.

Klimkiewicz, M. K. 2000. Longevity records of North America n birds. Version 200 0.1, Pautuxent Wildlife Research Center, Bird Banding Lab, Laurel, MD.

Lanyon, W.E. 1995. Eastern meadowlark (*Sturnella magna*). The Birds of North American online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology, retrieved from Birds of North America Online: http://bna.birds.cornell.edu/bna/species/160.

Leck. C.F. 1984. The status and distribution of New Jersey's birds. New Brunswick, New Jersey, Rutgers University Press.

Linnel, M.A., M.R. Conover, and T.J. Ohashi. 1996. Analysis of bird strikes at a tropical airport. J. Wild. Manage. 60:935-945.

Lovell, H.B. 1952. Black vulture depredations at Kentucky woodlands. Auk 64:48-49.

Lovell, H.B. 1947. Black vultures kill young pigs in Kentucky. Auk 64:131-132.

Lowney, M.S. 1999. Damage by black vultures in Virginia, 1990-1996. Wildl. Soc. Bull. 27:715-719.

MacKinnon, B., R. Sowden, and S. Dudley, editors. 2001. Sharing the skies: an aviation guide to management of wildlife hazards. Transport Canada, Aviation Publishing, Ottawa, Ontario, Canada.

Marra, P. P., C.J. Dove, R.A. Dolbeer, N.F. Dahlan, M. Heacker, J.F. Whatton, N.E. Diggs, C. France, and G.A. Henkes. 2009. Migratory Canada geese cause crash of US Airways Flight 1549. Frontiers in Ecology and the Environment. 7: 297-301.

Maryland Mute Swan Task Force. 2001. Recommendations: A summary of information. Maryland Department of Natural Resources. http://dnr.maryland.gov/wildlife/ Hunt_Trap/waterfowl/muteswans/mstfpc.html

MDNR (Michigan Department of Natural Resources). 2002. Mute Swan issues in Michigan. Michigan Department of Natural Resources Wildlife Issue Review Paper 12. 9pp.

MFC (Mississippi Flyway Council). 2012. Mississippi Flyway Council Policy – Management of Mute Swans. Mississippi Flyway Technical Section. http://mississippi.flyways.us.

NAS (National Audubon Society). 2011. The Christmas Bird Count Historical Results. http://birds.audubon.org/christmas-bird-count. Accessed September 2012.

NTSB (National Transportation Safety Board). 2009. Fourth update on investigation into ditching of US Airways jetliner into Hudson River. NTSB Advisory, 12 February 2009. NTSB, Washington, DC USA (http://www.ntsb.gov/Pressrel/2009/090212b.html)

Owen, M., and C. J. Cadbury. 1975. The ecology and mortality of Mute Swans at the Ouses Washes, England. Wildfowl 25:31-42.

Parmalee, P.W. and B.G. Parmalee. 1967. Results of banding studies of black vultures in eastern North America. Condor. 69:146-155.

Parmalee, P.W. 1954. The vultures: their movements, economic status, and control in Texas. Auk. 71:443-453.

Purdue University. 2010. Wildlife Conflicts Information Website. http://www3.ag.purdue.edu/entm/wildlifehotline/pages/sparrows.aspx. Accessed August 2012.

Phelps, A.W. 2008. Waterfowl Population Surveys 2007-2008. http://www.in.gov/dnr/fishwild/3352.htm

Preston, C.R. and R.D. Beane. 2009 *revised*. Red-tailed hawk (*Buteo jamaicensis*) *In* A. Poole and F. Gills (Eds.), The Birds of North America, No. 52, The Birds of North America, Inc. Philadelphia, PA U.S.A.

Rabenhold. P.P. and M.D. Decker. 1989. Black and turkey vultures expand their ranges northward. The Eyas. 12:11-15.

Raftovich, R.V., K.A. Wilkins, S.S. Williams, and H.L. Spriggs. 2012. Migratory bird hunting activity and harvest during the 2010 and 2011 Hunting Seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, U.S.A.

Raftovich, R.V., K.A. Wilkins, S.S. Williams, and H.L. Spriggs. 2011. Migratory bird hunting activity and harvest during the 2009 and 2010 Hunting Seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, U.S.A.

Raftovich, R.V., K.A. Wilkins, K.D. Richkus, S.S. Williams, and H.L. Spriggs. 2010. Migratory bird hunting activity and harvest during the 2008 and 2009 Hunting Seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, U.S.A.

Raftovich, R.V., K.A. Wilkins, K.D. Richkus, S.S. Williams, and H.L. Spriggs. 2009. Migratory bird hunting activity and harvest during the 2007 and 2008 Hunting Seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, U.S.A.

Rich, T.D., C.J. Beardsmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Iñigo-Elais, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenburg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY. Partners in Flight website. http://www.partnersinflight.org/cont_plan/(VERSION: March 2005). Accessed September 2012.

Roads, K.M. 1936. Black vultures kill and eat new-born lambs. Wilson Bulletin 28:219.

Robins, C.S. 1973. Introduction, spread, and present abundance of the house sparrow in North America. Ornithol. Monogr. 14:3-9.

Robinson, M. 1996. The potential for significant financial loss resulting from bird strikes in or around an airport. Proceedings of the Bird Strike Committee Europe. 22:353-367.

Ruth, J.M. 2006. Partners in Flight – U.S. Website. Served by the USGS Patuxent Wildlife Research Center, Laurel, MD, USA. http;//www.partnersinflight.org. Accessed August 2012.

Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J., Ziolkowski, Jr., and W.A. Link. 2011. *The North American Breeding Bird Survey, Results and Analysis 1966-2010. Version 12.07.2011 USGS Patuxent Wildlife Research Center, Laurel, MD*

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MD*

Seamans, D.W. Hamershock and G.E. Bernhardt. 1995. Determination of body density for twelve bird species. Ibis 137:425-428.

Seubert, J.L. and R.A. Dolbeer. 2004. Status of North American Canada goose populations in relation to strikes with civil aircraft. Bird Strike Committee. 13-17 Sept. 2004.

Seymour, K. L., and M. K. Peck. 2009. Re-identification of the Fort Albany Mute Swan

bone. Picoides 22(3):16-20.

Schorger, A. 1952. Introduction of the domestic pigeon. Auk 69:462-463 *In*: Johnston 1992.

Slate, D.A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N. A. Wildl. Nat. Res. Conf 57:51-62.

Sprunt, A. 1946. Predation on living prey by the back vulture. Auk 63:260-262.

Tatu, K. S., J. T. Anderson, L. J. Hindman, and G. Seidel. 2007. Mute Swans' impact on submerged aquatic vegetation in Chesapeake Bay. Jrl. Wildlife Mgmt. 71:1431-1439.

Terres, J.K. 1980. The Audubon Society Encyclopedia of North American Birds. Wings Bros. New York, New York.

Thorpe, J. 1996. Fatalities and destroyed civil aircraft due to bird strikes. 1912-1995. Proceedings of the International Bird Strike Conference 23:17-31

USDA (United States Department of Agriculture). 2005. An Early Detection System for Asian H5N1 Highly Pathogenic Avian Influenza in Wild Migratory Birds. USDA, Animal and Plant health Inspection Service, Wildlife Services, operation Support Staff, Riverdale, MD USA. 87pp.

USDA (United States Department of Agriculture). 2002a. Environmental Assessment -Bird Damage Management At Municipalities, Industrial Sites, Agricultural Sites, And Private Land Within Indiana. USDA, APHIS, WS Indiana State Office, 901 W. State St., Purdue University, W. Lafayette, IN 47907-2054.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC) Strategic Plan. 1999. USDA, APHIS, ADC Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS). 1998. Managing Wildlife Hazards at Airports. USDA, APHIS, WS Operational Support Staff, 4700River Road, Unit 87, Riverdale MD 20737.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control Program. 1997 Revised. Final Environmental Impact Statement. USDA, APHIS, Wildlife Services Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

USDC (United States Departemnt of Commerce), United States Census Bureau. 2012 State and County Quick Facts http://quickfacts.census.gov/qfd/states/18000.html. Accessed September 2012.

USDOT (U.S. Department of Transportation), Office of Inspector General (OIG). 2012. Audit report: FAA has not effectively implemented its wildlife hazard mitigation program. Report Number; AV-2012-170.

USFWS. 2007. Final Environmental Impact Statement: Light goose management. United States Fish and Wildlife Service.

http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/snowgse/tblcont.html. Accessed on December 9, 2009.

USFWS (United States Department of the Interior, Fish and Wildlife Service). 2003. Final Environmental Impact Statement: Double-crested Cormorant Management. United States Department of the Interior, USFWS, Div. of Migratory Bird Management, 4401 N. Fairfax Drive MS 634, Arlington, Virginia 22203.

Vercauteren, K. C. and D. R. Marks. 2004. Movements of urban Canada geese: implications for nicarbazin treatment programs. Pages 151-156 *in* T. J> moser, R. D. Lien, K. E. Abraham, D. E. Anderson, J. G. Brugginik, J. M. Coluccy, D. A. Graber, J. O. Leafloor, D. R. Luukkonenyand, R. E. Trost eds. Proceedings of the 2003 International Canada Goose Symposium, Madison, WI.

Warnock, R. 2009. Corrections to the Mute Swan paper by Alison and Burton. Piciodes 22(1):15.

Weber, W.J. 1979. Health hazards from pigeons , European starlings, and English sparrows. Thompson Publ. fresno, Calif. 138p.

Wilbur, S.R. 1983. The status of vultures in the western hemisphere. Pages in Vulture biology and management. Eds. By S.R. Wilbur and J.A. Jackson. Univ of CA Press. Berkley.

Wright, S. E. and R. A. Dolbeer. 2005. Percentage of wildlife strikes reported and species identified under a voluntary system. *In* Proceedings of Bird Strike Committee USA/Canada meeting, Vancouver, B.C. Canada (www.birdstrikecanada.com).