ENVIRONMENTAL ASSESSMENT

BIRD DAMAGE MANAGEMENT

IN THE STATE OF ILLINOIS

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ACRONYMS

APHIS	Animal and Plant Health Inspection Service
APMV	Avian Paramyxovirus
AQDO	Aquaculture Depredation Order
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BCR	Bird Conservation Region
BDM	Bird Damage Management
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWS	Canadian Wildlife Service
EA	Environmental Assessment
ECOFRAM	Ecological Committee on FIFRA Risk Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal Year
IDA	Illinois Department of Agriculture
IDNR	Illinios Department of Natural Resources
IDPH	Illinois Department of Public Health
MA	Methyl Anthranilate
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAS	National Audubon Society
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NWRC	National Wildlife Research Center
ROD	Record of Decision
SBC	Spring Bird Count
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USACOE	United States Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USGS	United States Geological Survey
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with the needs of wildlife which increases the potential for conflicting human/wildlife interactions. This Environmental Assessment (EA) evaluates the potential environmental effects of alternatives for WS involvement in bird damage management (BDM) in Illinois.

Wildlife damage management (WDM) is the science of reducing damage or other problems associated with wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 2010). The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the federal agency authorized to protect American resources from damage associated with wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)). Human/wildlife conflict issues are complicated by the wide range of public responses to wildlife and wildlife damage. What may be unacceptable damage to one person may be a normal cost of living with nature to someone else. Wildlife has either positive or negative values, depending on varying human perspectives and circumstances. Wildlife is generally regarded as providing economic, recreational and aesthetic benefits and the mere knowledge that wildlife exists is a positive benefit to many people. However, the activities of some wildlife may result in economic losses to agriculture, threaten human health or safety, or even damage to property. Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.

WS' activities are conducted to prevent or reduce wildlife damage to agricultural, industrial and natural resources, property, livestock, and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, tribes, private organizations, and individuals. The WS program uses an integrated wildlife damage management (IWDM) approach (WS Directive 2.105[1]) in which a combination of methods may be used or recommended to reduce wildlife damage. These methods may include non-lethal techniques like alteration of cultural practices, habitat management, repellents, frightening devices, and physical exclusion to prevent or reduce damage. The reduction of wildlife damage may also require removal of individual animals, reducing the local animal populations through lethal means. In some instances, the goal may be to eradicate an invasive species. Program activities are not based on punishing offending animals but are conducted to reduce damage and risks to human and livestock health and safety, and are used as part of the WS Decision Model (Slate et al. 1992).

WS is a cooperatively funded, service-oriented program that receives requests for assistance with wildlife damage management from private and public entities, including tribes and other governmental agencies. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently in accordance with applicable federal, state, and local laws and Memoranda of Understanding (MOUs)/Memoranda of Agreement (MOAs) between WS and other agencies.

[1]The WS Policy Manual (http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml) provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

1.2 PURPOSE

The purpose of this EA is to evaluate cumulatively the individual projects conducted by WS in Illinois to manage damage and threats to agricultural resources, property, natural resources, and threats to humans associated with birds. The WS program in Illinois continues to receive requests for assistance or anticipates recieving such requests to alleveite or prevent damage occurring to agricultural resources, natural resources, property, and human health and safety associated with several bird species. The potential impacts to these species are analyzed in this document. The species analyzed in detail include: common grackle (*Quiscalus quiscula*), red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), American coot (*Fulica americana*), double-crested cormorant (*Phalacrocorax auritus*), American crow (*Corvus brachyrhynchos*), Eurasian collared dove (*Streptopelia decaocto*), mourning dove (*Zenaida macroura*), feral and domestic waterfowl, mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), green-winged teal (*Anas carolinensis*), bald eagle (*Haliaeetus leucocephalus*), great egret (*Ardea alba*), American kestrel (*Falco sparverius*), Canada goose (*Branta canadensis*), snow goose (*Chen caerulescens*), herring gull (*Larus argentatus*), ring-billed gull (*Larus delawarensis*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), great blue heron (*Ardea herodias*), killdeer (*Charadrius vociferus*), Eastern meadowlark (*Sturnella magna*), snowy owl (*Bubo scandiacus*), monk parakeet (*Myiopsitta monachus*), rock pigeon (*Columba livia*), American robin (*Turdus migratorius*), house/English sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), mute swan (*Cygnus olor*), and turkey vulture (*Cathartes aura*).

This EA will assist in determining if the proposed management of bird damage could have a significant impact on the human environment based on previous activities conducted and based on the anticipation of receiving additional requests for assistance. Because the goals of WS are to conduct a coordinated program in accordance with plans and objectives developed to reduce damage, and because those goals and objectives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses are intended to apply to actions that may occur in any locale and at any time within Illinois as part of a coordinated program.

To meet the goals and objectives of addressing requests for assistance, WS is preparing this EA to:

- facilitate planning
- promote interagency coordination
- streamline program management
- analyze several alternatives to address the need for action and the identified issues
- evaluate and determine if there are any potentially significant or cumulative adverse effects
- clearly communicate to the public the analysis of individual and cumulative impacts

This EA will evaluate the need for action to manage damage associated with birds in the state, the potential issues associated with bird damage management, and the environmental consequences of conducting different alternatives to address the need for action and the identified issues. The issues and alternatives associated with bird damage management were initially developed by WS in consultation with the USFWS, the United State Army Corps of Engineers (ACOE), Illinois Department of Natural Resources (IDNR), Illinois Department of Public Health (IDPH), and the Chicago Park District. To assist with the identification of additional issues and alternatives to manage damage associated with birds

in Illinois, this EA is being made available to the public for review and comment prior to the issuance of a Decision[2].

WS and the USFWS previously developed an EA that addressed WS' activities to manage damage associated with birds in the state (USDA 2008; see Section 1.6). Based on the analyses in that EA, a Decision and Finding of No Significant Impact (FONSI) was signed selecting the proposed action alternative. The proposed action alternative implemented a damage management program using a variety of methods in an integrated approach (USDA 2008). Changes in the need for action and the affected environment have prompted WS to initiate this new analysis to address bird damage in the state. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action, primarily a need to address damage and threats of damage associated with several additional species of birds and the potential addition of new components to manage bird damage in the state.

1.3 NEED FOR ACTION

Some species of wildlife have adapted to and have thrived in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between humans and wildlife that lead to requests for assistance to reduce damage to resources and to reduce threats to human safety.

Both sociological and biological carrying capacities must be applied when resolving wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). Those phenomena are especially important because they define the sensitivity of a person or community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold determines the wildlife acceptance capacity. While the biological carrying capacity of habitat may support higher populations of wildlife, in many cases, the wildlife acceptance capacity is lower or has been met. Once the wildlife acceptance capacity is met or exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and safety.

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (The Wildlife Society 2010). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those species have no intent to do harm. They utilize habitats (e.g., reproduce, walk, forage) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or poses a threat to human safety, people often seek assistance. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (e.g., economic, social, aesthetics). Therefore, how damage is defined is often unique to the individual person and damage occurring to one individual may not be considered damage by another individual. However, the use of the term "*damage*" is consistently used to describe situations

[2] After the development of the EA by WS and consulting agencies and after public involvement in identifying new issues and alternatives, WS will issue a Decision. Based on the analyses in the EA after public involvement, a decision will be made to either publish a Notice of Intent to prepare an Environmental Impact Statement or a Finding of No Significant Impact will be noticed to the public in accordance to NEPA and the Council of Environmental Quality regulations.

where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (i.e., has reached an individual threshold). The term "*damage*" is most often defined as economic losses to resources or threats to human safety, but the term "*damage*" could also include a loss in aesthetic value and other situations where the actions of wildlife are no longer tolerable to an individual person.

Wildlife management is often based on balancing wildlife populations and human perceptions, in a struggle to preserve rare species, regulate species populations, oversee consumptive uses of wildlife, and conserve the environment that provides habitat for wildlife resources. Increasingly, cities, towns, parks, airports, and private properties have become sites of some of the greatest challenges for wildlife management (Adams et al. 2006). When the presence of a prolific, adaptable species is combined with human expansion, land management conflicts often develop. Birds are generally regarded as providing ecological, educational, economic, recreational, and aesthetic benefits (Decker and Goff 1987), and there is enjoyment in knowing wildlife exists and contributes to natural ecosystems (Decker and Chase 1997).

Birds add an aesthetic component to the environment, sometimes provide opportunities for recreational hunting, and like all wildlife, provide people with valued close contact with nature. Many people, even those people experiencing damage, consider those species of birds addressed in this EA to be a charismatic and valuable component of their environment; however, tolerance differs among individuals. Because of their prolific nature, site tenacity, longevity, size, and tolerance of human activity, many bird species are often associated with situations where damage or threats can occur.

Birds are difficult to manage because they are highly mobile, able to exploit a variety of habitat types within a given area, and cannot be permanently excluded from large areas. It is rarely desirable or possible to remove or disperse all problem birds from an area, but with a proper management scheme, the number of birds and associated problems may be reduced to a level that can be tolerated. Additionally, management of bird-related problems often exceeds the capabilities of individual people to reduce damage to tolerable levels. In Illinois, problem situations associated with birds typically involve, but are not limited to, unacceptable accumulations of feces in public-use areas, damage to agricultural and natural resources, and unacceptable safety hazards (e.g., aircraft striking birds). Those problems frequently occur on private properties, in residential communities, apartment/condominium complexes, municipal parks, schools, hospitals, natural/habitat restoration sites, corporate and industrial sites, office complexes, roadways, airports, and other areas.

The need for action to manage damage and threats associated with birds in Illinois arises from requests for assistance[3] received by WS to reduce and prevent damage associated with birds from occurring to four major categories (USDA 2008, USFWS 2003, USFWS 2009). Those four major categories include agricultural resources, natural resources, property, and threats to human safety. WS has identified those bird species most likely to be responsible for causing damage to those four categories based on previous requests for assistance and assessments of the threat of bird strike hazards at airports. Table 1.1 lists WS' technical assistance projects involving bird damage or threats of bird damage in Illinois from the federal fiscal year[4] (FY) 2010 through FY 2014. Table 1.1 does not include projects where direct operational assistance was conducted by WS.

Technical assistance has been provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on methods and

[3] WS only conducts bird damage management after receiving a request for assistance. Before initiating bird damage activities, a Memorandum of Understanding, cooperative service agreement, or other comparable document must be signed between WS and the cooperating entity, which lists all the methods the property owner or manager will allow to be used on property they own and/or manage.

[4] The federal fiscal year begins on October 1 and ends on September 30 the following year.

techniques to reduce damage that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA. The technical assistance projects conducted by WS are representative of the damage and threats that are caused by birds in Illinois. From FY 2010 through FY 2014, WS has conducted 3,768 technical assistance projects that addressed damage and threats of damage associated with those bird species addressed in this EA. Many of the projects involved multiple resources and multiple species.

Table 1.1 – Technical assistance (TA) projects by species conducted by WS in Illinois, FY 2010 - 2014

Species	Total TA	Species	Total TA
American black ducks	11	**American coots**	18
American crows	128	**American goldfinches**	4
American kestrels	114	**American robins**	36
American white pelicans	7	**American wigeons**	11
Bald eagles	9	**Barred owls**	13
Blackbirds	160	**Black-crowned night herons**	10
Blue jays	7	**Blue-winged teal**	22
Bobolinks	2	**Bonaparte's gulls**	15
Broad-winged hawks	2	**Buffleheads**	8
Canada geese	325	**Canvasbacks**	8
Cattle egrets	11	**Cedar waxwings**	5
Chickens (feral/free ranging)	1	**Cinnamon teal**	1
Common barn owls	21	**Common loons**	4
Cooper's hawks	127	**Dark-eyed juncos**	7
Double-crested cormorants	21	**Downy woodpeckers**	169
Ducks (feral)	1	**Eastern kingbirds**	5
Eastern meadowlarks	23	**Eastern screech owls**	5
English (House) sparrows	174	**Eurasian collared doves**	15
European starlings	274	**Franklin's gulls**	6
Gadwall	22	**Geese (feral)**	8
Goldeneyes	12	**Gray catbirds**	4
Great blue herons	118	**Great egrets**	16
Great horned owls	109	**Greater white-fronted geese**	1
Greater yellowlegs	8	**Grebes**	10
Green herons	14	**Green-winged teal**	22
Hairy woodpeckers	131	**Herring gulls**	92
Horned larks	19	**House finches**	16
Hummingbirds	1	**Killdeers**	29
Little blue herons	6	**Long-eared owls**	4
Longspurs	1	**Mallards**	73
Mergansers	15	**Monk parakeets**	105
Mourning doves	47	**Mute swans**	18
Nighthawks	12	**Northern cardinals**	13
Northern flickers	4	**Northern harriers**	15
Northern mockingbirds	4	**Northern pintails**	6
Northern shovelers	8	**Ospreys**	1
Peregrine falcons	14	**Pileated woodpeckers**	4

Plovers	8	**Purple finches**	5
Purple martins	4	**Quail**	9
Red-headed woodpeckers	5	**Redheads**	6
Red-shouldered hawks	6	**Red-tailed hawks**	162
Ring-billed gulls	112	**Ring-necked ducks**	5
Ring-necked pheasants	13	**Rock pigeons (feral)**	204
Rough-legged hawks	23	**Ruddy ducks**	5
Sandhill cranes	6	**Sandpipers**	26
Scaup	11	**Sharp-shinned hawks**	7
Short-billed dowitchers	7	**Short-eared owls**	12
Shrikes	3	**Snow buntings**	4
Snow geese	14	**Snowy egrets**	4
Snowy owls	18	**Sparrows (native)**	14
Swainson's hawks	5	**Swallows**	57
Swifts	6	**Terns**	13
Thrushes	1	**Unidentifiable birds**	14
Vultures	144	**White-breasted nuthatches**	1
Wild turkeys	24	**Wilson's snipes**	7
Wood ducks	28	**Wrens**	3
Yellow-bellied sapsuckers	4	**Yellow-crowned night herons**	6
		TOTAL: 3,768	

Table 1.2 lists those bird species and the resource types to which those bird species have caused damage in Illinois. Many of the bird species addressed in this EA can cause damage to or pose threats to a variety of resources. Many requests for assistance received by WS are related to threats associated with those bird species being struck by aircraft at or near airports. Bird strikes can cause substantial damage to aircraft requiring costly repairs. In some cases, bird strikes can lead to the catastrophic failure of the aircraft, which can threaten passenger safety.

Many of the species addressed in this assessment are gregarious (i.e., form large flocks) species especially during the fall and spring migration periods. Although damage and threats can occur throughout the year, damage or the threat of damage is highest during those periods when birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. For some bird species, such as swallows, cormorants and gulls, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists. 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 can increase the damage to the aircraft but also increases the risk that a catastrophic failure of the aircraft might occur, especially if multiple birds are ingested into aircraft engines.

Table 1.2 – Birds species addressed by WS in Illinois from FY 2010-2014 and the resource types damaged (If left blank then no resource was damaged)

	Resource*					Resource			
Species	**A**	**N**	**P**	**H**	**Species**	**A**	**N**	**P**	**H**
American black duck			X	X	American coot			X	X
American crow	X		X	X	American golden plover			X	X
American goldfinch			X	X	American kestrel			X	X

Species	Resource*				Species	Resource			
	A	N	P	H		A	N	P	H
American robin			X	X	American white pelican			X	X
American wigeon			X	X	Bald eagle			X	X
Barred owl			X	X	Black-bellied plover			X	X
Blackbirds	X		X	X	Black-crowned night heron			X	X
Blue jay	X		X	X	Blue-winged teal			X	X
Bobolink			X	X	Bonaparte's gull			X	X
Broad-winged hawk			X	X	Bufflehead			X	X
Canada goose	X	X	X	X	Canvasback			X	X
Cattle egret			X	X	Cedar waxwing				
Chicken (feral)					Common barn owl			X	X
Common loon			X	X	Cooper's hawk	X		X	X
Dark-eyed junco			X	X	Double-crested cormorant	X	X	X	X
Downy woodpecker			X	X	Duck (feral)				
Dunlin					Eastern kingbird			X	X
Eastern meadowlark			X	X	Eastern screech owl			X	X
English (House) sparrow	X		X	X	Eurasian collared dove	X		X	X
European starling	X	X	X	X	Franklin's gull			X	X
Gadwall			X	X	Goose (feral)			X	X
Goldeneye			X	X	Great blue heron	X	X	X	X
Great egret	X		X	X	Greater white-fronted goose			X	X
Greater yellowlegs			X	X	Great horned owl		X	X	X
Grebe			X	X	Green heron	X		X	X
Green-winged teal			X	X	Grey catbird			X	X
Hairy woodpecker			X	X	Herring gull	X	X	X	X
Horned lark			X	X	House finch			X	X
Killdeer			X	X	Little blue heron			X	X
Long-eared owl			X	X	Longspur			X	X
Mallard	X	X	X	X	Merganser			X	X
Monk parakeet		X	X	X	Mourning dove	X		X	X
Mute swan			X	X	Nighthawk			X	X
Northern cardinal			X	X	Northern flicker			X	X
Northern goshawk			X	X	Northern harrier			X	X
Northern mockingbird			X	X	Northern pintail			X	X
Northern shoveler			X	X	Osprey			X	X
Ovenbird					Peregrine falcon		X	X	X
Pileated woodpecker			X	X	Purple finch			X	X
Purple martin			X	X	Quail			X	X
Red-bellied woodpecker			X	X	Red-headed woodpecker			X	X
Redhead			X	X	Red-shouldered hawk			X	X
Red-tailed hawk	X	X	X	X	Ring-billed gull	X	X	X	X
Ring-necked duck			X	X	Ring-necked pheasant			X	X
Rock pigeon (feral)	X		X	X	Rough-legged hawk			X	X
Ruby-throated hummingbird					Ruddy duck			X	X
Sandhill crane			X	X	Sandpiper			X	X
Sapsucker			X	X	Scaup			X	X
Sharp-shinned hawk			X	X	Short-billed dowitcher			X	X
Short-eared owl			X	X	Shrike			X	X

Species	Resource*				Species	Resource			
	A	N	P	H		A	N	P	H
Snow bunting			X	X	Snow goose			X	X
Snowy owl			X	X	Sparrow (native)			X	X
Swainson's hawk			X	X	Swallow			X	X
Swift			X	X	Tern			X	X
Thrush					Vultures	X		X	X
White-breasted nuthatch	X		X	X	Wild turkey	X		X	X
Wilson's snipe			X	X	Wood duck			X	X
Woodcock			X	X	Wren			X	X
Yellow-rumped Warbler			X	X	Yellow-crowned night heron			X	X

*A=Agriculture, N =Natural Resources, P=Property, H=Human Health and Safety

During requests for assistance received by WS, cooperators often report or WS verifies through site visits, damage associated with various species of birds. Between FY 2010 and FY 2014, bird damage has been reported to WS or has been verified to exceed $1,250,000 (see Table 1.3). Damages have been reported or verified as occurring primarily to property and agricultural resources.

Table 1.3 – Reported or WS verified monetary damage by resource caused by birds in Illinois from FY 2010-2014

Resource	Damage
Equipment	$534,252
Structures	$346,421
Human Health and Safety	$184,500
Aquaculture	$106,000
Other Agriculture	$29,497
Other Property	$17,980
Landscaping, Turf, and Gardens	$11,170
Animals	$10,200
Field Crops	$10,065
Livestock	$3,940
TOTAL	**$1,254,025**

Table 1.3 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 damaged by birds. Similarly, placing a monetary value on threats to human safety can be difficult. Monetary damage reported in Table 1.3 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. Information regarding bird damage to agricultural resources, property, natural resources, and threats to human safety are discussed in the following subsections of the EA.

Need to Resolve Bird Damage to Agricultural Resources

According to the National Agricultural Statistics Service (NASS), there were approximately 23,752,778 acres devoted to agricultural production in Illinois during 2012 with a market value of agricultural products sold estimated at over $17 billion (NASS 2014). Crop production in Illinois is dominated by corn and soybeans, accounting for 21,368,278 acres producing 1,624,620,903 bushels of crop. The livestock inventory in Illinois during 2012 included 1,127,630 head of cattle, 4,630,796 pigs, and an estimated 4,327,311chickens (NASS 2014). Aquaculture sales were valued at over $3.9 million in Illinois in 2012 (NASS 2014).

A variety of bird species can cause damage to agricultural resources. Damage and threats of damage to agricultural resources are often associated with bird species that exhibit flocking behaviors (e.g., red-winged blackbirds, European starlings) or colonial nesting behavior (e.g., herons, gulls). Damage occurs through direct consumption of agricultural resources, the contamination of resources from fecal droppings, or the threat of disease transmission to livestock from contact with fecal matter. As shown in Table 1.2, many of the bird species addressed have been identified as causing or posing threats to agricultural resources.

Damage to Aquaculture Resources

Damage to aquaculture resources occurs primarily from the economic losses associated with birds consuming fish and other commercially raised aquatic organisms. Damage can also result from the death of fish and other aquatic wildlife from injury associated with bird predation as well as the threat of disease transmission from one impoundment to another or from one aquaculture facility to other facilities as birds move between sites. The introduction of disease can result in substantial economic losses since the entire impoundment is likely to become infected, which can result in extensive mortality.

The principal aquaculture products propagated at facilities in Illinois are catfish, sport or game fish, and other food fish (NASS 2014). Of those birds shown in Table 1.2 associated with damage to agriculture, of primary concern to aquaculture facilities in Illinois are American white pelicans, cormorants, herons, egrets, and crows. The majority of the hatcheries in Illinois, however are used to raise fish for recreation. These hatcheries can also exhibit economic losses associated with birds consuming the recreational fish.

Price and Nickum (1995) concluded that the aquaculture industry has small profit margins so that even a small percentage reduction in the farm gate value due to predation is an economic concern. The magnitude of economic impacts that predatory birds have on the aquaculture industry can vary dependent upon many different variables including the value of the fish stock, number of depredating birds present, and the time of year the predation is taking place.

During a survey of aquaculture facilities in the northeastern United States, 76% of respondents identified the great blue heron as the bird of highest concern regarding predation (Glahn et al. 1999). Glahn et al. (1999) found that 80% of the aquaculture facilities surveyed in the northeastern United States perceived birds as posing an economic threat due to predation which coincided with 81% of the facilities surveyed having birds present on aquaculture ponds. Great blue herons were found at 90% of the sites surveyed by Glahn et al. (1999). Loss of trout in ponds with herons present ranged from 9.1% to 39.4% in a Pennsylvania study with an estimated loss in production ranging from $8,000 to nearly $66,000 (Glahn et al. 1999). The stomach contents of great blue herons collected at trout producing facilities in the northeastern United States contained almost exclusively trout (Glahn et al. 1999). From FY 2010 – FY 2014, WS engaged in 10 technical assistance projects concerning great blue herons at aquaculture facilities and as their population increases it is likely that these projects will continue to increase.

Also of concern to aquaculture facilities is the transmission of diseases by birds between impoundments and from facility to facility. Given the confinement of aquatic organisms inside impoundments at aquaculture facilities and the high densities of those organisms in those impoundments, the introduction of a disease can result in substantial economic losses since the entire impoundment is likely to become infected, which can result in extensive mortality. Although the actual transmission of diseases through transport by birds is difficult to document, birds have been documented as having the capability of spreading diseases through fecal droppings and possibly through other mechanical means such as on feathers, feet, and regurgitation (Murray and Peeler 2004).

Damage and Threats to Livestock Operations

Damage to livestock operations can occur from several bird species in Illinois (USDA 2008). Economic damage can occur from bird consumption of livestock feed, from birds feeding on livestock, and from the increased risks of disease transmission associated with large concentrations of birds. Although individual or small groups of birds can cause economic damage to livestock producers, such as a vulture or a group of vultures feeding on newborn cattle, many requests for assistance are associated with damage occurring from bird species that congregate in large flocks at livestock operations. Damage and disease threats to livestock operations can occur throughout the year, however damage is highest during those periods when birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. For some bird species, such as barn swallows, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists.

Of primary concern to livestock operations in Illinois are European starlings, red-winged blackbirds, grackles, cowbirds, house sparrows and pigeons. The flocking behavior of these species, either from feeding, roosting and/or nesting, can lead to economic losses to agricultural producers from the consumption of livestock feed and from the increased risks associated with the transmission of diseases from fecal matter being deposited in feeding areas and in water used by livestock.

Certain bird species are also known to prey upon livestock, which can result in economic losses to livestock producers. Vultures are known to prey upon newly born calves and harass adult cattle, especially during the birthing process. The NASS reported livestock owners lost 11,900 head of cattle and calves from vultures in the United States during 2010 valued at $4.6 million (NASS 2011). Vulture predation on livestock is distinctive. Black vultures have killed pigs by pulling eyes out followed by attacks to the rectal area or directly attacking the rectal area (Lovell 1947, Lovell 1952, Lowney 1999). During a difficult delivery, vultures will peck at the half-expunged calf and kill it. In 2013, three calves were reported killed by black vultures in southern Illinois at a cost of $2,100.

In addition to vultures, eagles can also threaten livestock. Both bald and golden eagles can occur in Illinois; however bald eagles are more common. Bald eagles are not generally predators of livestock. They will, however, consume carrion that can be present at livestock operations and are therefore often assumed to be the predator responsible for livestock loss. In 1995, Vern Marr et al. found that bald eagles consumed 83% of sheep carcasses available in Oregon and 87% of bald eagle castings contained sheep wool. However, bald eagles were never observed depredating sheep. In a survey of animal damage control field personell, only 4% of respondents indicated that bald eagles were suspected to be responsible for loss of livestock in the western U.S. (Phillips and Sheridan Blom 1988). Golden eagles are more common in the western United States but are occasionally sighted in Illinois. Although most reasearchers have found predation levels of golden eagles on livestock (mostly sheep and goats) to be low, predation can increase in situations where local concentrations of golden eagles are high and other sources of food are scarce (Avery and Cummings 2004). In the western U.S., 62% of animal damage control field personell reported golden eagles as being the primary concern related to livestock loss by eagles (Phillips and Sheridan Blom 1988). Missouri and Iowa have experienced infrequent requests for service regarding eagle depredation on young swine, sheep and goats over the past ten years but note the increase in eagle populations likely has led to more incidents (E. Colboth and D. McMurtry, personal communication). In Illinois, WS has not received any requests for technical or operational assistance related to eagles and livestock depredation.

Economic losses can also result from raptors, particularly red-tailed hawks, feeding on domestic fowl such as chickens and waterfowl. Free-ranging fowl or fowl allowed to range outside of confinement for a period are particularly vulnerable to predation by raptors. Assigning a value to these losses are difficult because they are not always reported.

The flocking behavior of European starlings, house/English sparrows, crows, and feral pigeons during feeding, roosting, and/or nesting can lead to economic losses to agricultural producers from the consumption of livestock feed. Economic damages associated with starlings and blackbirds feeding on livestock rations has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et al. 1968, Dolbeer et al. 1978, Glahn and Otis 1981, Glahn 1983, Glahn and Otis 1986). Starlings damage an estimated $800 million worth of agricultural resources per year (Pimentel et al. 2000). Diet rations for cattle contain all of the nutrients and fiber that cattle need, and are so thoroughly mixed that cattle are unable to select any single component over others. Livestock feed and rations are often formulated to ensure proper health of the animal. Higher fiber roughage in livestock feed is often supplemented with corn, barley, and other grains to ensure weight gain and in the case of dairies, for dairy cattle to produce milk. Livestock are unable to select for certain ingredients in livestock feed while birds often can selectively choose to feed on the corn, barley, and other grains formulated in livestock feed. Livestock feed provided in open troughs is most vulnerable to feeding by birds. Birds often select for those components of feed that are most beneficial to the desired outcome of livestock. When large flocks of birds selectively forage for components in livestock feeds, the composition and the energy value of the feed can be altered which can negatively affect the health and production of livestock. The removal of this high-energy source by birds is believed to reduce milk yields, weight gains, and is economically critical (Feare 1984). Glahn and Otis (1986) reported that starling damage was also associated with proximity to roosts, snow, and freezing temperatures and the number of livestock on feed.

The economic significance of feed losses to starlings and blackbirds has been demonstrated by Besser et al. (1968) who concluded that the value of losses in feedlots near Denver, Colorado was $84 per 1,000 birds in 1967. Forbes (1995) reported European starlings consumed up to 50% of their body weight in feed each day. Glahn and Otis (1981) reported losses of 4.8 kg of pelletized feed consumed per 1,000 bird minutes. Glahn (1983) reported that 25.8% of farms in Tennessee experienced starling depredation problems of which 6.3% experienced considerable economic loss. In Pennsylvania, Shwiff et al. (2012) estimated that econmomic loss associated with bird damage was between $4.11M and 12.08M (mean 10.6M) with approximately 43 to 128 jobs foregone in 2009.

In addition, large concentrations of birds feeding, roosting, and/or loafing at livestock operations increase risks of disease transmission from fecal matter being deposited in areas where livestock feed, water, and are housed. Birds feeding in open troughs on livestock feed can leave fecal deposits, which can be consumed by livestock. Fecal matter can also be deposited in sources of water for livestock, which increases the likelihood of disease transmission and can contaminate other surface areas where livestock can encounter fecal matter deposited by birds. Many bird species, especially those encountered at livestock operations, are known to carry infectious diseases which can be excreted in fecal matter and pose not only a risk to individual livestock operations, but can be a source of transmission to other livestock operations as birds move from one area to another. A number of diseases that could affect livestock have been associated with rock pigeons, European starlings, and house sparrows and are described in Table 1.4 (Weber 1979).

Table 1.4 – Diseases of livestock that have been linked to feral domestic pigeons, European starlings, blackbirds, and/or English sparrows. Information from Weber 1979.

Disease	Livestock affected	Symptoms	Comments
Bacterial:			
Erysipeloid	Cattle, swine, horses, sheep, goats, chickens, turkeys, ducks	Pigs - arthritis, skin lesions, necrosis, septicemia Sheep - lameness	serious hazard for the swine industry, rejection of swine meat at slaughter due to speticemia, also affects dogs
Salmonellosis	All domestic animals	abortions in mature cattle, mortality in calves, decrease in milk production	Over 1700 serotypes

		in dairy cattle Colitis in pigs,	
Pasteurellosis	cattle, swine, horses, rabbits, chickens, turkey	Chickens and turkeys die suddenly without illness pneumonia, bovine mastitis, abortions in swine, septicemia, abscesses	Also affects cats and dogs
Avian tuberculosis	chickens, turkeys, swine, cattle, horses, sheep	Emaciation, decrease in egg production, and death in poultry. Mastitis in cattle	Also affects cats and dogs
Streptococcosis	cattle, swine, sheep, horses, chickens, turkeys, geese, ducks, rabbits	Emaciation and death in poultry. Mastitis in cattle, abscesses and inflammation of the heart , and death in swine	feral pigeons are susceptible and aid in transmission
yersinosis	cattle, sheep, goats, horses, turkeys, chickens, ducks	abortion in sheep and cattle	Also affects dogs and cats
vibriosis	cattle and sheep	In cattle, often a cause of infertility or early embryonic death. In sheep, the only known cause of infectious abortion in late pregnancy	Of great economic importance
Listeriosis	Chickens, ducks, geese, cattle, horses, swine, sheep, goat	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles	Also affects cats and dogs
Viral:			
meningitis	cattle, sheep, swine, poultry	inflammation of the brain, newborn calves unable to suckle	associated with listeriosis, salmonellosis, cryptococcosis
Encephalitis (7 forms)	horses, turkeys, ducks	drowsiness, inflammation of the brain	Mosquitos serve as vectors
Mycotic (fungal):			
aspergillosis	cattle, chickens, turkeys, and ducks	abortions in cattle	common in turkey poults
Blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	Rarely	Affects horses, dogs, and cats
candidiasis	cattle, swine, sheep, horses, chickens, turkeys	In cattle, mastitis, diarrhea, vaginal discharge, and aborted fetuses	causes unsatisfactory growth in chickens
Cryptococcosis	cattle, swine, horses	chronic mastitis in cattle, decreased milk flow and appetite loss	Also affects dogs and cats
histoplasmosis	horses cattle and swine	(in dogs) chronic cough, loss of appetite, weakness, depression, diarrhea, extreme weight loss	also affects dogs; actively grows and multiplies in soil and remains active long after birds have departed
Coccidiosis	poultry, cattle, and sheep	bloody diarrhea in chickens, dehydration, retardation of growth	almost always present in English sparrows; also found in pigeons and European starlings
Protozoal:			
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
toxoplasmosis	cattle, swine, horses, sheep, chickens, turkeys	In cattle, muscular tremors, coughing, sneezing, nasal discharge, frothing at the mouth, prostration and abortion	Also affects dogs and cats
Rickettsial/Chlamydial:			
chlamydiosis	cattle, horses, swine, sheep, goats, chickens, turkeys, ducks, geese	In cattle, abortion, arthritis, conjunctivitis, enteritis	also affects dogs and cats and many wild birds and mammals
Q fever	affects cattle, sheep, goats, and poultry	may cause abortions in sheep and goats	can be transmitted by infected ticks

Although birds are known to be carriers of diseases (vectors) that are transmissible to livestock and poultry, the rate that transmission occurs is poorly understood. For example, results of experiments assessing the spread of avian influenza among domestic poultry indicate that bird to bird transmission is extremely complex and differences occur between the strain of the virus, species of birds affected, and environmental conditions (Alexander et al 1986, Capua and Alexander 2007). Since multiple modes of disease transmission exist, identifying a single specific source can be difficult. Diligent biosecurity generally prevents wild bird to livestock transmission, but wild birds are often implicated in moving virus strains to a new area, resulting in infected surface water, and facilitating mechanical movement by people or other animals into confinements (Capua and Alexander 2007).

Carlson et al. (2011) reported that European starlings have the potential to transmit *salmonella* to livestock through droppings in feed troughs and contaminating drinking water troughs and the probability of *salmonella* contamination of feed and water troughs increased as the presence of starlings increased. Birds also cause damage by defecating on fences, shade canopies, and other structures, which can accelerate corrosion of metal components and can be aesthetically displeasing. Large concentrations of birds at livestock feeding operations can also pose potential health hazards to feedlot/dairy operators and their personnel through directly contacting fecal droppings or by droppings creating unsafe working conditions.

WS actively conducts avian health surveillance surveys to test for the prevalence of avian influenza viruses, avian paramyxovirus (APMV), and arboviruses including eastern equine encephalitis, St. Louis encephalitis, West Nile virus, and Turlock virus in various wild bird species. Newcastle disease is caused by APMV serotype 1, and depending on the virulence and species affected, can cause significant mortality in poultry (Alexander 2000). APMV can be spread to poultry through contaminated feces and respiratory secretions of wild birds; chickens in particular are highly susceptible to severe illnesses from the virus and very high mortality rates are likely (CFSPH 2011). Wild and domestic waterfowl are the acknowledged natural reservoirs for a variety of avian influenza viruses (Davidson and Nettles 1997). Avian influenza circulates among those birds without clinical signs and is not an important mortality factor in wild waterfowl (Davidson and Nettles 1997). However, the potential for avian influenza to produce devastating disease in domestic poultry makes its occurrence in waterfowl an important issue (Davidson and Nettles 1997, USDA 2005).

In 2014, Highly Pathogenic Avian influenza (HPAI) was discovered in wild waterfowl, captive Gyrfalcons, and several backyard poultry flocks in Washington (USDA 2014b). The detection of HPAI in the United States resulted in 30 countries putting restrictions on poultry and egg product imports (USDA 2015), the financial outfall of which is still not known. However, an outbreak of HPAI in the 1980's resulted in the destruction of 17 million chickens and turkeys at a cost of more than $65 million Federal dollars, and an estimated indirect cost of $250 million (Fichtner 1986).

Damage to Agricultural Crops

Besser (1985) estimated damage to agricultural crops associated with birds exceeded $100 million annually in the United States. Bird damage to agricultural crops occurs primarily from the consumption of sprouting crops (*i.e.*, loss of the crop and revenue), but also consists of trampling of emerging crops by waterfowl, damage to fruits associated with feeding, and fecal contamination. Crop commodities harvested in 2012 include corn, wheat, oats, barley, sorghum, soybeans, forage, rice, sunflowers, and vegetables (NASS 2014). Damage to agricultural field crops, as reported to WS, occurs primarily from American crows, Canada geese, starlings, blackbirds, and pigeons.

Waterfowl can graze and trample a variety of crops, including alfalfa, barley, corn, soybeans, wheat, rye, and oats (Cleary 1994). For example, a single intense grazing event by Canada geese in fall, winter, or

spring can reduce the yield of winter wheat by 16 to 30% (Fledger et al. 1987), and reduce growth of rye plants by more than 40% (Conover 1988). However, some research has reported that grazing by geese during the winter may increase rye or wheat seed yields (Clark and Jarvis 1978, Allen et al. 1985). Since 1985, agricultural practices have changed resulting in intensive wheat growing methods with much higher yields of approximately 100 bushels per acre, but these crops are unable to sustain even light grazing pressure without losing yield. Associated costs with agricultural damage involving waterfowl include costs to replant grazed crops (e.g., soybeans, corn), implementing non-lethal wildlife management practices, purchasing replacement hay, and decreased yields.

Bird damage to sweet corn can also result in economic losses to producers with damage often amplified since damage to sweet corn caused by birds makes the ear of corn unmarketable since damage is unsightly to the consumer (Besser 1985). Large flocks of red-winged blackbird are responsible for most of the damage reported to sweet corn with damage also occurring from grackles and starlings (Besser 1985). Damage occurs when birds rip or pull back the husk exposing the ear for consumption. Most bird damage occurs during the development stage known as the milk and dough stage when the kernels are soft and filled with a milky liquid, which the birds puncture to ingest the contents. Once punctured, the area of the ear damage often discolors and is susceptible to disease introduction into the ear (Besser 1985). Damage usually begins at the tip of the ear as the husk is ripped and pulled back but can occur anywhere on the ear (Besser 1985).

Damage can also occur to sprouting corn as birds pull out the sprout or dig the sprout up to feed on the seed kernel (Besser 1985). Damage to sprouting corn occurs primarily from grackles and crows but red-winged blackbirds and common ravens are known to cause damage to sprouting corn (Mott and Stone 1973). Additionally, starlings may pull sprouting grains and feed on planted seed (Johnson and Glahn 1994). Damage to sprouting corn is likely localized and highest in areas where breeding colonies of grackles exist in close proximity to agricultural fields planted with corn (Mott and Stone 1973, Rogers and Linehan 1977). Rogers and Linehan (1977) found grackles damaged two corn sprouts per minute on average when present at a field planted near a breeding colony.

Fruit and nut crops can be damaged by crows, robins, starlings, red-winged blackbirds, grackles, cowbirds, and American crows. Besser (1985) estimated bird damage to grapes, cherries, and blueberries exceed $1 million dollars annually in the United States. In 1972, Mott and Stone (1973) estimated that birds caused $1.6 to $2.1 million in damage to the blueberry industry in the United States, with starlings, robins, and grackles causing the most damage. Red-winged blackbirds, cowbirds, woodpeckers, and crows are also known to cause damage to blueberries (Besser 1985). Damage to blueberries typically occurs from birds plucking and consuming the berry (Besser 1985).

Damage to apples occurs from beak punctures which makes the apples unmarketable (Besser 1985). Crows and robins have been documented as causing damage to apples (Mitterling 1965). Damage is infrequently reported in apples since harvest of the crop typically occurs before apples reach a stage when damage is likely with damage being greatest during periods of drought (Mitterling 1965).

Need to Resolve Threats that Birds Pose to Human Health and Safety

Several bird species listed in Table 1.2 can be closely associated with human habitation and often exhibit gregarious roosting behavior, such as starlings, pigeons, waterfowl, gulls, crows, swallows, grackles, cowbirds, and red-winged blackbirds. The close association of those bird species with human activity can pose threats to human safety from disease transmission and threaten the safety of air passengers if birds are struck by aircraft. Excessive droppings can be aesthetically displeasing and aggressive behavior, primarily from waterfowl, can pose risks to human safety.

Threat of Disease Transmission

Birds can play an important role in the transmission of zoonotic diseases (i.e., animal diseases transmissible to humans) as either a reservoir host, by dispersing infected arthropod vectors (Reed et al. 2003), or through direct transmission by contact with infected birds or fecal material. As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, European starlings, and house sparrows; the more common zoonotic diseases affecting humans are described in table 1.5 (Weber 1979). Wild birds are also known to be reservoirs of several emerging infectious diseases, including West Nile Virus (WNV). Birds serve as important amplifying hosts for WNV, and over 110 species have been found to be susceptible to infection (Petersen and Roehrig 2001).

Few studies are available on the direct transmission of zoonotic diseases to people from wild birds. Study of this issue is complicated by the fact that some disease-causing agents associated with birds may also be contracted from other sources, or through a multi-species cycle such as West Nile Virus and *Culex spp* mosquitos (CDC 2013). The risk of direct disease transmission from wild birds to humans is likely very low; however the presence of disease organisms and potential transmission from domesticated birds and accumulations of fecal material is well documented (Weeks and Stickley 1984, Fallacara et al. 2000, USGS 2009).

Exposure to fecal material through direct contact, contaminated drinking water or food, or through the disturbance of accumulations of fecal droppings increases the likelihood of disease transmission. Many bird species (sparrows, pigeons, and starlings) are often associated with human habitation which increases interaction with birds or fecal material. Often birds are gregarious, coalescing in communal roosts or nesting areas (rookeries), which can lead to large accumulations of fecal material. Accumulations of bird droppings in public areas are aesthetically displeasing and are considered a health hazard by public health officials (IDPH 2007, Lenhart et al. 2004).

Table 1.5 - Diseases transmissible to humans that are associated with feral domestic pigeons, European starlings, And English sparrows. Information from Weber (1979)

Disease	Human Symptoms	Potential for Human Fatality
Bacterial:		
erysipeloid	skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	sometimes - particularly to young children, old or infirm people
salmonellosis	gastroenteritis, septicaemia, persistent infection	possible, especially in individuals weakened by other disease or old age
Pasteurellosis	respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	Rarely
Listeriosis	conjunctivitis, skin infections, meningitis in newborns, abortions, premature delivery, stillbirth	sometimes - particularly with newborns
Viral:		
meningitis	inflammation of membranes covering the brain , dizziness, and nervous movements	possible — can also result as a secondary infection with listeriosis, salmonellosis, cryptococcosis
encephalitis (7 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%
Mycotic (fungal):		
aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	Not usually
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	Rarely
candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	Rarely
cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis

histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow
Protozoal:		
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks
toxoplasmosis	inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	Possible
Rickettsial /Chlamydial:		
chlamydiosis	pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	occasionally, restricted to old, weak or those with concurrent diseases
Q fever	sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes	possible

In most cases in which human health concerns are a major reason for requesting assistance, no actual case of bird transmission of disease to humans have been proven to occur. Thus, the primary reason for requesting assistance is the risk of disease transmission.

Research has shown that gull species (e.g. Ring-billed gulls, Herring gulls, Glaucous gull), hereafter gulls, carry various species of bacteria such as *Bacillus* spp., *Clostridium* spp., *Campylobacter* spp., *Escherichia coli*, *Listeria* spp., and *Salmonella* spp. (MacDonald and Brown 1974, Fenlon 1981, Butterfield et al. 1983, Monaghan et al. 1985, Norton 1986, Vauk-Hentzelt et al. 1987, Quessey and Messier 1992). Transmission of bacteria from gulls to humans is difficult to document; however, Reilley et al. (1981) and Monaghan et al. (1985) both suggested that gulls were the source of contamination for cases of human salmonellosis. Gulls can threaten the safety of municipal drinking water sources by potentially causing dangerously high levels of coliform bacteria from their fecal matter. Contamination of public water supplies by gull feces has been stated as the most plausible source for disease transmission (e.g., Jones et al. 1978, Hatch 1996). Gull feces have also been implicated in accelerated nutrient loading of aquatic systems (Portnoy 1990), which could have serious implications for municipal drinking water sources.
Salmonella (*Salmonella* spp.) is a significant foodborne illness causing more than 1,000,000 illnesses, 19,000 hospitalizations, and 380 deaths per year in the United States (Scallan et al. 2011). Outbreaks are often linked to contaminated meat, eggs, or dairy products; however, *Salmonella* spp. may also be contracted by humans handling materials soiled with bird feces (Stroud and Friend 1987). Persons infected with *Salmonella* typically experience fever, abdominal cramps, and diarrhea. *Salmonella* can also be transmitted from birds to livestock (Daniels et. al 2003) affecting productivity and causing serious illness in young animals (Aiello 1998), thereby proliferating the disease in the Human food chain. Wild birds have also been implicated as important vehicles of transmission on farms (Hoelzer et al. 2011); particularly on farms lacking proper bird proofing. Davies and Wray (1997) found *Salmonella* infested bird droppings and contamination of feed and feed ingredients at processing mills, and Barber et al. (2002) cultured salmonella positive environmental samples (7.9%) collected from bird feces found at swine farms in Illinois. Prevention of salmonella contamination early in the human food production chain is an important step in the prevention of foodborne illness (Crump et al. 2002)

Histoplasma capsulatum is the fungus which causes the disease histoplasmosis in humans (Weeks and Stickley 1984). *H. capsulatum* is endemic in states bordering the Ohio River Valley and the lower Mississippi River, including Illinois (Manos et al. 1956) and thrives in soils enriched by nitrogen rich fecal material (Lenhart et al. 2004). The disturbance of soils or fecal material under bird or bat roosts can cause *H. capsulatum* to become airborne. Once airborne, the fungus could be inhaled by people in the area. *H. capsulatum* primarily affects the lungs, and most people are asymptomatic or have only mild

flu-like symptoms. Infants, young children, and persons with weakened immune systems or chronic lung disease are at increased risk for acute or chronic pulmonary disease which can include respiratory symptoms, fever, chest pains, and rarely multiple organ involvement that can be fatal unless treated (USGS 2009).

Psittacosis (also known as parrot fever and ornithosis), is caused by the bacterium *Chlamydia psittaci. C. psittaci* can be found in fecal material, and can be transmitted if it becomes airborne (Locke 1987). *C. psittaci* has been isolated from more than 100 species of birds; although mostly it is known as a disease of pet psittascine birds such as parrots, macaws, and parakeets. Waterfowl, herons, and rock pigeons are the most commonly infected wild birds in North America (Locke 1987), but it has also been isolated from ring-billed gulls, various songbirds, and upland gamebirds (Friend and Franson 1999). Severe cases of psittacosis have occurred among wildlife biologists and others handling snow geese, ducks, pigeons, and other birds (Wobeser and Brand 1982). Psittacosis symptoms vary from a mild flu-like illness with fever, headache, myalgia, with respiratory involvement, or it can present as severe atypical pneumonia. The illness generally is self-limiting and lasts 1-10 days, but complications can occur in some cases resulting in premature births, endocarditis, renal disease or multi-organ failure. Psitticosis can be fatal to humans if not treated with antibiotics, particularly to persons with weakened immune systems (Beeckman and Vanrompay 2009).

Escherichia coli are fecal coliform bacteria associated with fecal material of warm-blooded animals. There are over 200 specific serological types of *E. coli* with the majority of serological types being harmless (Sterritt and Lester 1988). Probably the best-known serological type of *E. coli* is *E. coli* O157:H7, which is usually associated with cattle (Gallien and Hartung 1994). Many communities monitor water quality at swimming beaches and lakes, but lack the financial resources to pinpoint the source of elevated fecal coliform counts. When fecal coliform counts at swimming beaches exceed established standards, the beaches are temporarily closed which can adversely affect the enjoyment of the area by the public, even though the serological type of the *E. coli* is unknown. Ring-billed and herring gulls are examples of two species that create concern with E. coli in Illinois. Sites in northern Illinois have had to ban swimming on public beaches because of high levels of *E. coli* bacteria in the water. Swimming bans due to high *E. coli* levels are estimated to have cost the city of Chicago over $2 million dollars in lost revenue (Whitman et al. 2001). The high concentration of gulls is believed to contribute to the *E. coli* problem at beaches. Results from a United States Department of the Interior, Geological Survey (USGS) study indicate that gulls were among the largest contributors to *E. coli* contamination at the beaches at a northern Illinois beach (Whitman et al. 2001). When the numbers of gulls observed at the beach were logged one day, it correlated significantly with water and foreshore sand concentrations of *E. coli*. In Lake County, Illinois, the Lake County Health Department used genetic ribotyping to identify the probable sources of elevated *E. coli* bacteria levels responsible for beach closures at three beaches in the county in 2003. Over 50% of the *E coli* isolates collected at each of the three beaches were from avian sources. Lake County Health Department Officials estimate that 95% or more of the birds observed at these sites were gulls (M. Adam, Lake County, pers. comm. March 20, 2007, Kinzelman et al 2006).

While direct transmission of diseases or parasites from birds to humans has not been well documented, the potential exists (Luechtefeld et al. 1980, Wobeser and Brand 1982, Hill and Grimes 1984, Pacha et al. 1988, Blankespoor and Reimink 1991, Graczyk et al. 1997, Saltoun et al. 2000, Kassa et al. 2001). In some cases, infections may even be life threatening for immunocompromised and immunosuppressed people (Roffe 1987, Graczyk et al. 1998). Financial costs related to human health threats involving birds may include testing of water for *coliform* bacteria, cleaning and sanitizing public-use areas, removal of fecal material, contacting and obtaining assistance from public health officials, and implementing non-lethal and lethal methods of wildlife damage management to reduce risks. WS recognizes and defers to the authority and expertise of local and state health officials in determining what does or does not constitute a threat to public health.

Threat of Aircraft Striking Wildlife at Airports and Military Installations

In addition to threats of zoonotic diseases, birds also pose a threat to human safety from being struck by aircraft. Birds struck by aircraft, especially when ingested into engines, can lead to structural damage to the aircraft and can cause catastrophic engine failure. The civil and military aviation communities have acknowledged that the threat to human safety from aircraft collisions with wildlife 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 (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transportation industry as a whole (Conover et al. 1995). In several instances, wildlife-aircraft collisions in the United States have resulted in human fatalities. 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 that collided with a flock of European starlings (Terres 1980). More recently, US Airways Flight 1549 was forced to make an emergency landing in the Hudson River in New York after striking a flock of Canada geese during its initial climb out of LaGuardia Airport.
When birds enter or exit a roost in large flight lines at or near airports or when present in large flocks foraging on or near an airport, those bird species represent a safety threat to aviation. Vultures and raptors can also present a risk to aircraft because of their large body mass and slow-flying or soaring behavior. Vultures are considered the most hazardous bird for an aircraft to strike based on the frequency of strikes, effect on flight, and amount of damage caused by vultures throughout the country (Dolbeer et al. 2000). Mourning doves also present risks when their late summer behaviors include creating large roosting and loafing flocks. Their feeding, watering, and gritting behavior on airport turf and runways further increases the risk of bird-aircraft collisions.

From 1990 through 2013, 6,378 birds have been reported as struck by aircraft in Illinois (FAA 2014). During this same period, 142,603 bird strikes have been reported to the Federal Aviation Administration (FAA) in the United States (Dolbeer et al. 2014). The number of actual bird strikes is likely to be much greater since an estimated 80% of civil bird strikes may go unreported (Linnell et al. 1999, Cleary et al. 2005, Wright and Dolbeer 2005). Between 2004 and 2008, Dolbeer (2009) estimated that 39% of aircraft strikes were reported to the FAA. Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway. From 1990 through 2013, approximately 71% of reported bird strikes to general aviation aircraft in the United States occurred when the aircraft was at an altitude of 500 feet above ground level or less. Additionally, approximately 92% occurred less than 3,500 feet above ground level (Dolbeer et al. 2014).

Doves/pigeons, gulls, raptors, shorebirds, and waterfowl have been the bird groups most frequently struck by aircraft in the United States (Dolbeer et al. 2014). Of the total known birds struck in the United States from 1990 through 2013, pigeons and doves comprised 15%, gulls comprised 14%, while raptors accounted for 13%, shorebirds comprised 8%, and waterfowl were identified in 6% of reported strikes (Dolbeer et al. 2014). From 2009-2013, pilots and airport personnel in Illinois have reported striking or observing strikes with birds a total of 2,179 times (FAA 2014). This averages to be 435 strikes annually and this number is likely low as often times bird strikes go unnoticed or unreported.

Birds being struck by aircraft can cause substantial damage. Bird strikes can cause catastrophic failure of aircraft systems (e.g., ingesting birds into engines) which can cause the plane to become uncontrollable which can lead to crashes. Since 1988, more than 255 people worldwide have died in aircraft that have crashed after striking wildlife (Dolbeer et al 2014). Between 1990 and 2013, 26 people died after commercial or private aircraft have stuck birds in the United States (Dolbeer et al. 2014). Of those 26 fatalities involving bird strikes, eight fatalities occurred after striking birds that were not identified while eight fatalities occurred after strikes involving red-tailed hawks (Dolbeer et al. 2014). A recent example

occurred in Oklahoma where an aircraft struck American white pelicans (*Pelecanus erythrorhynchos*) causing the plane to crash killing all five people aboard (Dove et al. 2009). Injuries also occur from bird strikes to pilots and passengers. Between 1990 and 2013, 26 strikes involving geese have resulted in injuries to 128 people while 32 strikes involving vultures resulted in injuries to 39 people (Dolbeer et al. 2014).

Additional Human Safety Concerns Associated with Birds

As people are increasingly living in closer proximity to wildlife, the lack of harassing and threatening behavior by people toward many species of wildlife, especially around urban areas, has led to a decline in the fear wildlife have toward humans. When wildlife species begin to habituate to the presence of people and human activity, a loss of apprehension occurs that can lead those species to exhibit threatening behavior toward people. This threatening behavior continues to increase as human populations expand and the populations of those species that adapt to human activity increase. Threatening behavior can be in the form of aggressive posturing, a general lack of apprehension toward people, or abnormal behavior. Although birds attacking people occurs rarely, aggressive behavior by birds does occur, especially during nest building and the incubation of eggs and rearing of chicks. Raptors can aggressively defend their nests, nesting areas, and young, and may swoop and strike at pets, children, and adults.

In addition to raptors, waterfowl can also aggressively defend their nests and nestlings during the nesting season and may attack or threaten pets, children, and adults. Feral waterfowl often nest in high densities in areas used by humans for recreational purposes such as industrial areas, parks, beaches, and sports fields (VerCauteren and Marks 2004). If people unknowingly approach waterfowl or their nests at those locations, injuries could occur if waterfowl react aggressively to the presence of those people or pets. In 2012, an Illinois man drowned after encountering a mute swan. The swan was blamed for knocking the man out of his kayak and attacking him in the water, potentially leading to his death (Golab 2012). Additionally, slipping hazards can be created by the buildup of feces from birds on docks, walkways, and other foot traffic areas. To avoid those conditions, regular cleanup is often required to alleviate threats of slipping on fecal matter, which can be economically burdensome.

Need to Resolve Bird Damage Occurring to Property

As shown in Table 1.2, the bird species addressed in this assessment are known to cause damage to property in Illinois. Property damage can occur in a variety of ways and can result in costly repairs and clean-up. Bird damage to property occurs through direct damage to structures through roosting behavior and through their nesting activities. One example of direct damage to property occurs when vultures tear roofing shingles or pull out latex caulking around windows. Accumulations of fecal droppings can cause damage to buildings and statues. Woodpeckers also cause direct damage to property through excavating holes in buildings either for nesting purposes or to locate food which can remove insulation and allows water and other wildlife to enter the building. Aircraft striking birds can also cause substantial damage requiring costly repairs and aircraft downtime. Direct damage can result from birds that act aggressively toward their reflection in mirrors and windows, which can scratch paint and siding.

Birds frequently damage structures on private property and 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 in bird droppings. Electrical utility companies frequently have problems with birds and bird droppings causing power outages by shorting out transformers and substations. This has resulted in hundreds of thousands of dollars of outage time for power companies. In addition to causing power outages noted above, property damage from vultures can include tearing and consuming latex window caulking or rubber gaskets sealing window panes, asphalt and cedar roof shingles, vinyl seat covers from

boats, patio furniture, and ATV seats. Vultures also cause damage to cell phone and radio towers by roosting on critical tower infrastructure.

Gulls, raptors, waterfowl, and doves are the bird groups most frequently struck by aircraft in the United States. When struck, 26% of the reported gull strikes resulted in damage to the aircraft or had a negative effect on the flight while 63% of the reported waterfowl strikes resulted in damage or negative effects on the flight compared to 41% of strikes involving raptors and 10% of strikes involving pigeons and doves (Dolbeer et al. 2014). Since 1990, over $216 million in damages to civil aircraft have been reported from strikes involving waterfowl (Dolbeer et al. 2014). In total, aircraft strikes involving birds have resulted in over $596 million in reported damages to civil aircraft since 1990 in the United States (Dolbeer et al. 2014).

Damage to property associated with large concentrations of roosting birds occurs primarily from accumulations of droppings and feather debris. Birds that routinely roost and loaf in the same areas often leave large accumulations of droppings and feather debris, which is aesthetically displeasing and can cause damage to property. The recurring presence of fecal droppings under bird roosts can lead to repeated cleaning costs for property owners. Fecal accumulation from birds roosting in power plants and at industrial parks can lead to property damage to the facility as well as become a health hazard for workers. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property use, loss of aesthetic value of flowers, gardens, and lawns consumed by geese, loss of customers or visitors irritated by walking in fecal droppings, repair of golf greens, and replacing grazed turf. The costs of re-establishing overgrazed lawns and cleaning waterfowl feces from sidewalks have been estimated at more than $60 per bird (Allan et al. 1995).

The attraction of landfills as a food source for gulls has been well-documented (Mudge and Fern 1982, Patton 1988, Belant et al. 1995*a*, Belant et al. 1995*b*, Gabrey 1997, Belant et al. 1998). Large numbers of gulls are attracted to landfills as feeding and loafing areas throughout North America. In the midwestern United States, landfills often serve as foraging and loafing areas for gulls throughout the year, while attracting larger populations of gulls during winter (Washburn 2012). Landfills have even been suggested as contributing to the increase in gull populations (Verbeek 1977, Patton 1988, Belant and Dolbeer 1993*a*, Belant and Dolbeer 1993*b*, Belant et al. 1993). Gulls that visit landfills may loaf and nest on nearby rooftops, causing health concerns and structural damage to buildings and equipment. Bird conflicts associated with landfills include accumulation of feces on equipment and buildings, distraction of heavy machinery operators, and the potential for birds to transmit disease to workers on the site. The tendency for gulls to carry waste off site results in accumulation of feces and the deposition of garbage on surrounding industrial and residential areas which creates a nuisance, as well as increases the risks of disease transmission.

Damage to property by birds, reported to or verified by WS in Illinois has totaled $898,653 between FY 2010 and FY 2014, which is an average of $179,730 per year (Table 1.3). In most situations, requests for assistance received by WS are associated with the accumulation of fecal droppings in areas where birds roost, loaf, and feed causing structural damage to property.

Need to Resolve Bird Damage Occurring to Natural Resources

Birds can negatively affect natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation occurs when large concentrations of birds in a localized area negatively affect characteristics of the surrounding habitat, which can then adversely affect other wildlife species and become aesthetically displeasing. Competition can occur when two species compete (usually to the detriment of one species) for available resources,

such as food or nesting sites. Direct depredation occurs when predatory bird species feed on other wildlife species, which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered (T&E) species.

Habitat degradation in Illinois occurs primarily in areas where colonial waterbirds nest, where waterfowl trample vegetation and feed on new plantings at wetland restoration sites, or where the gregarious roosting behavior of birds occurs. The degradation of habitat occurs from the continuous accumulation of fecal droppings that occurs under nesting colonies of birds or under areas where birds consistently roost. Over time, the accumulation of fecal droppings under areas where colonial waterbirds nest can lead to the loss of vegetation due to the ammonium nitrogen found in the fecal droppings of birds. The combined activities of stripping leaves and branches for nesting material, the weight of nests of many colonial waterbirds breaking branches, and the accumulation of feces under areas where roosting and nesting occurs can lead to the death of surrounding vegetation within three to ten years of areas being occupied by colonial waterbirds (Lewis 1929, Lemmon et al. 1994, Weseloh and Ewins 1994, Weseloh and Collier 1995, Weseloh et al. 1995, Korfanty et al. 1999, Hebert et al. 2005).

Some species listed as threatened and endangered under the Endangered Species Act of 1973 (ESA) are preyed upon or otherwise adversely affected by certain bird species. Concentrations of gulls often impact the productivity and survivorship of rare or endangered colonial species such as terns (USDI 1996) and prey upon the eggs and chicks of colonial waterbirds. Colonial nesting gull species are also known to compete with other bird species, such as terns and plovers, for nest sites.

1.4 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of migratory birds is the responsibility of the USFWS. As the authority for the overall management of bird populations, the USFWS was involved in reviewing the EA and provided input to ensure compliance with agency mandates, policies, and regulations. The IDNR is responsible for managing wildlife in the State of Illinois, including birds. The IDNR establishes and enforces regulated hunting seasons, including the establishment of seasons that allow the take of some of the bird species addressed in this assessment.

For migratory birds, the IDNR can establish hunting seasons for those species under frameworks determined by the USFWS. WS' activities to reduce and/or prevent bird damage would be coordinated with the USFWS and the IDNR, which would ensure WS' actions are incorporated into population objectives established by those agencies. The take of many of the bird species addressed in this EA can only occur when authorized by a depredation permit issued by the USFWS and/or a nuisance wildlife control permit issued by the IDNR; therefore, the take of those bird species by WS to alleviate damage or reduce threats of damage would only occur at the discretion of those agencies. In addition, WS' annual take of birds to alleviate damage or threats of damage would only occur at levels authorized by those agencies as specified in depredation permits.

Based on the scope of this EA, the decisions to be made are:

- How can WS best respond to the need to reduce bird damage in Illinois?
- Do the alternatives have significant impacts meriting the preparation of an Environmental Impact Statement (EIS)?

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for bird damage management to reduce threats to human safety and to resolve damage to property, natural resources, and agricultural resources on federal, state, tribal, municipal, and private land within the State of Illinois, wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting damage management activities to meet the need for action and evaluates different alternatives to meet that need while addressing those issues.

The methods available for use under the alternatives evaluated are provided in Appendix B. The alternatives and Appendix B also discuss how methods would be employed to manage damage and threats associated with birds. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives by WS to manage or prevent damage and threats associated with birds from occurring when permitted by the USFWS pursuant to the Migratory Bird Treaty Act (MBTA) and/or when permitted by the IDNR in compliance with Illinois statutes and administrative codes.

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 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.

The USFWS is a consulting agency on this EA to analyze cumulative take of those bird species addressed in this EA from the issuance of depredation permits to entities within the state and to ensure compliance with the NEPA. The USFWS has jurisdiction over the management of migratory birds and has specialized expertise in identifying and quantifying potential adverse effects to the human environment from activities to manage bird damage.

Federal, State, County, City, and Private Lands

Under two of the alternatives, WS could continue to provide bird damage management activities on federal, state, county, municipal, and private land in Illinois when a request is received for such services by the appropriate resource owner or manager. In those cases where a federal agency requests WS' assistance with managing damage caused by birds, the requesting agency would be responsible for analyzing those activities in accordance with the NEPA. However, this EA would cover such actions if the requesting federal agency determined the analyses and scope of this EA were appropriate for those actions and the requesting federal agency adopted this EA through their own Decision based on the analyses in this EA. Therefore, actions taken on federal lands have been analyzed in the scope of this EA.

Native American Lands and Tribes

At present there are no federally-recognized tribes in Illinois. In the event that Native American tribes are federally-recognized in the state the WS program in Illinois would only conduct damage management activities on tribal lands when requested by a Native American Tribe. Activities would only be conducted after a MOU or cooperative service agreement had been signed between WS and the Tribe requesting

assistance. Therefore, the Tribe would determine when WS' assistance is required and what activities would be allowed. Because Tribal officials would be responsible for requesting assistance from WS and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would be anticipated. Those methods available to alleviate damage associated with birds on federal, state, county, municipal, and private properties under the alternatives analyzed in this EA would be available for use to alleviate damage on Tribal properties when the use of those methods has been approved by the Tribe requesting WS' assistance. Therefore, the activities and methods addressed under the alternatives would include those methods that could be employed on Native American lands, when requested and agreed upon between the Tribe and WS.

Period for which this EA is Valid

If the analyses in this EA indicate an EIS is not warranted, this EA would remain valid until WS and the USFWS determine that new needs for action, changed conditions, new issues, or new alternatives having different potential environmental impacts must be analyzed. At that time, this analysis and document would be reviewed and supplemented pursuant to the NEPA. The EA would be reviewed to ensure that activities conducted under the selected alternative occur within the parameters evaluated in the EA. If the alternative analyzing no involvement in bird damage activities by WS were selected, no additional analyses would occur based on the lack of involvement by WS. The monitoring of activities by WS would ensure the EA remained appropriate to the scope of damage management activities conducted by WS in Illinois under the selected alternative, when requested.

Site Specificity

This EA analyzes the potential impacts of bird damage management based on previous activities conducted on private and public lands in Illinois where WS and the appropriate entities have entered into a MOU, cooperative service agreement, or other comparable document. This EA also addresses the potential impacts of bird damage management on areas where additional agreements may be signed in the future. Because the need for action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the alternatives.

Many of the bird species addressed in this EA can be found statewide and throughout the year; therefore, damage or threats of damage can occur wherever those birds occur. Planning for the management of bird damage must be viewed as being conceptually similar to other entities whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown, but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Some of the sites where bird damage could occur can be predicted; however, specific locations or times where such damage would occur in any given year cannot be predicted. The threshold triggering an entity to request assistance from WS to manage damage associated with birds is often unique to the individual; therefore, predicting where and when such a request for assistance would be received by WS is difficult. This EA emphasizes major issues as those issues relate to specific areas whenever possible; however, many issues apply wherever bird damage occurs and those issues are treated as such in this EA.

Chapter 2 of this EA identifies and discusses issues relating to bird damage management in Illinois. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS (see Chapter 3 for a description of the WS Decision Model and its application).

Decisions made using the model would be in accordance with WS' directives[5] and Standard Operating Procedures (SOPs) described in this EA as well as relevant laws and regulations.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Illinois. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to accomplish the program's mission.

Summary of Public Involvement

Issues were defined and preliminary alternatives were identified by WS through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document will be advertised to the public through legal notices published in local print media, through direct mailings to parties that have requested to be notified or have been identified to have an interest in the reduction of threats and damage associated with birds, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

WS will provide for a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a Decision.

1.6 RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

Double-crested Cormorant Management in the United States - Final Environmental Impact Statement: The USFWS has prepared a Final EIS (FEIS) on the management of double-crested cormorants (USFWS 2003). WS was a formal cooperating agency during the preparation of the FEIS and 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).

Extended Management of Double-crested Cormorants under 50 CFR 21.47 and 21.48 - Final Environmental Assessment: The cormorant management FEIS developed by the USFWS in cooperation with WS established a Public Resource Depredation Order (PRDO; 50 CFR 21.48). To allow for an adaptive evaluation of activities conducted under the PRDO established by the FEIS, those Orders would have expired on April 30, 2009 (USFWS 2003). 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).

Proposal to Permit Take as Provided under the Bald and Golden Eagle Protection Act - Final Environmental Assessment: Developed by the USFWS, this EA evaluated the issues and alternatives associated with the promulgation of new regulations to authorize the "*take*" of bald eagles and golden eagles as defined under the Bald and Golden Eagle Protection Act. The preferred alternative in the EA evaluated the authorization of disturbance take of eagles, the removal of eagle nests where necessary to reduce threats to human safety, and the issuance of permits authorizing the lethal take of eagles in limited circumstances, including authorizing take that is associated with, but is not the purpose of, an action (USFWS 2010). A Decision and Finding of No Significant Impact (FONSI) was made for the preferred

[5] WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

alternative in the EA. The selected alternative in the EA established new permit regulations for the "*take*" of eagles (see 50 CFR 22.26) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27). The USFWS published a Final Rule on September 11, 2009 (74 FR 46836-46879).

***Depredation Permits for the Control and Management of Gulls in the Great Lakes Region - Final Environmental Impact Statement*:** The USFWS Region 3 prepared an EA and signed a FONSI (USFWS 2000) for the management of ring-billed and herring gull damage to protect human health and safety, property and the productivity of other colonial water birds. The alternative selected by the USFWS allows for the issuance of depredation permits for the take of ring-billed and herring gulls for damage management.

Resident Canada Goose Management - Final Environmental Impact Statement: The USFWS has issued a FEIS on the management of resident Canada geese (USFWS 2005). Pertinent and current information available in the FEIS has been incorporated by reference into this Decision/FONSI. The FEIS may be obtained by contacting the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, MBSP-4107, Arlington, Virginia 22203 or by downloading it from the USFWS website at http://www.fws.gov/migratorybirds/issues/cangeese/finaleis.htm.

USFWS Light Goose Management – Final Environmental Impact Statement: The USFWS has issued a FEIS that analyzes the potential environmental impacts of management alternatives for addressing problems associated with overabundant light goose populations. The "*light*" geese referred to in the FEIS include the lesser snow goose (*Chen caerulescens caerulescens*), greater snow goose (*C. c. atlantica*), and the Ross's goose (*C. rossii*), and that nest in Arctic and sub-Arctic regions of Canada and migrate and winter throughout the United States. A ROD and Final Rule were published by the USFWS and the final rule went into effect on December 5, 2008. Information from the USFWS FEIS on light goose management (USFWS 2007*a*) has been incorporated by reference into this EA.

***WS' Environmental Assessments*:** WS has previously developed an EA that analyzed the need for action to manage damage associated with several bird species (USDA 2008). This EA identified the issues associated with managing damage associated with birds and analyzed alternative approaches to meet the specific need identified in the EA while addressing the identified issues.

Since activities conducted under the previous EAs will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EAs that addressed birds will be superseded by this analysis and the outcome of the Decision issued.

***Chicago's Bird Agenda 2006*:** The Chicago Bird Agenda was established by a collaboration of city and state planners, environmental organizations and federal conservation agencies to set priorities for preserving bird habitat, reducing hazards to birds and supporting desirable bird species (Chicago Department of the Environment 2006). It also provides general guidance on addressing problems with bird species causing nuisance conflicts including issues with goose droppings at parks, the potential impact of gull feces on beach closures and adverse impacts of non-native bird species on native birds.

1.7 AUTHORITY OF FEDERAL AND STATE AGENCIES

The authorities of WS and other agencies as those authorities relate to conducting wildlife damage management activities are discussed by agency below:

WS' Legislative Authority

The primary statutory authorities for the WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 USC 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with wildlife. WS' directives define program objectives and guide WS' activities to manage wildlife damage management.

USFWS' Authority

The USFWS mission is to conserve, protect, and enhance fish and wildlife along with their habitats for the continuing benefit of the American people. Responsibilities are shared with other federal, state, tribal, and local entities; however, the USFWS has specific responsibilities for the protection of T&E species under the ESA, migratory birds, inter-jurisdictional fish, and certain marine mammals, as well as for lands and waters that the USFWS administers for the management and protection of those resources. The USFWS also manages lands under the National Wildlife Refuge System.

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the MBTA and those that are listed as T&E under the ESA. The take of migratory birds is prohibited by the MBTA. However, the USFWS can issue depredation permits for the take of migratory birds when certain criteria are met pursuant to the MBTA. Depredation permits are issued to take migratory birds to alleviate damage and threats of damage. Under the permitting application process, the USFWS requires applicants to describe prior non-lethal damage management techniques that have been used. In addition, the USFWS can establish orders that allow for the take of those migratory birds addressed in those orders without the need for a depredation permit.

The USFWS authority for migratory bird management is based on the MBTA of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the Soviet Union. Section 3 of this Act authorized the Secretary of Agriculture:

> *"From time to time, having due regard to the zones of temperature and distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the convention to allow hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President."*

The authority of the Secretary of Agriculture, with respect to the MBTA, was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 FR 2731, 53 Stat. 1433.

United States Army Corps of Engineers (USACE)

The mission of the USACE is to deliver vital public and military engineering services and partnering in peace and war, to strengthen or Nation's security, energize the economy, and reduce risks from disasters. The USACE regulatory Program is committed to protecting the Nation's aquatic resources, while allowing reasonable development through fair, flexible and balanced permit decisions. The Corps evaluates permit applications for essentially all construction activities that occur in the Nation's waters, including wetlands. The Army Corps of Engineers is responsible for managing property at various

locations in Illinois including Chicago Lock and the DuSable Harbor Breakwall. The USACE may seek to manage bird damage on its properties and/or may work with adjacent property owners and managers when birds using USACE property cause problems at adjacent sites (e.g., gulls nesting on Chicago Lock and the DuSable Harbor Breakwall).

United States Environmental Protection Agency (EPA)

The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) which regulates the registration and use of pesticides, including repellents for dispersing birds and avicides available for use to lethally take birds.

United States Food and Drug Administration (FDA)

The FDA is responsible for protecting the public health by assuring the safety, efficacy, and security of human and veterinary drugs, biological products, medical devices, our nation's food supply, cosmetics, and products that emit radiation. The FDA is also responsible for advancing the public health by helping to speed innovations that make medicines and foods more effective, safer, and more affordable; and helping the public get the accurate, science-based information they need to use medicines and foods to improve their health.

Illinois Department of Natural Resources (IDNR)

The IDNR authority for managing most wildlife species in the State is given under Illinois Compiled Statutes (ILCS) Chapter 520 of the Wildlife Code. Subject to federal regulations and Section 3 of the Illinois Endangered Species Act, the Department may authorize owners and tenants of lands or their agents to remove or destroy any wild bird when the wild bird is known to be destroying property or causing a risk to human health or safety upon his or her land. Upon receipt by the Department of information from the owner, tenant, or sharecropper that any one or more species of wildlife is damaging dams, levees, ditches, or other property on the land on which he resides or controls, together with a statement regarding location of the property damages, the nature and extent of the damage, and the particular species of wildlife committing the damage, the Department shall make an investigation. If, after investigation, the Department finds that damage does exist and can be abated only by removing or destroying that wildlife, a permit shall be issued by the Department to remove or destroy the species responsible for causing the damage.

Section 525.35 of the Illinois Administrative Code states; "Any owner or tenant of lands, including operations, associations and governmental bodies, may, without a permit, scare away migratory birds, either game or non-game, as defined in Section 2.2 of the Wildlife Code [520 ILCS 5/2.2] when they are:

1) causing damage to property or wildlife;
2) creating a risk to human health or safety; or
3) concentrated in such numbers and manner as to constitute a health hazard or other nuisance, provided that:

    A) the damage, risk, hazard or other nuisance must be identifiable to an employee of the Department; and
    B) scaring must be done in accordance with 50 CFR 21.41 (2004), except birds that have a nest with eggs and/or a nest with young may not be scared without proper authorization from the Department.

Since 2003 the IDNR has been issued a special Canada goose permit from the USFWS under 50CFR 21.26. Under this permit the IDNR is given the authority to issue Canada goose egg and nest destruction permits as well as lethal shooting permits for agricultural damage for the state of Illinois. The applicant no longer needs a USFWS permit for the destruction of Canada goose eggs or nests under this special use permit. The IDNR is responsible for issuing, monitoring and reporting permit numbers, nest and egg take information and Canada goose population estimates to the USFWS under this special permit.

Illinois Department of Agriculture (IDOA)

The mission of IDOA is to be an advocate for Illinois' agricultural industry and provide the necessary regulatory functions to benefit consumers, agricultural industry, and our natural resources. The agency will strive to promote agri-business in Illinois and throughout the world. The IDOA registers pesticides for use in the state of Illinois and also registers pesticide applicators.

Illinois Department of Public Health (IDPH)

The mission of the IDPH is to promote the health of the people of Illinois through the prevention and control of disease and injury. The IDPH is responsible for certifying structural pesticide applicators in the state of Illinois for both general use and restricted use pesticides in accordance with the Illinois Structural Pest Control Act (225 ILCS 235). Illinois WS employees applying pesticides are certified technicians through the IDPH.

Illinois Native American Tribes

Currently, Illinois WS does not have MOUs with any American Indian Tribes. Any WS activities conducted on reservation lands would only be conducted at the request of the Tribe and after appropriate authorizing documents were signed. Therefore, WS would only conduct bird damage management activities on reservation lands after agreements with the Tribes to conduct such activities are in place. If WS enters into an agreement with a Tribe for bird damage management, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA. MOUs, agreements and NEPA compliance would be conducted as appropriate before conducting bird damage management on reservation lands.

1.8 COMPLIANCE WITH LAWS AND STATUTES

Several laws or statutes authorize, regulate, or otherwise would affect WS' activities under the alternatives. WS would comply with all applicable federal, state, and local laws and regulations in accordance with WS Directive 2.210. Those laws and regulations relevant to managing bird damage in the state are addressed below:

National Environmental Policy Act (NEPA)

All federal actions are subject to the NEPA (Public Law 9-190, 42 USC 4321 et seq.). WS follows CEQ regulations implementing the NEPA (40 CFR 1500 et seq.), USDA (7 CFR 1b), and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The 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. Federal activities affecting the physical and biological environment are regulated in part by the CEQ through regulations in 40 CFR 1500-1508. In accordance with the CEQ and

USDA regulations, APHIS guidelines concerning the implementation of NEPA procedures, as published in the Federal Register (44 CFR 50381-50384), provide guidance to the APHIS regarding the NEPA process.

Pursuant to the NEPA and CEQ regulations, this EA documents the analyses resulting from federal actions, 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 the 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 permitting guidelines in 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. All actions analyzed in this EA would be conducted in compliance with the regulations of the MBTA, as amended.

The law was further clarified to include only those birds afforded protection from take in the United States by the Migratory Bird Treaty Reform Act of 2004. Under the Reform Act, the USFWS published a list of bird species not protected under the MBTA (70 FR 12710-12716). Free-ranging or feral domestic waterfowl, mute swans, ring-necked pheasants, wild turkeys, monk parakeets, rock pigeons, European starlings, and house sparrows are not protected from take under the MBTA. A permit from the USFWS to take those species is not required. However, a permit from the IDNR may be required to take those species.

In addition to the issuance of depredation permits for the take of migratory birds, the Act 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 to lethally take blackbirds when those species are found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance (Sobeck 2010). Those bird species that can be lethally taken under the blackbird depredation order that are addressed in the assessment include American crows, fish crows, red-winged blackbirds, common grackles, boat-tailed grackles, and brown-headed cowbirds.

Depredation Order for Double-crested Cormorants to Protect Public Resources (50 CFR 21.48)

The purpose of this depredation order is to reduce the occurrence and/or minimize the risk of adverse impacts to public resources (fish, including both free-swimming and hatchery stock at federal, state, and tribal facilities, wildlife, plants, and their habitats) caused by double-crested cormorants. This depredation order authorizes the IDNR, federally recognized tribes, and state directors of WS to prevent depredation of public resources by taking without a permit any double-crested cormorant committing or

about to commit such act. Under this depredation order nonlethal control methods should be utilized first when they are considered effective and practicable and not harmful to other nesting birds.

Depredation/Control Orders for Canada Geese

As discussed previously, the USFWS developed an EIS to evaluate alternatives to address increasing resident goose populations across the United States and to reduce associated damage (USFWS 2005). In addition, several depredation orders were established to manage damage associated with resident Canada geese without a depredation permit from the USFWS when certain criteria are occurring. Under 50 CFR 21.49, resident Canada geese can be lethally taken at airports and military airfields without the need for a depredation permit by airport authorities or their agents when those geese are causing damage or posing a threat of damage to aircraft. A Canada goose nest and egg depredation order has also been established that allows the nests and eggs of those geese causing or posing a threat to people, property, agricultural crops, and other interests to be destroyed without the need for a depredation permit once the participant has registered with the USFWS (see 50 CFR 21.50). A similar depredation order was established to manage damage to agricultural resources associated with Canada geese. Under 50 CFR 21.51, Canada geese can be lethally taken without a permit from the USFWS in those states designated, including Illinois, when geese are causing damage to agricultural resources. Resident Canada geese can be addressed using lethal and non-lethal methods by state agencies, Tribes, and the District of Columbia when those geese pose a direct threat to human health under 50 CFR 21.52. Under the depredation orders for Canada geese, no individual federal depredation permit is required to take geese once the criteria of those orders have been met.

Control Order for Muscovy Ducks (50 CFR 21.54)

Muscovy ducks are native to South America, Central America, and Mexico with a small naturally occurring population in southern Texas. Muscovy ducks have also been domesticated and have been sold and kept for food and as pets in the United States. In many states, Muscovy ducks have been released or escaped captivity and have formed feral populations, especially in urban areas, that are non-migratory. The USFWS has issued a Final Rule on the status of the Muscovy duck in the United States (75 FR 9316-9322). Since naturally occurring populations of Muscovy ducks are known to inhabit parts of south Texas, the USFWS has included the Muscovy duck on the list of bird species afforded protection under the MBTA at 50 CFR 10.13 (75 FR 9316-9322). To address damage and threats of damage associated with Muscovy ducks, the USFWS has also established a control order for Muscovy ducks under 50 CFR 21.54 (75 FR 9316-9322). Under 50 CFR 21.54, Muscovy ducks, and their nests and eggs, may be removed or destroyed without a depredation permit from the USFWS at any time in the United States, except in Hidalgo, Starr, and Zapata Counties in Texas (75 FR 9316-9322).

Bald and Golden Eagle Protection Act (16 USC 668)

Populations of bald eagles showed periods of steep declines in the lower United States during the early 1900s attributed to the loss of nesting habitat, hunting, poisoning, and pesticide contamination. To curtail declining trends in bald eagles, Congress passed the Bald Eagle Protection Act (16 USC 668) in 1940 prohibiting the take or possession of bald eagles or their parts. The Bald Eagle Protection Act was amended in 1962 to include the golden eagle and is now referred to as the Bald and Golden Eagle Protection Act. Certain populations of bald eagles were listed as *"endangered"* under the Endangered Species Preservation Act of 1966, which was extended when the modern Endangered Species Act (ESA) was passed in 1973. The *"endangered"* status was extended to all populations of bald eagles in the lower 48 States, except populations of bald eagles in Minnesota, Wisconsin, Michigan, Washington, and Oregon, which were listed as *"threatened"* in 1978. As recovery goals for bald eagle populations began to be reached in 1995, all populations of eagles in the lower 48 States were reclassified as *"threatened"*.

In 1999, the recovery goals for populations of eagles had been reached or exceeded and the eagle was proposed for removal from the ESA. The bald eagle was officially de-listed from the ESA on June 28, 2007 with the exception of the Sonora Desert bald eagle population. Although officially removed from the protection of the ESA across most of its range, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act.

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 "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*" eagles. The regulations authorize the USFWS to issue permits for the take of bald eagles and golden eagles on a limited basis (see 74 FR 46836-46837, 50 CFR 22.26, 50 CFR 22.27). As necessary, WS would apply for the appropriate permits as required by the Bald and Golden Eagle Protection Act.

Endangered Species Act (ESA)

Under the ESA, all federal agencies will seek to conserve T&E species and will utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the 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 will use the best scientific and commercial data available*" (Sec. 7 (a) (2)).

As part of the development of this EA, WS has consulted with the USFWS concerning T&E species in Illinois in regards to proposed bird damage management activities, which will be discussed in Chapter 4.

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 under the alternatives causes major ground disturbance, any physical destruction or damage to property, any alterations of property, 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 could 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 pyrotechnics and 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 the use of those methods would be to the benefit of the historic property. A built-in minimization 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 Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice - Executive Order 12898

Executive Order 12898 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 use of methods 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. WS would only employ and/or recommend legally available and approved methods under the alternatives 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, to develop and implement a MOU with the USFWS that shall promote the conservation of migratory bird populations. WS has developed MOU with the USFWS as required by this Executive Order and WS will abide by the MOU until its expiration or the completion of an updated MOU.

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 until a reasonable effort has been made to protect the items and the proper authority has been notified.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

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 employed and/or recommended by the WS' program in Illinois pursuant to the alternatives would be registered with the EPA and the IDOA, when applicable. All chemical methods would be employed by WS pursuant to label requirements when providing direct operational assistance under the alternatives. In addition, WS would recommend that all label requirements be adhered to when recommending the using of chemical methods while conducting technical assistance projects under the alternatives.

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. As appropriate, a consistency determination would be conducted by WS to assure management actions would be consistent with the state's Coastal Zone Management Program.

New Animal Drugs for Investigational Use

The FDA can grant permission to use investigational new animal drugs (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. The use of alpha-chloralose as a method for resolving waterfowl damage and threats to human safety is discussed in Appendix B of this EA.

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.

Illinois Wildife Laws, Regulations, and Policies Regarding Bird Damage Management

In Illinois, laws, regulations and policies relating to BDM can be found in the Wildlife Code (520 ILCS 5). The Wildlife Code gives the IDNR authority to develop adminisrative rules for the management of wildlife in the state. Some of these administrative rules are related to BDM in the state. The Wildlife

Code can be found at http://www.dnr.illinois.gov/adrules/Pages/default.aspx and the adopted administraive rules can be found at http://www.dnr.illinois.gov/adrules/Pages/default.aspx.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of SOPs, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop SOPs. Additional descriptions of affected environments will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Bird damage or threats of damage can occur statewide in Illinois wherever birds occur. However, bird damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed between WS and a cooperating entity. Most species of birds addressed in this EA can be found throughout the year across the state where suitable habitat exists for foraging, loafing, roosting, and breeding. Since birds can be found throughout the state, requests for assistance to manage damage or threats of damage could occur in areas occupied by those bird species.

Upon receiving a request for assistance, the proposed action alternative or those actions described in the other alternatives could be conducted on private, federal, state, tribal, and municipal lands in Illinois to reduce damages and threats associated with birds to agricultural resources, natural resources, property, and threats to human safety. The analyses in this EA 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. This EA analyzes the potential impacts of bird damage management and addresses activities in Illinois that are currently being conducted under a MOU/MOA or cooperative service agreement with WS where activities have been and currently are being conducted. This EA also addresses the impacts of bird damage management where additional agreements may be signed in the future.

Assistance requests to resolve bird damage could occur, but are not necessarily limited to, areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where birds may roost, loaf, feed, nest, or otherwise occur. Examples of areas where bird damage management activities could be conducted are: residential buildings, golf courses, athletic fields, recreational areas, swimming beaches, parks, hatcheries or nurseries, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, wetlands, restoration sites, cemeteries, public parks, bridges, industrial sites, urban/suburban woodlots, reservoirs and reservoir shore lands, nuclear, hydro and fossil power plant sites, substations, transmission line rights-of-way, landfills, military bases, or at any other sites where birds may roost, loaf, feed, or nest. Damage management activities could be conducted at agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, grain mills, and grain handling areas (e.g., railroad yards) where birds destroy crops, feed on spilled grains, or contaminate food products for human or livestock consumption. Additionally, activities could be conducted at airports and surrounding properties where birds represent a threat to aviation safety.

Environmental Status Quo

As defined by the NEPA implementing regulations, the "*human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that*

environment" (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "*human environment*", it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or would occur in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with resident wildlife species managed by the state natural resources agency, invasive species, or unprotected wildlife species.

Most native wildlife species are protected under state or federal law. For some bird species, take during the hunting season is regulated pursuant to the MBTA by the USFWS through the issuance of frameworks, that include the allowable length of hunting seasons, methods of take, and allowed take which are implemented by the IDNR. Under the blackbird depredation order (50 CFR 21.43), blackbirds can be taken by any entity without a depredation permit when those species identified in the order are found committing or about to commit damage or posing a human safety threat. Pursuant to the MBTA, the USFWS can issue depredation permits to those entities experiencing damage associated with birds, when deemed appropriate. Free-ranging or feral domestic waterfowl, European starlings, rock pigeons, mute swans, ring-necked pheasants, wild turkeys, monk parakeets, and house sparrows are not protected from take under the MBTA and can be addressed without the need for a depredation permit from the USFWS. However, pheasants, turkeys, and mute swans are currently protected under Illinois State law and the lethal take of those species requires a permit from the IDNR.

When a non-federal entity (e.g., agricultural producers, health agencies, municipalities, counties, private companies, individuals, or any other non-federal entity) takes an action to alleviate bird damage, the action is not subject to compliance with the NEPA due to the lack of federal involvement[6] in the action. Under such circumstances, the environmental baseline or status quo must be viewed as an environment that includes those resources as they are managed or impacted by non-federal entities in the absence of the federal action being proposed. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards birds should occur and even the particular methods that would be used, WS' involvement in the action would not affect the environmental status quo. WS' involvement would not change the environmental status quo if the requestor had conducted the action in the absence of WS' involvement in the action. Since the lethal take of birds can occur either without a permit if those species are non-native, during hunting seasons, under depredation orders, under control orders, or through the issuance of depredation permits by the USFWS and/or IDNR and since most methods for resolving damage are available to both WS and to other entities, WS' decision-making ability is restricted to one of three alternatives. WS can either provide technical assistance for managing damage with no direct involvement, take the action using the specific methods as decided upon by the non-federal entity, or take no action at which point the non-federal entity could take the action anyway either without a permit, during the hunting season, under depredation orders, under control orders, or through the issuance of a depredation permit by the USFWS and/or IDNR. Under those circumstances, WS would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS' direct involvement.

Therefore, based on the discussion above, in those situations where a non-federal entity has obtained the appropriate depredation permits or conducts activities under the depredation/control orders, and has already made the decision to remove or otherwise manage birds to stop damage with or without WS' assistance, WS' participation in carrying out that action would not affect the environmental status quo.

In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement than from a decision not to assist. For example, if a cooperator believes WS has greater

[6] If a federal permit is required to conduct damage management activities, the issuing federal agency would be responsible for compliance with the NEPA for issuing the permit.

expertise to manage damage when compared to other entities, WS' management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. The concern arises from those persons experiencing damage using methods that have no prior experience with managing damage or threats associated with birds. The lack of experience in bird behavior and damage management methods could lead to the continuation of damage, which could threaten human safety or could lead to the use of inappropriate methods in an attempt to resolve damage. WS' personnel are trained in the use of methods, which increases the likelihood that damage management methods are employed appropriately, which can increase effectiveness, humaneness, minimizes non-target take, and reduces threats to human safety from those methods. Thus, in those situations, WS' involvement may actually provide some benefit to the human environment when compared to the environmental status quo in the absence of such involvement.

2.2 ISSUES ASSOCIATED WITH BIRD DAMAGE MANAGEMENT ACTIVITIES

Issues are concerns of the public and/or professional community raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues related to managing damage associated with birds in Illinois were developed by WS in consultation with partners. The EA will also be made available to the public for review and comment to identify additional issues.

The following are those issues related to the possible implementation of the alternatives, including the proposed action alternative, and are further discussed in Chapter 4.

Issue 1 - Effects of Damage Management Activities on Target Bird Populations

A common issue when addressing damage caused by wildlife is the potential impact of management actions on the populations of target species. Methods available to resolve damage or threats to human safety are categorized into non-lethal and lethal methods. Non-lethal methods available can disperse or otherwise make an area unattractive to target species causing damage, which reduces the presence of those species at the site and potentially the immediate area around the site where non-lethal methods were employed. Lethal methods would result in local population reductions in the area where damage or threats were occurring. The number of target species that could be removed from the population using lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individual birds involved with the associated damage or threat, and the efficacy of methods employed. Under certain alternatives, both non-lethal and lethal methods could be recommended, as governed by federal, state, and local laws and regulations.

The analysis for magnitude of impact on the populations of those species addressed in the EA would be based on a measure of the number of individuals killed from each species in relation to that species' abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations would be based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations would be based on population trends and harvest trend data, when available. Take would be monitored by comparing the number killed with overall populations or trends in the population. All lethal take of birds by WS would occur at the requests of a cooperator seeking assistance and only after the take of those birds species has been permitted by the USFWS pursuant to the MBTA, when required.

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 Landbird Population database, the Spring Bird Count (SBC), published literature, and harvest data. Further information on those sources of information is provided below.

Breeding Bird Survey (BBS)

Bird populations can be monitored by using trend data derived from data collected during the BBS. Under established guidelines, observers count birds at established survey points for a set duration along a pre-determined route, usually along a road. Surveys were started in 1966 and are conducted in June, which is generally considered as the period of time when those birds present at a location are likely breeding in the immediate area. The BBS is conducted annually in the United States, across a large geographical area, under standardized survey guidelines. The BBS is a large-scale inventory of North American birds coordinated by the United States Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2014). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, because of variable local habitat and climatic conditions. Trends can be determined using different population equations and tested to identify statistical significance.

Current estimates of population trends from BBS data are derived from hierarchical model analysis (Link and Sauer 2002, Sauer and Link 2011) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is also determined using BBS data (Sauer et al. 2014).

Christmas Bird Count (CBC)

The CBC is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society (NAS). The CBC reflects the number of birds frequenting a location during the winter months. Participants count the number of birds observed within a 15-mile diameter circle around a central point (177 mi^2). The CBC data does not provide a population estimate, but the count can be used as an indicator of trends in the population of a particular bird species over time. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (NAS 2010).

Partners in Flight Landbird Population Estimate

The BBS data are intended for use in monitoring bird population trends, but it is also possible to use BBS data to develop a general estimate of the size of bird populations. Using relative abundances derived from the BBS, Rich et al. (2004) extrapolated population estimates for many bird species in North America as part of the Partners in Flight Landbird Population Estimate database. The Partners in Flight system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 mi^2) survey conducted during the BBS to an area of interest. The model used by Rich et al. (2004) makes assumptions on the detectability of birds, which can vary for each species. Some species of birds that are more conspicuous (visual and auditory) are more likely to be detected during bird surveys when compared to bird species that are more secretive and do not vocalize often. Information on the detectability of a species is combined to create a detectability factor, which may be combined with relativ e abundance data from the BBS to yield a population estimate (Rich et al. 2004). The Partners in Flight Science Committee updated the database in the past year to reflect current population estimates (PFSC 2013).

Bird Conservation Regions

Bird Conservation Regions are areas in North America that are characterized by distinct ecological habitats that have similar bird communities and resource management issues. The State of Illinois lies

within the Eastern Tallgrass Prairie (Bird Conservation Region 22), the Prairie Hardwood Transition (Bird Conservation Region 23), and the Central Hardwoods (Bird Conservation Region 24) regions. The majority of the state lies within the Eastern Tallgrass Prairie region.

Spring Bird Count (SBC)

The Illinois SBC was initiated in 1975 and entails volunteers conducting a census in early May of each year. The census occurs statewide and participants record all birds seen or heard. The dataset is maintained by the Illinois Natural History Survey and data could be found at http://www.inhs.uiuc.edu/databases/sbc/about.html when this EA was prepared. Although these data are not collected under strict sampling designs, they may be useful to assess trends in bird populations in the State.

Giant Canada Goose Population Estimate

The Giant Canada Goose Committee of the Mississippi Flyway Council Technical Section formed a Giant Canada goose management plan in 1996. The goal of the plan was to manage the population of giant Canada geese in the Mississippi Flyway at a level that would provide the maximum recreational opportunities consistent with social accecptability. The plan provides basic principles and strategies to help guide management of the giant Canada goose population in the Mississippi Flyway. IDNR biologists survey the state from aircraft to estimate the resident population of giant Canada geese in the state.

Colonial Waterbird Survey

Since 1970, the USFWS and Canadian Wildlife Service have conducted four censuses of colonial waterbirds in the Great Lakes region. The fourth survey estimated the distribution and abundance of breeding pairs of waterbirds between 2007-2009. Surveys were conducted on foot, by boat, and through use of aerial photography. Although surveying the abundance of individual birds is not the goal of this survey, information relating to abundance of nesting pairs and trends over time can provide valuable insight as to the population status of many species.

Annual Harvest Estimates

The populations of several migratory bird species are sufficient to allow for annual harvest seasons that typically occur during the fall migration periods of those species. Migratory bird hunting seasons are established under frameworks developed by the USFWS and implemented by the IDNR. Those species addressed in this EA that can also be hunted during regulated seasons in the state include snow geese, Canada geese, wood ducks, mallards, American green-winged teal, blue-winged teal, hooded mergansers, ring-necked pheasants , Northern bobwhite, American coots, American woodcocks, American crows, mourning doves, and wild turkeys.

For crows, take can also occur under the blackbird depredation order established by the USFWS pursuant to the MBTA. Therefore, the take of crows can occur during annual hunting seasons and under the blackbird depredation order that allows crows to be taken to alleviate damage and to alleviate threats of damage. For many migratory bird species considered harvestable during a hunting season, the number of birds harvested during the season is reported by the USFWS and/or the IDNR in published reports.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on non-target species, including threatened and endangered species. Methods available to resolve damage or threats of damage can be categorized as lethal and non-lethal. Non-lethal methods disperse or otherwise make an area where damage is occurring unattractive to the species (target species) causing the damage, thereby reducing the presence of those species in the area. However, non-lethal methods also have the potential to inadvertently disperse non-target wildlife. Lethal methods remove individuals of the species (target species) causing the damage, thereby reducing the presence of those species in the area and the local population. However, lethal methods also have the potential to inadvertently capture or kill non-target wildlife.

Before initiating management activities, WS would select locations that are extensively used by the target species. WS would also use SOPs that minimize the effects on non-target species' populations. SOPs are further discussed in Chapter 3. Methods available for use under the alternatives are described in Appendix B.

The ESA makes it illegal for any person to '*take*' any listed endangered or threatened species or their critical habitat. The ESA defines take as, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1531-1544). Critical habitat is a specific geographic area or areas that are essential for the conservation of a threatened or endangered species. The Act requires that federal agencies conduct their activities in a way to conserve species. It also requires that federal agencies consult with the appropriate implementing agency (either the USFWS or the National Marine Fisheries Service) prior to undertaking any action that may take listed endangered or threatened species or their critical habitat pursuant to Section 7(a)(2) of the ESA. As part of the scoping process to facilitate interagency cooperation, WS has consulted with the USFWS pursuant to Section 7 of the ESA during the development of this EA, which is further discussed in Chapter 4. WS has also consulted with the IDNR regarding the potential impacts to state listed T&E species.

There may also be concerns that WS' activities could result in the disturbance of eagles that may be near or within the vicinity of WS' activities. Under 50 CFR 22.3, the term "*disturb"*, as it relates to take under the Bald and Golden Eagle Act, has been defined as "*to agitate or bother a Bald and Golden Eagles 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."* The environmental consequences evaluation conducted in Chapter 4 of this EA will discusses the potential for WS' activities to disturb eagles as defined by the Act.

To reduce the potential risk that some state-listed T&E species pose to human health and safety, WS may be permitted to purposefully take those species. If permitted, WS would operate in accordance with permits issued by the IDNR for the take of state-listed T&E species.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

An additional issue often raised is the potential risks to human health and safety associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human safety. WS' employees would use and recommend those methods legally available, selective for target species, and effective at resolving the damage associated with wildlife. Still, some concerns exist regarding the safety of WS' methods despite their legality. As a result, WS will analyze the potential for proposed methods to pose a risk to members of the public or employees of WS.

Safety of Chemical Methods Employed

The issue of using chemical methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods would include avicides, immobilizing drugs, reproductive inhibitors, herbicides, and repellents. Avicides are those chemical methods used to lethally take birds. DRC-1339 is the only avicide currently being considered for use to manage damage in this assessment. In Illinois, DRC-1339 is registered for use by WS for management of damage associated with feral pigeons, red-winged blackbirds, brown-headed cowbirds, common grackles, European starlings, crows, and gulls.

Several avian repellents are commercially available to disperse birds from an area or discourage birds from feeding on desired resources. Avitrol is an avian repellent available for use to manage damage associated with several bird species. For those species addressed in this assessment, Avitrol is available to manage damage associated with red-winged blackbirds, common grackles, brown-headed cowbirds, European starlings, house sparrows, feral pigeons, and crows. Other repellents are also available with the most common ingredients being polybutene, anthraquinone, and methyl anthranilate.

Alpha-chloralose, a sedative, is also being considered as a method that could be employed under the alternatives to manage damage associated with waterfowl. Alpha-chloralose could be used to sedate waterfowl temporarily and lessen stress on the animal from handling and transportation from the capture site. Drugs delivered to immobilize waterfowl would occur on site with close monitoring to ensure proper care of the animal. Alpha-chloralose is fully reversible with a full recovery of sedated animals occurring.

Sodium lauryl sulfate (SLS) is a wetting agent for managing European starlings, red-winged, yellow-headed, and Brewer's blackbirds, cowbirds, grackles, American crows, common ravens, feral pigeons, and magpie roosts. SLS is a surfactant commonly used in soap products, including shampoos and fruit juices. All label directions will be followed when using SLS.

Nicarbazin is the only reproductive inhibitor currently registered with the EPA. Current products containing nicarbazin are available for use to manage local populations of waterfowl and pigeons by reducing or eliminating the hatchability of laid eggs. Chemical methods are further discussed in Appendix B of this EA. The use of chemical methods is regulated by the EPA through the FIFRA, the IDPH, the IDNR, the FDA, and by WS Directives.

Herbicides are commonly used to modify the plant species in the environment. WS may use herbicides to make habitats less attractive to wildlife, thereby dissuading wildlife use. For example, herbicides may be used at airport environments to reduce the presence of broad-leaf plants which are often attractive to wildlife as they can be highly palatable and produce nutritious seeds and fruits. Two common herbicides that are being evaluated for use in this EA are Rodeo ™ (glyphosate: N-(phosphonomethyl) glycine, isopropylamine salt) and Crossbow (2,4-Dichlororphenoxyacetic acid). These herbicides will be used in compliance of label and MSDS requirements. Further descriptions of these herbicides can be found in Chapter 4 under the alternatives.

Safety of Non-Chemical Methods Employed

Most methods available to alleviate damage and threats associated with birds are considered non-chemical methods. Non-chemical methods employed to reduce damage and threats to safety caused by birds, if misused, could potentially be hazardous to human safety. Non-chemical methods are also discussed in detail in Appendix B. Many of the non-chemical methods are only activated when

triggered by attending personnel (e.g., cannon nets, firearms, pyrotechnics, lasers), are passive live-capture methods (e.g., walk-in style live-traps, mist nets), or are passive harassment methods (e.g., effigies, exclusion, anti-perching devices, electronic distress calls).

The primary safety risk of most non-chemical methods occurs directly to the applicator or those persons assisting the applicator. However, risks to others do exist when employing non-chemical methods, such as when using firearms, cannon nets, or pyrotechnics. Most of the non-chemical methods available to address bird damage in Illinois would be available for use under any of the alternatives and could be employed by any entity, when permitted. Risks to human safety from the use of non-chemical methods will be further evaluated as this issue relates to the alternatives in Chapter 4.

Issue 4 - Effects on the Aesthetic Values of Birds

One issue is the concern that the proposed action or the other alternatives would result in the loss of aesthetic benefits of target birds to the public, resource owners, or residents in the area where damage management activities occur. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies, large percentages of households have indoor or outdoor pets. However, some people may consider individual wild animals and birds as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). Those benefits include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (Bishop 1987). Direct benefits are derived from a personal relationship with animals. Direct benefits may be derived from direct consumptive use (e.g., using parts of or the entire animal) or non-consumptive use (e.g., viewing or photographing the animal in nature) (Decker and Goff 1987).

Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and translocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations. Some people totally opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be

killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment. The effects on the aesthetic value of birds from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were identified by WS during the scoping process of this EA. Those issues were considered by WS; however, those issues will not be analyzed in detail for the reasons provided.

Appropriateness of Preparing an EA (instead of an EIS) for Such a Large Area

A concern was raised that an EA for an area as large as the State of Illinois would not meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other regulatory agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage would occur, the program cannot predict the specific locations or times at which affected resource owners would determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions could be categorically excluded (7 CFR 372.5(c)). The intent in developing this EA is to determine if the proposed action would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. This EA addresses impacts for managing damage and threats to human safety associated with birds in the State to analyze individual and cumulative impacts and to provide a thorough analysis.

In terms of considering cumulative effects, one EA analyzing impacts for the entire state would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination were made through this EA that the proposed action or the other alternatives might have a significant impact on the quality of the human environment, then an EIS would be prepared. Based on previous requests for assistance, the WS program in Illinois would continue to conduct bird damage management in a very small area of the state where damage is occurring or likely to occur.

WS' Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife. WS operates in accordance with applicable federal and state laws and regulations enacted to ensure species viability. Methods available are employed to target individual birds or groups of birds identified as causing damage or posing a threat of damage. Any reduction of a local population or group would frequently be temporary because immigration from adjacent areas or reproduction would replace the animals removed. WS operates on a small percentage of the land area of Illinois and would only target those birds identified as causing damage or posing a threat. Therefore, damage management activities conducted pursuant to any of the alternatives would not adversely affect biodiversity.

A Loss Threshold should be Established before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. In addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied plaintiffs' motion for a preliminary injunction. In part, the court found a forest supervisor only needed to show that damage from wildlife was threatened to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for damage management actions.

Bird Damage Management should not occur at Taxpayer Expense

An issue previously identified is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Funding for damage management activities would be derived from federal appropriations and through cooperative funding. Activities conducted for the management of damage and threats to human safety from birds would be funded through cooperative service agreements with individual property owners or managers. A minimal federal appropriation is allotted for the maintenance of a WS program in Illinois. The remainder of the WS program is entirely fee-based. Technical assistance is provided to requesters as part of the federally funded activities, but all direct assistance in which WS' employees perform damage management activities is funded through cooperative service agreements between the requester and WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by birds and that prove to be the most cost effective would receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under similar circumstances where birds are causing damage or pose a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. WS often applies the most cost effective methods to prevent or reduce damage first but will apply other methods as the situation dictates.

Bird Damage should be Managed by Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce bird damage for property owners when deemed appropriate by the resource owner. Some property owners would prefer to use a private nuisance wildlife control agent because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to enter into an agreement with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues.

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally take birds. As described in Appendix B, the lethal removal of birds with firearms by WS to alleviate damage or threats would occur using a rifle or shotgun. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). To address lead exposure from the use of shotguns, the standard conditions of depredation permits issued by the USFWS pursuant to the MBTA for the lethal take of birds requires the use of non-toxic shot. To alleviate concerns associated with lead exposure in wildlife, WS would only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns to take all birds.

The removal of birds by WS would occur primarily from the use of shotguns. However, the use of rifles could be employed to lethally take some species. Birds that were removed using rifles would occur within areas where retrieval of all bird carcasses for proper disposal would be highly likely (e.g., at roost sites). With risks of lead exposure occurring primarily from ingestion of lead shot and bullet fragments, the retrieval and proper disposal of bird carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through a bird, if misses occur, or if the bird carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of either ground water or surface water from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (i.e., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the "*action level*" of 15 parts per billion as defined by the EPA (i.e., requiring action to treat the water to remove lead). The study found that the dissolution (i.e., capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which serves to further reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities to reduce bird damage using rifles, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

Since the harvest of birds can occur during regulated hunting seasons, through the issuance of depredation permits, under depredation orders without the need to obtain a depredation permit, or are considered non-native with no depredation permit required for take, WS' assistance with removing birds would not be additive to the environmental status quo. This is because those birds removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. The amount of lead deposited into the environment may be lowered by WS' involvement in damage management activities due to efforts by WS to ensure projectiles do no pass through, but are contained within, the bird carcass, which limits the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that birds are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which further reduces the potential for lead to be deposited in the soil from misses. In addition, WS' involvement ensures bird carcasses lethally removed using firearms would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures bird carcass would be removed from the environment to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that could be deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from bird carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water.

Effects on Human Health from Consumption of Waterfowl

Of concern under this issue is the consumption of waterfowl meat donated to charitable organizations by WS. Of recent concern is the potential for lead bullet fragments to be present in meat that has been processed for human consumption. In addition, the potential for the spreading of zoonotic diseases or other contaminants in waterfowl processed and donated for human consumption is a concern. In Illinois, the option for donation of waterfowl meat to charitable organizations is exclusively available for waterfowl which have been live-captured during a charity harvest roundup or similar event.

In order to address potential health concerns associated with consuming waterfowl, birds that could potentially be donated for human consumption will be evaluated by biologists for malformations. The bird will also be examined by an IDOA licensed Type II poultry processor. The whole bird, and specifically the breast meat, will be examined for abscesses, infected wounds, lesions, parasites and/or evidence of disease. Any waterfowl determined to be unsuitable for processing and unused goose parts will be disposed of in accordance with established IDOA guidelines. The breast meat products found to be healthy and wholesome will be ground, mixed/blended, packaged and labeled as required by IDOA. The meat products will be donated to IDNR-designated charitable organizations for human consumption. Poultry processing facilities utilized for this process would be in compliance with existing USDA regulations pertaining to the processing and handling of fowl (e.g., turkeys, chickens).

Waterfowl immobilized using alpha chloralose would not be donated for human consumption with disposal of carcasses occurring by deep burial or incineration. Waterfowl taken by any method for disease sampling or in an area where zoonotic diseases of concern are known to be prevalent and of concern to human health after consuming processed waterfowl meat would not be donated for consumption and would be disposed of by deep burial or incineration. Also, alpha chlorolose would not be used within 30 days of any legal hunting season to prevent humans harvesting birds that have consumed alpha chlorolose.

WS' activities to alleviate damage or threats associated with waterfowl would only occur after receiving a request for direct operational assistance. Therefore, the decision to process waterfowl for human consumption that were taken by WS would be the sole responsibility of the entity requesting assistance.

WS would not process and/or donate processed waterfowl meat to charitable organizations and would not be involved with the processing and/or donation of the meat to charitable organizations.

Global Climate Change/Greenhouse Gas Emissions

The WS program activities that may result from the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of the proposed action. The proposed action would meet requirements of applicable federal laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives that were developed to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration using the WS Decision model (Slate et al. 1992). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). SOPs for bird damage management in Illinois are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

The following alternatives were developed to address the identified issues associated with managing damage caused by birds in Illinois:

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird Damage (Proposed Action/No Action)

The proposed action/no action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by birds in Illinois. A major goal of the program would be to resolve and prevent bird damages and to reduce threats to human safety. To meet this goal, WS, in cooperation with the USFWS and in consultation with the IDNR, would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management. Funding could occur through federal appropriations or from cooperative funding.

The adaptive approach to managing damage associated with birds would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request after applying the WS Decision Model. City/town managers, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. WS would work with those persons experiencing bird damage in addressing those birds responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as birds begin to cause damage. Bird damage that has been ongoing can be difficult to resolve using available methods since birds are conditioned to feed, roost, loaf, and are familiar with a particular location. Subsequently, making that area unattractive using available methods can be difficult to achieve once damage has been ongoing. The USFWS and/or IDNR could continue to issue depredation permits to WS and to those entities experiencing bird damage when requested by the entity and when deemed appropriate by the USFWS and/or IDNR for those species that require a permit.

Under this alternative, WS could respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to

reduce damages caused by birds, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. The take of birds can only legally occur through the issuance of a depredation permit by the USFWS and/or IDNR and only at levels specified in the permit, unless those bird species are afforded no protection under the MBTA or a depredation/control order has been established by the USFWS in which case no permit for take is required. When applying for a depredation permit, the requesting entity submits with the application the number of birds requested to be taken to alleviate the damage. Therefore, under this alternative, the USFWS could: 1) deny an application for a depredation permit when requested to alleviate bird damage, 2) issue a depredation permit at the take levels requested, or 3) issue permits at levels below those take levels requested.

Property owners or managers may choose to implement WS' recommendations on their own (i.e., technical assistance), use contractual services of private businesses, use volunteer services of private organizations, use the services of WS (i.e., direct operational assistance), or take no action.

The property owner or manager may choose to apply for their own depredation permit from the USFWS to lethally take birds, as required by the implementing regulations of the MBTA for depredation control (see 50 CFR 21.41). The USFWS requires non-lethal methods be used and shown ineffective or impractical before the USFWS will issue a depredation permit. In this situation, WS could evaluate the damage and complete a Migratory Bird Damage Report, which would include information on the extent of the damages, the number of birds present, and a recommendation for the number of birds that should be taken to best alleviate the damages.

Following USFWS review of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, a depredation permit could be issued to authorize the lethal take of a specified number of birds as part of an integrated approach. Upon receipt of a depredation permit, the property owner, manager, or appropriate subpermittee may commence the authorized activities and must submit a written report to USFWS of their activities upon expiration of their permit. Permits may be renewed annually as needed to resolve damage or reduce threats to human safety. Property owners or managers could conduct management using those methods legally available. Most methods discussed in Appendix B that are available for use to manage bird damage would be available to all entities. The only methods currently available to WS that would not be available for use by those persons experiencing bird damage are the avicide DRC-1339 and the immobilizing drug alpha-chloralose, which can only be used by WS.

In anticipation of damage management activities, WS would annually submit an application for a depredation permit to the USFWS estimating the maximum number of birds that could be lethally taken to alleviate damage in Illinois through direct operational assistance projects. The number of birds anticipated to be lethally taken by WS would be based on previous requests for assistance received to manage damage associated with those species of birds. Therefore, the USFWS could: 1) deny WS' application for a depredation permit, 2) issue a depredation permit for the take of birds at a level below the number requested by WS, or 3) issue a depredation permit for the number of birds requested by WS. In addition, WS could be listed as subpermittees under depredation permits issued to other entities.

Non-lethal methods include, but are not limited to, habitat/behavior modification, nest/egg destruction, lure crops, visual deterrents, live traps, translocation, exclusionary devices, frightening devices, alpha-chloralose, reproductive inhibitors, and chemical taste repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS include live-capture followed by euthanasia, DRC-1339, the recommendation of take during hunting seasons, and firearms. WS would employ cervical dislocation or carbon dioxide to euthanize target birds once those birds were live-captured using other methods. Carbon dioxide is an acceptable form of euthanasia for birds while

cervical dislocation is a conditionally acceptable[7] method of euthanasia (AVMA 2013). The use of firearms could also be used to euthanize birds live-captured; however, the use of firearms for euthanasia is considered a conditionally acceptable method for wildlife (AVMA 2013).

Lethal and non-lethal methods are intended to be short-term attempts at reducing damage occurring at the time those methods are employed. Long-term solutions to managing bird damage would include limited habitat manipulations and changes in cultural practices that are addressed further below and in Appendix B.

Appendix B contains a thorough description of the methods available for use in an integrated approach to address requests for assistance to manage damage or reduce threats to human safety. As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those persons experiencing damage associated with birds.

Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in the most cost-effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, elimination of invasive species (e.g., European starlings) or any combination of these, depending on the circumstances of the specific damage problem.

Technical Assistance Recommendations

The WS program in Illinois regularly provides technical assistance to individuals, organizations, and other federal, state, and local government agencies for managing bird damage. Technical assistance includes collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues.

From FY 2010 through FY 2014, WS conducted 3,768 technical assistance projects that involved bird damage to agricultural resources, property, natural resources, and threats to human safety in Illinois (see Table 1.1).

Operational Damage Management Assistance

Operational damage management assistance includes damage management activities that are directly conducted by or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, when requested by the party experiencing damage, and there is a written MOU, cooperative service agreement, or other comparable document between WS and the entity requesting assistance. The initial investigation defines the nature, history, and extent of the problem, species responsible for the damage, and methods

[7] The AVMA (2013) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

available to resolve the problem. The professional skills of WS' personnel are often required to resolve problems, especially if restricted-use chemicals are necessary or if the problems are complex.

To address the anticipated needs of property owners/managers with bird damages that may request WS' assistance with lethal methods to alleviate their damages, WS would submit an application for a one-year depredation permit to the USFWS estimating the maximum number of birds of each species to be lethally taken as part of an integrated approach. The USFWS would conduct an independent review of the application, and if acceptable, issue a permit as allowed under the depredation permit regulations. WS could request an amendment of their permit to increase the number of birds that could be taken to address unpredicted and emerging bird damages/conflicts. Each year, WS would submit an application for renewal of their permit, and using adaptive management principles, would adjust numbers of birds to meet anticipated needs based upon management actions in the previous year and anticipated damages and conflicts in the next year. The USFWS would review these applications annually and issue permits as allowed by regulations. All alterations in the number of birds to be taken would be checked against the impacts analyzed in this EA. All management actions by WS would comply with appropriate federal, state, and local laws.

Educational Efforts

Education is an important element of the WS program because wildlife damage management is about finding compromise and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. Cooperating agencies frequently collaborate with other entities in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that other wildlife professionals and the public are periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development

The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate damage management techniques. For example, research biologists from the NWRC were involved with developing and evaluating mesurol for reducing crow predation on eggs. NWRC biologists have authored hundreds of scientific publications and reports, and are respected worldwide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model (WS Directive 2.201, Figure 3.1) and described by Slate et al. (1992). WS' personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be

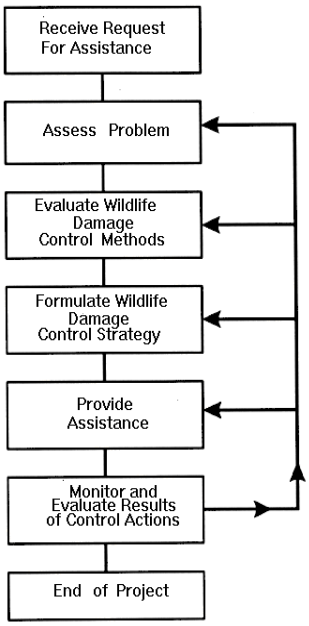


Figure 3.1 – Wildlife Services Decision Model

impractical, too costly, or inadequate for effectively reducing damage. WS' personnel assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed practical for the situation would be incorporated into a damage management strategy. After this strategy had been implemented, monitoring would be conducted and evaluation would continue to assess the effectiveness of the strategy. If the strategy were effective, no further management would be needed. In terms of the WS Decision Model, most efforts to manage damage consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The WS Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

Community-based Decision Making

The WS program in Illinois follows the "*co-managerial approach*" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS could provide technical assistance regarding the biology and ecology of birds and effective, practical, and reasonable methods available to the local decision-maker(s) to reduce damage or threats. This could include non-lethal and lethal methods. WS and other state and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available. Resource owners and others directly affected by bird damage or conflicts have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

By involving decision-makers in the process, damage management actions can be presented to allow decisions to involve those individuals that the decision-maker(s) represents. Requests for assistance to manage birds often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives, the decision-maker(s) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentations by WS on activities to manage damage. This process allows decisions on activities to be made based on local input.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would be restricted to only using or recommending non-lethal methods to resolve damage caused by birds in Illinois (Appendix B). Lethal methods could continue to be used under this alternative by those persons experiencing damage without involvement by WS. In situations where non-lethal methods were impractical or ineffective to alleviate damage, WS could refer requests for information regarding lethal methods to the the state, local animal control agencies, or private businesses or organizations. Property owners or managers may choose to implement WS' non-lethal recommendations on their own or with the assistance of WS, implement lethal methods on their own, or request assistance (non-lethal or lethal) from a private or public entity other than WS.

Alternative 3 – No Bird Damage Management Conducted by WS

This alternative precludes any activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of bird damage management. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, the IDNR, IDPH, and/or private entities. This alternative would not deny other federal, state, and/or local agencies, including private entities, from conducting damage management activities directed at alleviating damage and threats associated with birds. Many of

the methods listed in Appendix B would be available for use by other agencies and private entities, unless otherwise noted in the Appendix, to manage damage and threats associated with birds.

Under this alternative, property owners/managers may have difficulty obtaining permits to use lethal methods. The USFWS needs professional recommendations on individual damage situations before issuing a depredation permit for lethal take, and the USFWS does not have the mandate or the resources to conduct damage management activities. Currently, WS fills this role by reviewing applications for depredation permits in Illinois and providing permit issuance recommendations to USFWS. Under this alternative, State agencies with responsibilities for migratory birds would likely have to provide this information if depredation permits are to be issued. If the information were provided to the USFWS, following the agency's review of a complete application package for a depredation permit from a property owner or manager to lethally take birds, the permit issuance procedures would follow that described in Alternative 1.

Despite no involvement by WS in resolving damage and threats associated with birds, those persons experiencing damage caused by birds could continue to resolve damage by employing those methods legally available since the take of birds could occur either through the issuance of depredation permits by the USFWS; take during the hunting seasons, and blackbirds could be taken at any time when found committing or about to commit damage or posing a human safety threat under a depredation order; Muscovy ducks could be taken under the control order, and non-native bird species could be taken without the need for a depredation permit issued by the USFWS. All methods described in Appendix B would be available for use by those persons experiencing damage or threats except for the use of alpha-chloralose for waterfowl and DRC-1339 for blackbirds and gulls, which can only be used by WS.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

In addition to those alternatives analyzed in detail, several alternatives were identified by WS; however, those alternatives will not receive detailed analyses in this EA for the reasons provided. Those alternatives considered, but not analyzed in detail include:

Use of Non-lethal Methods before Lethal Methods

This alternative would require that all non-lethal methods or techniques described in Appendix B be applied to all requests for assistance to reduce damage and threats to safety from birds. If the use of all non-lethal methods fails to resolve the damage situation or reduce threats to human safety at each damage situation, lethal methods would be employed to resolve the request. Non-lethal methods would be applied to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by those persons experiencing bird damage.

Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS. Verification of the methods used would be the responsibility of WS. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods can be evaluated. The proposed action (Alternative 1) is similar to a non-lethal before lethal alternative because the use of non-lethal methods is considered before lethal methods by WS (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analyses in this EA.

Use of Lethal Methods Only by WS

This alternative would require the use of lethal methods only to reduce threats and damage associated with birds. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Therefore, this alternative was not considered in detail.

Trap and Translocate Birds Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Birds would be live-captured using alpha-chloralose, live-traps, cannon nets, rocket nets, bow nets, or mist nets. All birds live-captured through direct operational assistance by WS would be translocated. Translocation sites would be identified and have to be approved by the USFWS, the IDNR, and/or the property owner where the translocated birds would be placed prior to live-capture and translocation. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. However, the translocation of birds could only occur under the authority of the USFWS and/or IDNR. Therefore, the translocation of birds by WS would only occur as directed by those agencies. When requested by the USFWS and/or the IDNR, WS could translocate birds under any of the alternatives analyzed in detail, except under the no involvement by WS alternative (Alternative 3). Since WS does not have the authority to translocate birds in the state unless permitted by the USFWS and/or the IDNR, this alternative was not considered in detail.

The translocation of birds that have caused damage to other areas following live-capture, generally would not be effective or cost-effective. Translocation is generally ineffective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and translocation would most likely result in bird damage problems at the new location. In addition, hundreds or thousands of birds would need to be captured and translocated to solve some damage problems (e.g., urban blackbird roosts); therefore, translocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of the stress to the translocated animal, poor survival rates, and the difficulties that translocated wildlife have with adapting to new locations or habitats (Nielsen 1988).

Compensation for Bird Damage

The compensation alternative would require WS to establish a system to reimburse persons impacted by bird damage. Under such an alternative, WS would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS would conduct site visits to verify damage. Analysis of this alternative indicated that a compensation only alternative had many drawbacks. Compensation would: 1) require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation, 2) most likely be below full market value, 3) give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies, and 4) not be practical for reducing threats to human health and safety.

Technical Assistance Only

This alternative would restrict WS to only providing technical assistance (advice) on BDM. Producers, property owners, agency personnel, or others could obtain permits from the USFWS and/or the IDNR as needed and could conduct bird damage management using any of the legally available non-lethal and lethal techniques. Technical assistance information is also readily available from entities other than WS such as the USFWS, universities, extension agents, FAA, and private individuals and organizations.

Environmental impacts of this alternative are likely to be similar to Alternative 3. Consequently, the agencies have determined that detailed analysis of this alternative would not contribute substantive new information to the understanding of environmental impacts of damage management alternatives and have chosen to not analyze this alternative in detail.

3.3 STANDARD OPERATING PROCEDURES (SOPs) FOR BIRD DAMAGE MANAGEMENT

SOPs improve the safety, selectivity, and efficacy of those methods available to resolve or prevent damage. The current WS program uses many such SOPs. Those SOPs would be incorporated into activities conducted by WS when addressing bird damage and threats.

Some key SOPs pertinent to the proposed action and alternatives include the following:

- The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, would be consistently used and applied when addressing bird damage.

- EPA-approved label directions would be followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects occur to the environment when chemicals are used in accordance with label directions.

- Material Safety Data Sheets for pesticides would be provided to all WS' personnel involved with specific damage management activities.

- The presence of non-target species would be monitored before using DRC-1339 to reduce the risk of mortality of non-target species' populations.

- All personnel who would use chemicals are trained and certified to use such substances or would be supervised by trained or certified personnel.

- All personnel who use firearms would be trained according to WS' Directives.

- Management actions would be directed toward specific birds posing a threat to human safety, causing agricultural damage, causing damage to natural resources, or causing damage to property.

- Only non-toxic shot would be used when employing shotguns to lethally take bird species.

- The removal of birds would only occur when authorized by the USFWS and/or IDNR, when applicable, and only at levels authorized.

- Personnel would be trained in the latest and most humane devices/methods for removing problem birds. The NWRC is continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.

- WS' use of euthanasia methods would comply with WS Directive 2.505.

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

Several additional SOPs are applicable to the alternatives and the issues identified in Chapter 2 including the following:

Issue 1 - Effects of Damage Management Activities on Target Bird Populations

- Lethal take of birds by WS would be reported and monitored by WS, the IDNR, and the USFWS to evaluate population trends and the magnitude of WS' take of birds in the state.
- WS would only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.
- WS would monitor bird damage management activities to ensure activities do not adversely affect bird populations.
- Preference would be given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.
- WS' personnel would be present during the use of most live-capture methods (e.g., mist nets, cannon nets, rocket nets) to ensure birds captured would be addressed in a timely manner to minimize the stress of being restrained.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

- When conducting removal operations via shooting, identification of the target animal would occur prior to application.
- WS' personnel would use bait, trap placements, and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.
- Any non-target animals captured in cage traps, nets, or any other restraining device would be released whenever it is possible and safe to do so.
- Carcasses of birds retrieved after damage management activities have been conducted would be disposed of in accordance with WS Directive 2.515 and USFWS and IDNR permits.
- Personnel would be present during the use of live-capture methods or live-traps would be checked frequently to ensure non-target species are released immediately or are prevented from being captured.
- WS has consulted with the USFWS and the IDNR to evaluate activities to resolve bird damage and threats to ensure the protection of T&E species.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

- Damage management activities would be conducted professionally and in the safest manner possible. Damage management activities would be conducted away from areas of high human activity. If this were not possible, then activities would be conducted during periods when human activity is low (e.g., early morning).

- Damage management via shooting would be conducted during times when public activity and access to the control areas are restricted. Personnel involved in shooting operations would be fully trained in the proper and safe application of this method.

- All personnel employing chemical methods would be properly trained and certified in the use of those chemicals. All chemicals used by WS would be securely stored and properly monitored to ensure the safety of the public. WS' use of chemicals and training requirements for those chemicals are outlined in WS Directive 2.401.

- All chemical methods used by WS or recommended by WS would be registered with the EPA and the IDOA.

- Carcasses of birds retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515, including any permits required by the USFWS and IDNR.

- WS' employees who use alpha chloralose participate in approved training courses concerning immobilizing drugs.

- WS would adhere to all established withdrawal times when using immobilizing drugs for the capture of waterfowl that are agreed upon by WS, the USFWS, the IDNR, and veterinarian authorities. Although unlikely, in the event that WS is requested to immobilize waterfowl either during a period of time when harvest of waterfowl is occurring or during a time where the withdrawal period could overlap with the start of a harvest season, WS would euthanize the animal to minimize threats to human health.

Issue 4 - Effects on the Aesthetic Values of Birds

- Management actions to reduce or prevent damage caused by birds would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- All methods or techniques applied to resolve damage or threats to human safety would be agreed upon by entering into a cooperative service agreement, MOU, or comparable document prior to the implementation of those methods.

- Feral domestic waterfowl, mute swans, pigeons, starlings, and house sparrows are non-native, invasive species in the state that can cause harm to native flora and fauna. Any reduction in those populations could be viewed as benefiting the aesthetic value of a more native ecosystem.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative as those alternatives relate to the issues identified. The following resource values are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. Those resources will not be analyzed further.

The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

Indirect Effects: These are impacts caused by an action that are later in time or farther removed in distance, but are still reasonably foreseeable.

Cumulative Effects: As defined by CEQ (40 CFR 1508.7), these 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 undertaking such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

The proposed action/no action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS, the USFWS, and the IDNR.

Issue 1 - Effects of Damage Management Activities on Target Bird Populations

Population Impact Analyses of the Alternatives

The alternatives discussed in Chapter 3 were developed in response to the issues identified in Chapter 2. The issue of the potential impacts of conducting the alternatives on the populations of target bird species is analyzed for each alternative below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird Damage (Proposed Action/No Action)

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance using methods described in Appendix B to those persons requesting assistance with managing damage and threats associated with birds. 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. The potential impacts on the populations of target bird species from the implementation of the proposed action are analyzed for each species below. Unless noted otherwise, the State population

estimate listed for each species analyzed below was obtained from PFSC (2013). BBS population trends for two time periods (1966-2012, 2002-2012) for Illinois and the Eastern Tallgrass Prairie region that Illinois falls within are listed for each species when available (Sauer et al. 2014). The statistical significance of a trend for a given species that is determined by the BBS data is color coded: a black percentage indicates a statistically non-significant positive or negative trend, a red percentage indicates a statistically significant negative trend, and a blue percentage indicates a statistically significant positive trend (Sauer et al. 2014).

Non-lethal methods can disperse or otherwise make an area unattractive to birds causing damage; thereby, reducing the presence of birds at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed or recommended to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if a cooperator requesting assistance has already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use has already been proven ineffective in adequately resolving the damage or threat.

Many non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse birds from the area resulting in a reduction in the presence of those birds at the site where those methods were employed. However, birds responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. Non-lethal methods are not employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed. The use of non-lethal methods would not have adverse impacts on bird populations in the State under any of the alternatives.

The use of lethal methods could result in local population reductions in the area where damage or threats were occurring since individuals would be removed from the population. 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. The use of lethal methods would result in local reductions of birds in the area where damage or threats were occurring. The number of birds removed from the population using lethal methods would be dependent on the number of requests for assistance received, the number of birds involved with the associated damage or threat, and the efficacy of methods employed.

WS may recommend birds be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of birds causing damage. Managing bird populations over broad areas could lead to a decrease in the number of birds causing damage. Establishing hunting and trapping seasons and the allowed take during those seasons is the responsibility of the IDNR. WS does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons. However, the harvest of those birds with hunting and/or trapping seasons would be occurring in addition to any take that could occur by WS under the alternatives or recommended by WS.

Generally, WS only conducts damage management on species whose population densities are high or concentrated and usually only after they have caused damage. No indirect effects were identified for this issue. The issue of the potential impacts of conducting the alternatives on the populations of those target bird species addressed in this EA is analyzed for each alternative below.

Blackbird Status

The blackbird group in North America includes ten species of birds (Dolbeer 1994) including some of the most prolific and abundant birds in North America (Dolbeer and Stehn 1983). Of those ten species, American crows, red-winged blackbirds, brown-headed cowbirds, and common grackles are the species most commonly involved with causing damage or posing threats of damage in Illinois. The USFWS has established a Federal Depredation Order (50 CFR 21.43) for blackbirds (Sobeck 2010). The IDNR has established ILCS 525.35d, which provides those experiencing damage from blackbirds similar authorities to resolve those conflicts. Therefore, no federal or state permit is required to remove blackbirds, cowbirds, grackles, and crows if they are 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.

Common Grackle Biology and Population Impacts

IL population estimate: 5,000,000
BBS Eastern Tallgrass Prairie, 1966-2012: -1.25%
BBS Eastern Tallgrass Prairie, 2002-2012: -2.58%
WS take as % of state population: 0.06%

WS proposed annual take: 3,000
BBS IL, 1966-2012: -1.02%
BBS IL, 2002-2012: -4.06%

One blackbird species commonly found in mixed species flocks is the common grackle. Common grackles are a semi-colonial nesting species often associated with human activities (Peer and Bollinger 1997). Common grackles have likely benefited from human activities, such as the clearing of forests in the mid-western United States. Forest fragmentation provides suitable nesting habitat since grackles nest along the outside perimeter of forests. The planting of trees in residential areas has led to an expansion of the species range into the western United States (Peer and Bollinger 1997). The number of common grackles observed during the Spring Bird Count (SBC) shows a stable trend in Illinois from 2011-2013 (Beveroth 2014).

Like other blackbird species, the take of common grackles can occur under the previously referenced Federal Blackbird Depredation Order (50 CFR 21.43) which allows blackbirds, including common grackles, to be taken when committing damage or about to commit damage without the need for a depredation permit. Therefore, the number of common grackles taken annually by other entities is currently unknown. The number of grackles addressed in Illinois by WS to alleviate damage is shown in Table 4.1. Since depredation permits are not needed for the take of these birds and the reporting of take was not required under 50 CFR 21.43 of the MBTA prior to January 3, 2011 (Sobeck 2010) the number of common grackles lethally removed by other entities is unknown and the cumulative take is not applicable.

Table 4.1 – Number of Common Grackles addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	59	0	0
2012	153	48	0	19
2013	30	25	0	22
TOTAL	**183**	**132**	**0**	**41**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
The take of common grackles by WS is expected to be of low magnitude when compared to the statewide estimated population. The relative abundance of grackles, long-term increasing population trends, and that WS' starling/blackbird damage management activities would only be conducted at a limited number of sites involving a very small portion of the area in the state proves that there would be no adverse direct or indirect impact on the state population. The take of these birds can only occur when permitted by the USFWS or when taken under 50 CFR 21.43. Based on the above information and WS anticipated lethal take of common grackles in Illinois, WS should have minimal cumulative impacts on local, statewide, and national populations.

Red-winged Blackbird Biology and Population Impacts

IL population estimate: 3,000,000
BBS Eastern Tallgrass Prairie, 1966-2012: -0.82%
BBS Eastern Tallgrass Prairie, 2002-2012: -2.09%
WS take as % of state population: 0.10 %

WS proposed annual take: 3,000
BBS IL, 1966-2012: -0.33%
BBS IL, 2002-2012: -4.17%

Perhaps the most abundant bird in North America, the red-winged blackbird is highly adaptable to habitat change caused by humans and can be found in Illinois throughout the year (Yasukawa and Searcy 1995). Red-winged blackbirds can cause severe damage to sunflower fields with the ability to destroy an entire field in just a few days (USGS 2013). These blackbirds can create substantial damage to aircraft and can also threaten human safety. From 2011 to 2013 this species has been involved in 10 separate aircraft strikes in Illinois (FAA 2014). Natural mortality in blackbird populations is between 50-65% of the population each year regardless of human-cause control operations (Fankhauser 1971). Dolbeer (1994) states that this high mortality rate is offset by a reproductive rate of two to four young fledged per female per year. Given the density-dependent relationships in a blackbird population (i.e. decreased mortality and increased fecundity of surviving birds) a high number of blackbirds would likely have to be killed in order to impact the regional breeding population.

The number of red-winged blackbirds addressed in Illinois by all entities to alleviate damage is shown in Table 4.2. Since depredation permits are not needed for the take of these birds and the reporting of take was not required under 50 CFR 21.43 of the MBTA Prior to January 3, 2011 (Sobeck 2010) the number of red-winged blackbirds lethally removed by other entities is unknown and the cumulative take is not applicable.

Table 4.2 – Number of Red-winged Blackbirds addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	2407	145	0	12
2012	3764	85	0	17
2013	6492	154	0	0
TOTAL	**12663**	**384**	**0**	**29**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
WS proposed take level will have no adverse direct or indirect effects on red-winged blackbird populations. Based on the limited take by WS when compared to the estimated breeding population, WS' proposed annual take of red-winged blackbirds would be of low magnitude. Additionally, red-winged

blackbird populations have remained abundant enough that the USFWS maintains a Federal Blackbird Depredation Order for this species. The take of these birds can only occur when permitted by the USFWS or when taken under 50 CFR 21.43. All take is reported to the USFWS to ensure cumulative take is considered as part of population management objectives for this species. Therefore, WS does not anticipate any significant cumulative impacts to red-winged blackbird populations.

Brown-headed Cowbird Biology and Population Impacts

IL population estimate: 5,900,000
BBS Eastern Tallgrass Prairie, 1966-2012: -0.48%
BBS Eastern Tallgrass Prairie, 2002-2012: -0.19%
WS take as % of state population: 0.05 %

WS proposed annual take: 3,000
BBS IL, 1966-2012: 1.48
BBS IL, 2002-2012: 2.14

Brown-headed cowbirds are another species of blackbird commonly found in mixed species flocks during migration periods. Somewhat unique in their breeding habits, cowbirds are known as brood parasites, meaning they lay their eggs in the nests of other bird species (Lowther 1993). Female cowbirds can lay 30-80 eggs per season with eggs reportedly being laid in the nests of over 200 species of birds, of which, 144 species have actually raised cowbird young (Robinson and Herkert 1997; Lowther 1993). No parental care is provided by cowbirds to host species when raising cowbird young (Peterson 1980). The number of brown-headed cowbirds observed during the SBC from 2011 through 2013 shows a stable trend within Illinois (Beveroth 2014).

The take of brown-headed cowbirds can occur under the Federal Blackbird Depredation Order (50 CFR 21.43) which allows blackbirds, including cowbirds, to be taken when committing damage or about to commit damage without the need for a depredation permit. The number of cowbirds addressed in Illinois by WS to alleviate damage is shown in Table 4.3. Since depredation permits are not needed for the take of these birds and the reporting of take under 50 CFR 21.43 of the MBTA was not required prior to January 3, 2011 (Sobeck 2010) the number of cowbirds lethally removed by other entities is unknown and the cumulative take is not applicable.

Table 4.3 – Number of Brown-headed Cowbirds addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	1865	332	50	0
2012	1470	41	50	0
2013	925	54	53	0
TOTAL	**4260**	**427**	**153**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Although cowbirds can cause damage or pose threats of damage, some take of cowbirds by WS would be the result of addressing flocks of mixed species comprised of starlings and other blackbirds. Given the relative abundance of brown-headed cowbirds in Illinois, long-term stable population trends, and that WS' cowbird damage management activities would only be conducted at a limited number of sites involving a very small portion of the area in the state, WS concludes that the proposed action will not adversely directly or indirectly impact the state, regional or national brown-headed cowbird population. All take is reported to the USFWS to ensure cumulative take is considered as part of population

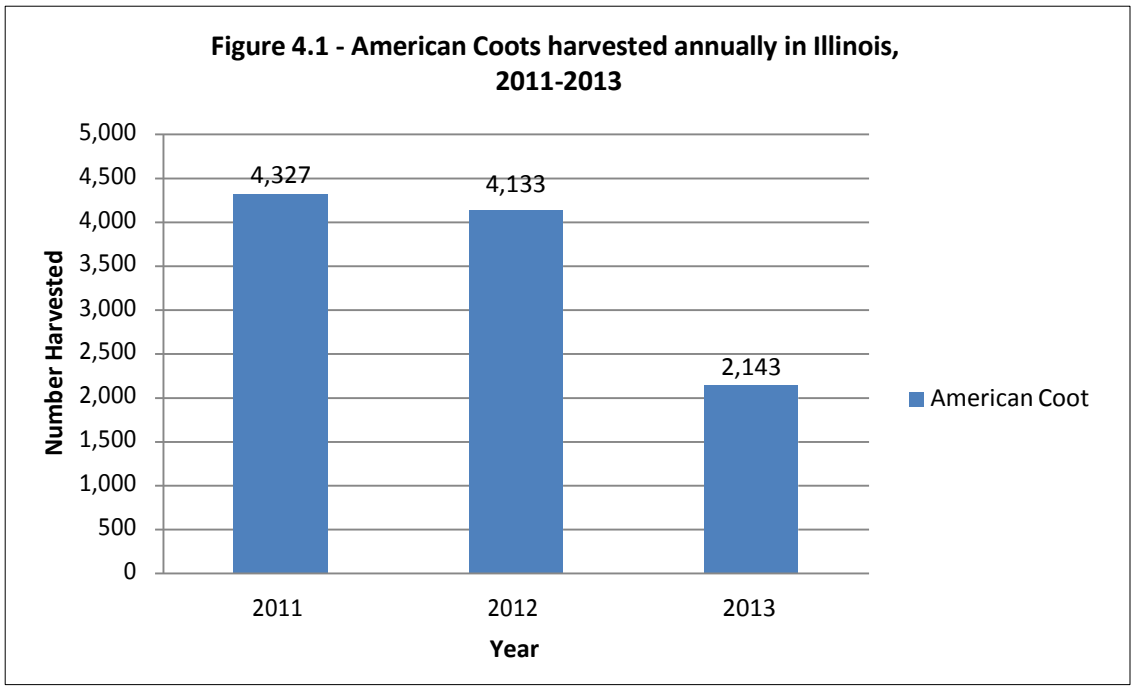
management objectives for this species. Therefore, WS does not anticipate any significant cumulative impacts to red-winged blackbird populations.

American Coot Biology and Population Impacts

IL population estimate: N/A
BBS Eastern Tallgrass Prairie, 1966-2012: -9.72%
BBS Eastern Tallgrass Prairie, 2002-2012: -12.10%
WS take as % of average annual harvest: 1.4%

WS proposed annual take: 50
BBS IL, 1966-2012: -10.97%
BBS IL, 2002-2012: -20.60%

American coots can be found across the majority of the United States. They are the most aquatic members of their family and are also very hardy. Coots are opportunistic feeders and are highly adaptable towards any habitat (Audubon 2014, Ehrlich et al. 1988). American coot flocks may number up to 1,500 individuals and can be a threat towards aviation safety and human health. American coots can be harvested within Illinois between October and January. The annual harvest numbers in Illinois for coots from 2011 through 2013 is shown in Figure 4.1 (Raftovich and Wilkins 2013; Raftovich et al. 2014). Although a population estimate is not available for Illinois, the number of American coots observed during the SBC has shown a general increasing trend in Illinois from 2011 through 2013 (Beveroth 2014). Additionally, survey data from the CBC indicates that the number of American coots within the state has shown a generally stable to increasing trend since 1966 (NAS 2010).



The number of American coots addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.4. The annual harvest of coots in Illinois averaged 3,534 individuals per year from 2011-2013. WS' proposed take of 50 would account for 1.4% of the average annual harvest.

Table 4.4 – Number of American Coots addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	1	10	0
2012	1	1	20	0
2013	6	2	40	1
TOTAL	**7**	**4**	**70**	**1**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed take level will have no adverse direct or indirect effects on American coot populations. The potential authorized take from all non-WS entities combined with WS proposed take and the annual harvest is not expected to create adverse cumulative impacts. The take of coots by WS would only occur 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 of coots in Illinois. WS' proposed take is only a small percentage of the annual harvest, and therefore is not expected to hinder the ability of those interested persons in harvesting American coots during the hunting season.

Double-crested Cormorant Biology and Population Impacts

IL population estimate: N/A
BBS Eastern Tallgrass Prairie, 1966-2012: 12.25%
BBS Eastern Tallgrass Prairie, 2002-2012: 15.80%
WS take as % of state population: N/A
WS proposed annual take: 125
BBS IL, 1966-2012: 16.44%
BBS IL, 2002-2012: 14.24%

Double-crested cormorants are large fish-eating colonial waterbirds widely distributed across North America (Hatch and Weseloh 1999). As stated in the cormorant management FEIS developed by the USFWS, the recent increase in the double-crested cormorant population in North America, and the subsequent range expansion, has been well-documented along with concerns of negative impacts associated with the expanding cormorant population (USFWS 2003). Wires et al. (2001) and Jackson and Jackson (1995) have suggested that the current cormorant resurgence may be, at least in part, a population recovery following years of DDT-induced reproductive suppression and unregulated take prior to protection under the MBTA. There appears to be a correlation between increasing cormorant populations and growing concern about associated negative impacts, thus creating a very real management need to address those concerns (USFWS 2003, USFWS 2009).

The double-crested cormorant is one of six species of cormorants breeding in North America and has the widest range (Hatch 1995). Double-crested cormorants range throughout North America, from the Atlantic coast to the Pacific coast (USFWS 2003) and breeding populations are showing statistically significant increasing trends across the U.S. (estimated at 4.6% annually since 1966), in the Eastern BBS region (estimated at 3.9% annually since 1966) (Sauer et al. 2014). The BBS has also shown an increasing trend in Illinois, estimated at 16.4% since 1966 (Sauer et al. 2014) The total population of double-crested cormorants in the U.S. and Canada is estimated at between 2 and 2.4 million birds (USFWS 2003). From 2007 through 2013 a Colonial Waterbird Survey estimated that 38,269 nests occurred just along Lake Michigan. This survey covers shoreline and islands of the Great Lakes and some inland colonies near the shores of the Great Lakes, but it does not account for the birds that might have been nesting on inland lakes and rivers. The cormorant's range has expanded in the Great Lakes and this

survey documented an 8% increase in the number of nesting cormorants since the third survey that was conducted in 1997-1999 (Wires et al. 2001).

The number of double-crested cormorants addressed in Illinois by all entities to alleviate damage is shown in Table 4.5. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non-WS entities.

Table 4.5 – Number of Double Crested Cormorants addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	67	7	0	0
2012	33	5	0	0
2013	5	6	0	0
TOTAL	**105**	**18**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct or indirect effects on cormorant populations. WS anticipates the number of requests for assistance will increase to manage damage caused by cormorants. This is due to the increasing number of cormorants observed during the breeding season, overwintering within the state, as well as the increase of WS assistance requests at civil and military airports. Additionally, the potential authorized take from all non-WS entities combined with WS proposed take is not expected to create adverse cumulative impacts. The permitting of take by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for double-crested cormorants in Illinois. Ws' proposed take of 125 double-crested cormorants annually is anticipated to have minimal effects on the regional or continental cormorant populations.

American Crow Biology and Population Impacts

IL population estimate: 360,000
BBS Eastern Tallgrass Prairie, 1966-2012: 0.39%
BBS Eastern Tallgrass Prairie, 2002-2012: -1.64%
WS take as % of state population: 0.07 %
Cumulative take as % of state population: 0.07%

WS proposed annual take: 250
BBS IL, 1966-2012: 0.06%
BBS IL, 2002-2012: -1.73%

American crows are highly adaptable and will live in any open place that offers a few trees to perch in and a reliable source of food. Crows regularly use both natural and human-created habitats, including farmlands, pastures, landfills, city parks, golf courses, cemeteries, yards, vacant lots, feedlots, and the shores of waterways. American crows are one of the most recognizable birds in Illinois. Large flocks of crows tend to concentrate in some areas where abundant food and roosting sites are available. This can be very problematic when dealing with human safety at airports regarding airstrikes. Large fall and winter crow roosts may cause serious problems in some areas, particularly when located in towns or other sites near people. Such roosts are objectionable because of the odor of the bird droppings, health concerns, noise, and damage to trees in the roost. American crows are listed under the Federal depredation order for blackbirds, cowbirds, grackles, crows and magpies (50 CFR 21.43) which allows entities to lethally remove birds when causing damage or potentially causing damage. However, the USFWS could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the

continued viability of crow populations, which should also assure that cumulative impacts on crow populations would have no significant impact on the quality of the human environment.

The number of American crows addressed in Illinois by all entities to alleviate damage is shown in Table 4.6. Reported hunter harvest for the 2013 – 2014 Illinois season was 182 birds and a decreasing trend of hunter harvested crows in the state has been noticed since 2010 (IDNR 2014*a*). The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non WS entities.

Table 4.6 – Number of American Crows addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	806	4	0	0
2012	3561	18	0	0
2013	2612	17	0	0
TOTAL	**6,979**	**39**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Given the relative abundance of American crows, long-term stability to increasing population trends, and that WS' crow damage management activities would only be conducted at a limited number of sites involving a very small portion of the area in the state, WS concludes that the proposed action will not adversely directly or indirectly impact the state, regional, or national American crow population. Although non-WS removal is unknown, crows have maintained a historically increasing population that has remained viable enough to support an annual hunting season and a Federal Blackbird Depredation Order. Therefore, WS does not expect there to be significant adverse cumulative impacts to crow populations. Additionally, the USFWS could impose restrictions on depredation harvest as needed to assure cumulative removal does not adversely affect the continued viability of crow populations, which should also assure that cumulative impacts on crow populations would have no significant impact on the quality of the human environment. WS also does not expect crow populations to be impacted enough to limit the ability of those persons interested in harvesting crows during the regulated hunting season.

Eurasian Collared Dove Biology and Population Impacts

IL population estimate: N/A
BBS Eastern Tallgrass Prairie, 1966-2012: 40.93%
BBS Eastern Tallgrass Prairie, 2002-2012: 48.84%
WS take as % of state population: N/A
WS proposed annual take: 750
BBS IL, 1966-2012: 62.11%
BBS IL, 2002-2012: 53.30%

Eurasian collared doves are nonnative to the United States and, as such, are not afforded protection under the MBTA (70 FR 12710-12716). However, their strong increasing trend proves that they are a highly adaptable species. The number of Eurasian collared doves observed during the CBC and SBC shows an increasing trend throughout 2011, 2012, and 2013 in Illinois (NAS 2010; Beveroth 2014). Eurasian collared doves are often found with mourning doves and feral pigeons in damage situations. Damage caused by Eurasian collared doves includes feeding at industrial sites and contaminating sensitive areas with droppings, feathers, and bird-borne pathogens. They are managed as a game species in Illinois, but there is currently no limit on recreational harvest of the species.

The number of Eurasian collared doves addressed in Illinois by all entities to alleviate damage is shown in Table 4.7. The cumulative take and WS take as a percentage of the state population values are the same since no depredation permits were given to other entities.

Table 4.7 – Number of Eurasian Collared Doves addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	0	0	0
2012	845	134	0	0
2013	2250	220	0	0
TOTAL	**3095**	**354**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

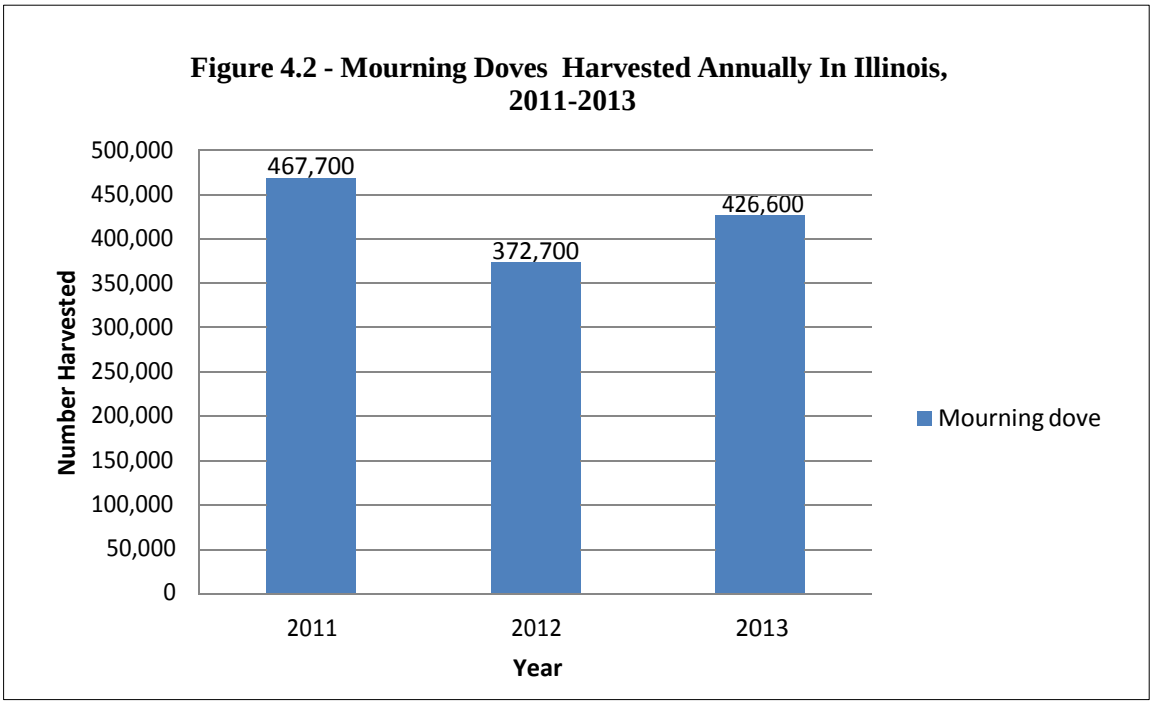
Direct, Indirect, and Cumulative Effects:
Given the low magnitude of WS' proposed take along with the rapidly growing regional population of this species from the bird surveys previously listed, WS take will not have a direct or indirect impact on Eurasian collared dove populations. WS' proposed Eurasian collared dove damage management activities would be conducted pursuant to Executive Order 13112. The Executive 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 associated damages, 2) monitor invasive species populations, 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 on invasive species. WS has concluded that the proposed level of Eurasian collared dove take will not have an adverse cumulative impact to the state, regional, or national population.

Mourning Dove Biology and Population Impacts

IL population estimate: 2,400,000
BBS Eastern Tallgrass Prairie, 1966-2012: -0.32%
BBS Eastern Tallgrass Prairie, 2002-2012: 0.22%
WS take as % of state population: 0.08%
Cumulative take as % of state population: 0.19%

WS proposed annual take: 2,000
BBS IL, 1966-2012: 0.95%
BBS IL, 2002-2012: 1.89%

Mourning doves are migratory birds with substantial populations throughout much of North America and are one of Illinois' most widespread breeding bird species. These doves can create substantial damage to aircraft and can also threaten human safety. From 2011 to 2013 this species has been involved in 75 reported aircraft strikes in Illinois (FAA 2014). BBS relative abundance estimates indicate that mourning doves are among the ten most commonly counted bird species in the state (Sauer et al. 2014). Mourning doves are considered migratory game birds and many states have regulated hunting seasons for doves, including Illinois. Doves can be harvested within Illinois during a two-way split season that occurs between September and January. The annual harvest numbers in Illinois for mourning doves from 2011 through 2013 is shown in Figure 4.9 (Raftovich and Wilkins 2013; Raftovich et al. 2014). The number of mourning doves observed during the CBC has shown a general increasing trend in Illinois since 1966 although populations have experienced slight declines in the past twenty years (NAS 2010).



The number of mourning doves addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.8. The annual harvest of mourning doves in Illinois averaged to 422,333 individuals per year from 2011-2013. WS' proposed take of 2,000 would account for 0.47% of the average annual harvest. The highest authorized take for non-WS entities, 2670 mourning doves, in addition to the WS proposed take was used to assess the cumulative take.

Table 4.8 – Number of Mourning Doves addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	12755	1046	2320	304
2012	27392	1594	1570	429
2013	27918	814	2670	356
TOTAL	**68065**	**3454**	**6560**	**1089**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed take level will have no adverse direct or indirect effects on mourning dove populations. Local populations of mourning doves in Illinois are likely augmented by migrating birds during the winter months. The potential authorized take from all non-WS entities combined with WS proposed take and the annual harvest is not expected to create adverse cumulative impacts. The take of mourning doves by WS would only occur 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 of doves in Illinois and would not result in adverse cumulative impacts. WS' proposed take is only a small percentage of the annual harvest, and therefore is not expected to hinder the ability of those interested persons in harvesting mourning doves during the hunting season.

Feral and Domestic Waterfowl Biology and Population Impacts

Domestic waterfowl refers to captive-reared, domestic, of some domestic genetic stock, or domesticated breeds of ducks, geese, and swans. Examples of domestic waterfowl include, but are not limited to, Muscovy ducks, Pekin ducks, Rouen ducks, Cayuga ducks, Swedish ducks, Chinese geese, Toulouse geese, Khaki Campbell ducks, Embden geese, and pilgrim geese. Feral ducks may include a combination of mallards, Muscovy ducks, and mallard-Muscovy hybrids. All domestic ducks, except for Muscovy ducks, were derived from the mallard (Drilling et al. 2002). Domestic waterfowl have been released at business parks, universities, wildlife management areas, parks, military bases, residential communities, and housing developments. Many times, those birds are released with no regard or understanding of the consequences or problems they can cause to the environment or the local community.

Feral ducks are distinguished by feather coloration not typical of wild ducks, weight, and/or flight ability. Flight ability alone is not used as a determining condition during the summer molt. Most feral ducks exhibit two or more of these characteristics. Feral waterfowl, when captured, are euthanized while wild ducks may be released to the wild in accordance with permit guidance from the USFWS and the IDNR.

Federal law does not protect domestic varieties of waterfowl (see 50 CFR 21), nor are domestic waterfowl specifically protected by state law in Illinois. Domestic waterfowl may at times cross breed with migratory waterfowl species, creating a hybrid cross breed (e.g., mallard X domestic duck, Canada goose X domestic goose). Those types of hybrid waterfowl species would be removed in accordance with definitions and regulations provided in 50 CFR 10 and 50 CFR 21.

Domestic ducks, geese, and swans are non-indigenous species considered by many wildlife biologists and ornithologists to be an undesirable component of native ecosystems in North America. Any reduction in the number of these domestic waterfowl species could be considered as benefiting other native bird species since they compete with native wildlife for resources. Domestic and feral waterfowl are almost always found near water, such as ponds, lakes, retaining pools, and waterways. Domestic and feral waterfowl generally reside in the same area year-round with little to no migration occurring. Currently, population estimates do not exist for domestic and feral waterfowl in Illinois.

The Muscovy ducks located in Illinois are from non-migratory populations that originated from domestic stock. The USFWS has recently changed the regulations governing Muscovy ducks. Because Muscovy ducks occur naturally in southern Texas, this species has been added to the list of migratory birds afforded protection under the MBTA. However, it has been introduced and is not native in other parts of the United States, including Illinois. The USFWS now prohibits sale, transfer, or propagation of Muscovy ducks for hunting and any other purpose other than food production, and allows their removal in locations in which the species does not occur naturally in United States, including Illinois. The USFWS has revised 50 CFR 21.14 (permit exceptions for captive-bred migratory waterfowl other than mallard ducks) and 50 CFR 21.25 (waterfowl sale and disposal permits), and has added 50 CFR 21.54, which is an order to allow control of Muscovy ducks, their nests, and eggs.

Between FY 2011 – 2013, WS provided technical assistance regarding feral waterfowl on 9 occassions. During the same time period, no lethal take by WS occurred. The number of feral waterfowl lethally removed by non-WS entities to alleviate damage or threats in Illinois is unknown since the reporting of feral waterfowl removal is not required. Although no specific hunting season has been designated specifically for feral waterfowl, some domestic or feral waterfowl are removed during the annual hunting season for free-ranging waterfowl.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of additional efforts, WS could lethally remove up to 200 feral ducks or feral geese and up to 20 feral waterfowl nests (and eggs) could be destroyed annually under the proposed action. Additionally, WS could lethally remove up to 200 Muscovy ducks and up to 20 Muscovy duck nests (and eggs) could be destroyed annually under the proposed action. Although the number of feral waterfowl inhabiting Illinois is currently unknown, based on the limited removal proposed and the likely benefit to the natural environment that could occur, WS proposed removal level will have no adverse direct or indirect effects on feral waterfowl populations. Additionally, WS proposed removal combined with potential removal by non-WS entities, including hunter harvest, is not expected to create adverse cumulative impacts on feral waterfowl and Muscovy duck populations.

Mallard Biology and Population Impacts

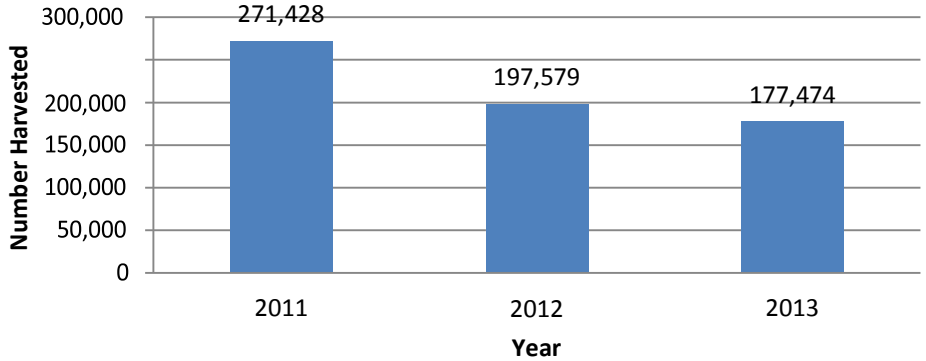
Population estimate: 10,900,000 (USFWS 2014*b*)
BBS Eastern Tallgrass Prairie, 1966-2012: 2.02%
BBS Eastern Tallgrass Prairie, 2002-2012: -1.58%
WS take as % of regional population: 0.005%
Cumulative take as % of regional population: 0.02%

WS proposed annual take: 500 + 20 nests
BBS IL, 1966-2012: 0.18%
BBS IL, 2002-2012: -7.81%

Mallards are the world's most familiar duck species and are the most adaptable, occupying a wide range of habitats (Gooders and Boyer 1986). One of the mallard's foraging characteristics is its ability to utilize agricultural grain crops as well as natural aquatic foods (Johnsgard 1975). Large flocks of mallards can lead to numerous problems, especially in urban areas where the defecation can contaminate private lawns and swimming pools (University of Illinois Extension 2014). From 2011 to 2013 this species has been involved in 19 separate aircraft strikes in Illinois (FAA 2014). The annual harvest numbers in Illinois for mallards in Illinois from 2011 through 2013 is shown in Figure 4.3 (Raftovich and Wilkins 2013; Raftovich et al. 2014).

The number of mallards observed in the state during the CBC has shown a relatively stable trend since 1966 (NAS 2010). The number of mallards observed in the state during the Mid-winter Waterfowl Survey conducted in 2014 was estimated at 110,978 (Klimstra et al. 2014). In 2013, the number of mallards observed during the Mid-winter Waterfowl Survey in Illinois was 332,025 (Klimstra et al. 2014). The estimated population for mallards was 10.9 ± 0.3 million in 2014, which is 42% above the long-term average (USFWS 2014*a*).

Figure 4.3 - Mallards harvested annually in Illinois, 2011-2013



The number of mallards addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.9. The annual harvest of mallards in Illinois averaged to 215,494 individuals per year from 2011-2013. WS' proposed take of 500 would account for 0.23% of the average annual harvest. The highest authorized take for non-WS entities, 1584 mallards, in addition to the WS proposed take was used to assess the cumulative take. Removal of mallard nests may include treatment of eggs to render them unviable (i.e., oiling, addling). From FY 2011 to FY 2013, mallard nest removal by WS averaged one nest (Table 4.10).

Table 4.9 – Number of Mallards addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	7951	317	1549	82
2012	5327	201	1004	24
2013	9007	176	1584	35
TOTAL	**22285**	**694**	**4137**	**141**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Table 4.10 – Number of Mallard nests removed by WS in Illinois from FY 2011 to FY 2013

Federal Fiscal Year	Number of nests
2011	2
2012	0
2013	0
Average	**1**

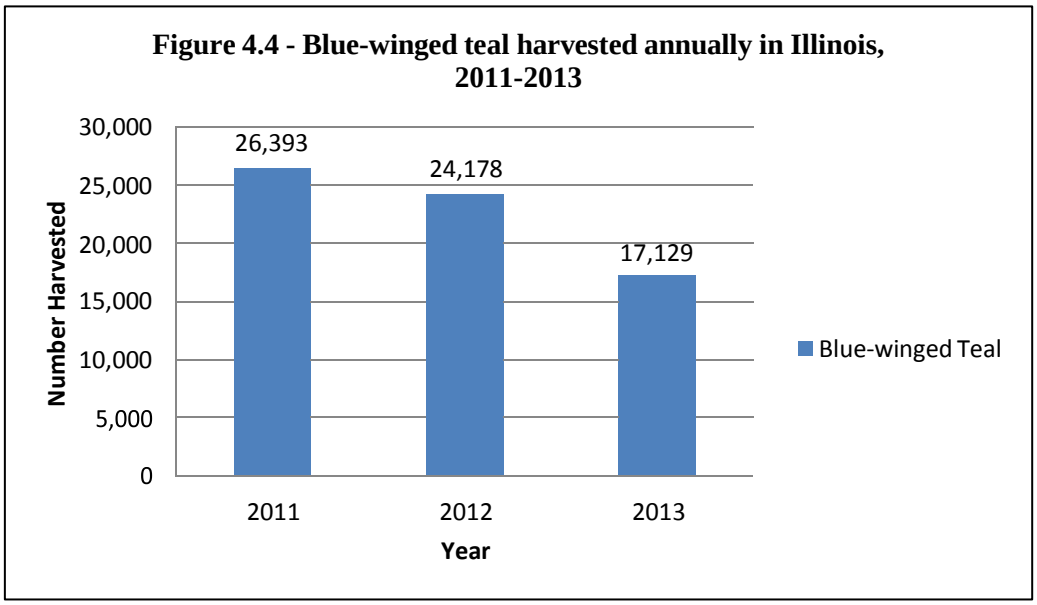
Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed take level will have no adverse direct or indirect effects on mallard populations. The removal of 500 mallards would represent 0.5% of the mallards observed in Illinois in the Mid-winter Waterfowl Survey conducted in 2014. The potential authorized take from all non-WS entities combined with WS proposed take and the annual harvest is not expected to create adverse cumulative impacts. The take of mallards by WS would only occur 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 of mallards in Illinois. WS' proposed take is only a small percentage of the annual harvest, and therefore is not expected to hinder the ability of those interested persons in harvesting mallards during the hunting season.

Blue-winged Teal Biology and Population Impacts

Regional population estimate: 8,542,000 (USFWS 2014*b*) WS proposed annual take: 100
BBS Eastern Tallgrass Prairie, 1966-2012: -0.74% BBS IL, 1966-2012: -6.05%
BBS Eastern Tallgrass Prairie, 2002-2012: 9.55% BBS IL, 2002-2012: -15.20%
WS take as % of regional population: 0.001%
Cumulative take as % of regional population: 0.001%

Blue-winged teal can be found throughout North America. They are small, shy ducks of ponds, marshes and protected bays (Robbins et al. 1997). This species could pose a threat to human safety from aircraft collisions when occurring near airports. Blue-winged teal are considered migratory game birds and many states have regulated hunting seasons for teal, including Illinois. Teal can be harvested within Illinois between October and January. The annual harvest numbers in Illinois for blue-winged teal from 2011

through 2013 is shown in Figure 4.4 (Raftovich and Wilkins 2013; Raftovich et al. 2014). The number of blue-winged teal observed during the SBC has shown a general increasing trend in Illinois since 2011 (Beveroth 2014). The USFWS estimates total blue-winged teal populations to be 8.5 ± 0.5 million, which was similar to the 2013 estimate and 75% above the long-term average of 4.9 ± 0.04 million (USFWS 2014*a*).



The number of blue-winged teal addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.11. The annual harvest of blue-winged teal in Illinois averaged to 22,567 individuals per year from 2011-2013. WS' proposed take of 100 would account for 0.44% of the average annual harvest. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non-WS entities.

Table 4.11 – Number of Blue-winged Teal addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	158	6	0	0
2012	17	0	0	0
2013	188	1	0	0
TOTAL	**363**	**7**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

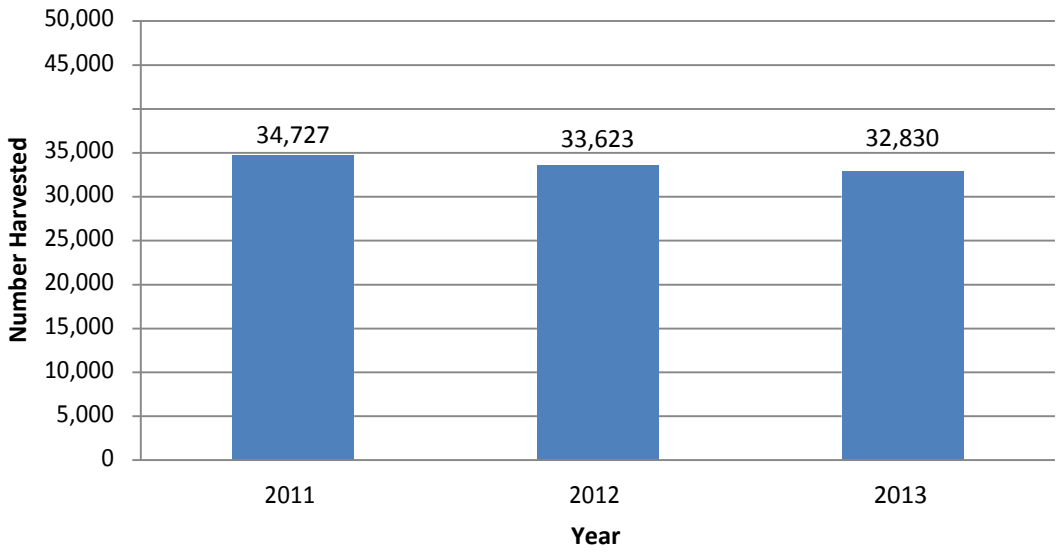
Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed take level will have no adverse direct or indirect effects on blue-winged teal populations. The potential authorized take from all non-WS entities combined with WS proposed take and the annual harvest is not expected to create adverse cumulative impacts. The take of blue-winged teal by WS would only occur 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 of teal in Illinois. WS' proposed take is only a small percentage of the annual harvest, and therefore is not expected to hinder the ability of those interested persons in harvesting blue-winged teal during the hunting season.

Green-winged Teal Biology and Population Impacts

Regional population estimate: 3,440,000 (USFWS 2014*b*) WS proposed annual take: 100
BBS Eastern Region, 1966-2012: 0.65 BBS IL, 1966-2012: N/A
BBS Eastern Region, 2002-2012: 2.85 BBS IL, 2002-2012: N/A
WS take as % of regional population: 0.003%
Cumulative take as % of regional population: 0.003%

Green-winged teal are the smallest dabbling duck in North America. This species could pose a threat to human safety from aircraft collisions when occurring near airports. Green-winged teal can be seen foraging on vegetative materials in shallow wetlands, agricultural fields, and woodlots. These ducks can also walk easily on land and can be found nesting in grasses and weeds of meadows as far as 200 feet from water (Alsop 2001). Green-winged teal are considered migratory game birds and many states have regulated hunting seasons for teal, including Illinois. Teal can be harvested in Illinois between October and January. The annual harvest numbers in Illinois for green-winged teal from 2011 through 2013 are shown in Figure 4.5 (Raftovich and Wilkins 2013; Raftovich et al. 2014). The USFWS estimates the total population of green-winged teal to be 3.4 ± 0.2 million, which was similar to the 2013 estimate and 69% above the long-term average of 2.0 ± 0.02 million (USFWS 2014*a*).

Figure 4.5 - Green-winged teal harvested annually in Illinois, 2011-2013



The number of green-winged teal addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.12. The annual harvest of green-winged teal in Illinois averaged to 33,727 individuals per year from 2011-2013. WS' proposed take of 100 would account for 0.30% of the average annual harvest. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non-WS entities.

Table 4.12 – Number of Green-winged Teal addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	12	2	0	0
2012	4	0	0	0
2013	6	0	0	0
TOTAL	**22**	**2**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed take level will have no adverse direct or indirect effects on American green-winged teal populations. The potential authorized take from all non-WS entities combined with WS proposed take and the annual harvest is not expected to create adverse cumulative impacts. The take of green-winged teal by WS would only occur 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 of teal in Illinois. WS' proposed take is only a small percentage of the annual harvest, and therefore is not expected to hinder the ability of those interested persons in harvesting American green-winged teal during the hunting season.

Bald Eagle Biology and Population Impacts

IL population estimate: 100 breeding pairs (USFWS 2013) WS proposed take: Harassment as necessary
BBS Eastern Tallgrass Prairie, 1966-2012: 16.23% BBS IL, 1966-2012: 25.30%
BBS Eastern Tallgrass Prairie, 2002-2012: 22.76% BBS IL, 2002-2012: 17.44%
WS take as % of state population: NA
Cumulative take as % of state population: NA

The bald eagle is a large raptor often associated with aquatic habitats across North America with breeding populations occurring primarily in Alaska and Canada; however, eagles have been documented nesting in all 48 contiguous states, except Rhode Island and Vermont (Buehler 2000). Nesting normally occurs from late-March through September with eggs present in nests from late-March through the end of May. Eaglets can be found in nests generally from late-May through mid-September (Buehler 2000). In Illinois, the nesting season for bald eagles ranges from late January through August (USFWS 2007*b*).

Although officially removed from the protection of the ESA across most of its range, the bald eagle is still afforded protected under the Bald and Golden Eagle Protection Act (16 USC 688) and, in Illinois, Illinois Wildlife Code (520 ILCS 5) affords certain protections to bald eagles. Becuase of these protections and restrictions on pesticide safety and use, bald eagles have been increasing over the past decades. According to the USFWS, the number of bald eagle nesting pairs has increased from an estimated 487 pairs in 1963 to 9,789 pairs in 2006 (USFWS 2013). From 1975-2008, the number of counties in Illinois where bald eagle nesting occurs has risen from one to 67 counties (Illinois Endangered Species Protection Board 2009) and since 1990 the breeding population of eagles in Illinois has increased from an estimated 8 breeding pairs to 100 breeding pairs in 2006 (USFWS 2013). The number of wintering and migrating bald eagles has also increased, although their numbers are much more difficult to quantify. The increasing population poses a unique threat for airports that contain or border eagle habitat. Raptors, including eagles, are hazards to human safety and aircraft operations at airports because of their size, hunting behavior, and hovering/soaring habits. In spite of the large size and loud noise of incoming and departing aircraft, raptors are generally hesitant to yield aerial territory and therefore are frequently struck (Blokpoel 1976). From 2011 to 2013 this species has been involved in two separate aircraft strikes in

Illinois (FAA 2014). Conflicts with eagles at airports can occur throughout the year, although many conflicts are reported during the winter when there are many more eagles in Illinois as birds migrate from the north.

As was discussed in Chapter 1, under the Bald and Golden Eagle Protection Act, the definition of "*take*" includes actions that can *"disturb"* eagles. For the purposes of the Act under 50 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."* The Bald and Golden Eagle Protection Act allows the USFWS to permit the take of eagles when "*necessary for the protection of...other interests in any particular locality*" after determining the take is "*...compatible with the preservation of the bald eagle*" (16 U.S.C. 668a). The USFWS developed an EA that evaluated alternatives and issues associated with regulations establishing new permits for the take of eagles pursuant to the Act (USFWS 2010). Based on the evaluations in the EA and a FONSI, the selected alternative in the EA established new permit regulations for the "*take*" of eagles (see 50 CFR 22.26) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27).

Under 50 CFR 22.26, WS and/or an airport authority could apply for a permit allowing for the harassment of eagles that pose threats to aviation safety at civil and military airports. Under the proposed action alternative, WS could employ harassment methods to disperse eagles from airports/air bases or surrounding areas when authorized and permitted by the USFWS pursuant to the Act. Alternatively, if no permit is issued by the USFWS to harass eagles that are posing a threat of aircraft strikes, no activities would be conducted by WS. Activities would only be conducted by WS when a permit allowing for the harassment of eagles has been issued to WS or to an airport authority/military installation where WS is working as a subpermittee. No lethal take of eagles would occur under this proposed action alternative. In the event that remains of eagles are encountered by WS staff, the National Eagle Repository will be notified as described in section "J" of the Federal Fish and Wildlife Depredation Permit.

WS would abide by all measures and stipulations provided by the USFWS in permits issued for the harassment of eagles at airports to reduce aircraft strikes. The USFWS determined that the issuance of permits allowing the "*take*" of eagles as defined by the Act would not significantly impact the human environment when permits are issued for "*take*" of eagles under the guidelines allowed within the Act (USFWS 2010). Therefore, the issuance of permits to allow for the "*take*" of eagles, including permits issued to WS or other entities has been fully evaluated in a separate analysis (USFWS 2010).

The number of bald eagles addressed in Illinois by all entities to alleviate damage is shown in Table 4.13. During FY 13, WS harassed one bald eagle from an Illinois airport to alleviate strike risks pursuant to a permit issued by the USFWS and in accordance with the Bald and Golden Eagle Protection Act.

Table 4.13 – Number of Bald Eagles addressed in Illinois from FY 2011 to FY 2013

Year	Take under Depredation Permits			
	Dispersed by WS[1]	**Take by WS[1]**	**Authorized Take for Other Entities[2]**	**Take by Other Entities[2]**
2011	0	0	0	0
2012	0	0	0	0
2013	1	0	0	0
TOTAL	**1**	**0**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct or indirect effects on bald eagle populations. Illinois WS would utilize non-lethal harassment techniques to deter or move eagles from active airfields. All harassment and reporting would be conducted in accordance with permits issued by the USFWS and is not expected to result in death of individual birds or disturbance of nests, winter roosts, or foraging congregations. Harassment at airports may benefit individual birds by preventing eagles from being killed in collisions with aircraft, and will not negatively impact the abundance, distribution, or trend of the population.

Great Egret Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: 5.63%
BBS Eastern Tallgrass Prairie, 2002-2012: 2.59%
WS take as % of state population: NA

WS proposed annual take: 75
BBS IL, 1966-2012: 5.15%
BBS IL, 2002-2012: -0.72%

Great egrets are large, white wading birds seen in Illinois during spring, summer, and fall. The great egret is a common migrant and summer resident along the Illinois and Mississippi rivers and a few other areas where nesting colonies are present (INHS 2014). Several species of fish-eating birds, including great egrets, are commonly observed at aquaculture facilities catching their prey (Werner et al. 2001). Not only does this species cause damage to aquaculture facilities, but they also use open spaces and water sources associated with airports for foraging. The large bodied birds can cause significant damage to aircraft when struck and threaten human safety. These birds are colonial nesters that may be found with other species sharing a rookery. Having a rookery in close proximity to an airport is especially dangerous, as adults and young birds may use the airfield.

Great egrets are showing a statistically significant increase across all U.S. BBS survey routes. Since 1966, the number of great egrets observed survey-wide has increased at an annual rate of 2.1% which is a statistically significant increase (Sauer et al. 2014). Similarly, the number of egrets observed on BBS routes in Illinois have increased at an annual rate of 5.15% since 1966 (Sauer et al. 2014).

The number of great egrets addressed in Illinois by all entities to alleviate damage is shown in Table 4.14. The cumulative take as percent of state population is not applicable because USFWS did not issue any depredation permits to non-WS entities. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non-WS entities.

Table 4.14 – Number of Great Egrets addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	39	3	0	0
2012	152	3	0	0
2013	267	5	0	0
TOTAL	**458**	**11**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct effects on egret populations. The majority of the direct operational assistance conducted by WS on great egrets is non-

lethal and the lethal takes by WS is permitted by the USFWS and IDNR pursuant to the MBTA. These organizations ensure that take by WS occurs within allowable take levels and will have no adverse indirect or cumulative effects on the great egret population.

American Kestrel Biology and Population Impacts

IL population estimate: 60,000
BBS Eastern Tallgrass Prairie, 1966-2012: 0.64%
BBS Eastern Tallgrass Prairie, 2002-2012: -0.05%
WS take as % of state population: 0.33%
Cumulative take as % of state population: 0.76%

WS proposed annual take: 200
BBS IL, 1966-2012: 1.71%
BBS IL, 2002-2012: -1.33 %

American kestrels are the smallest and most common North American falcon. Their range includes most of North America, except the far northern portions of Alaska and Canada (Smallwood and Bird 2002). Kestrels are considered fairly common during most of the year and breed in Illinois. Like many falcons, kestrels use open areas for hunting prey which can become problematic for airports in regards to posing threats to human safety. From 2011 to 2013 this species has been involved in 126 separate aircraft strikes in Illinois (FAA 2014). The number of American kestrels observed during the SBC is showing a steady trend throughout Illinois (Beveroth 2014).

The number of American kestrels addressed in Illinois by all entities to alleviate damage is shown in Table 4.15. The highest combined authorized take by non-WS entities (255 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.15 – Number of American Kestrels addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	61	32	195	10
2012	272	98	145	49
2013	311	91	255	55
TOTAL	**644**	**221**	**595**	**114**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct or indirect effects on kestrel populations. As with other raptor species, WS would continue to primarily employ non-lethal methods, including trapping and relocating, to address damage and threats of damage. However, lethal removal could be conducted when immediate threats to human safety take place or when habituations to non-lethal methods occur. If requests for assistance occur in the spring, there could be an impact on the nesting and/or breeding success of individuals that are in close proximity to that area; this localized impact would be minimal and therefore would also not cause adverse indirect effects on the state American kestrel populations. Additionally, the potential authorized take from all non-WS entities combined with WS proposed take is not expected to create adverse cumulative impacts. The permitting of the take by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for kestrels in Illinois.

Canada Goose Biology and Population Impacts

IL resident population estimate: 96,050 (IDNR 2014*b*)
BBS Eastern Tallgrass Prairie, 1966-2012: 17.99%
BBS Eastern Tallgrass Prairie, 2002-2012: 9.42%
WS take as % of state population: 3.1%
Cumulative take as % of state population: 5.1%

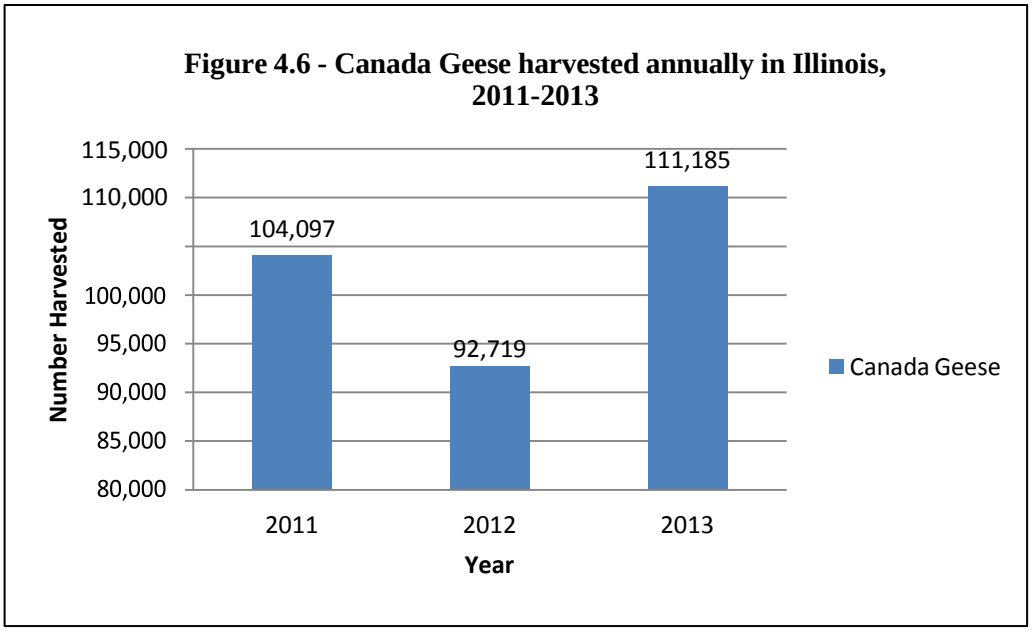
WS proposed annual take: 3,000 + 500 nests
BBS IL, 1966-2012: 16.01%
BBS IL, 2002-2012: 0.28%

Canada geese are probably more abundant now than at any time in history. They rank first among wildlife watchers and second among harvests of waterfowl species in North America. Canada geese are also the most widely distributed and phenotypically variable species of birds in North America (Rusch et al. 1995). Breeding populations now exist in every province and territory of Canada and in 49 of the 50 United States. There are two behaviorally-distinct types of Canada goose populations in Illinois: resident and migratory. Although they appear similar, they exhibit many different behaviors that affect the management of these birds. The spring population estimate of resident Canada geese in Illinois is 96,050 with biologists estimating the Mississippi Flyway Giant Canada goose population at 1,461,000 geese (IDNR 2014*b*, USFWS 2014*b*). The Mississippi Flyway Giant Canada goose population is considered overabundant and is being managed to reduce its size (USFWS 2014*b*). Many people view Canada geese as a charismatic and highly valued species, however, individual tolerance of goose behavior differs (Smith et al. 1999). Their prolific nature, site tenacity, longevity, size, and tolerance to human activity can become problematic.

One of the more dangerous bird species, Canada geese can create substantial damage to aircraft and can also threaten human safety. From 2011 to 2013 this species has been involved in 10 separate aircraft strikes in Illinois(FAA 2014). Goose feces damage property, compromises overall quality of life, and has the potential to pose serious health threats due to the presence of disease-causing organisms.

Like many waterfowl species in Illinois, Canada geese can be harvested during regulated hunting seasons that occur from October through January. Figure 4.6 depicts the total number of hunter harvested geese between 2011 and 2013.

Figure 4.6 - Canada Geese harvested annually in Illinois, 2011-2013



The number of Canada geese addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.16. The annual harvest of Canada geese in Illinois averaged to 102,667 individuals per year from 2011-2013. WS' proposed take of 3,000 would account for 2.9% of the average annual harvest. The highest authorized take for non-WS entities (1890 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.16 – Number of Canada Geese addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	20673	345	1840	137
2012	21672	231	940	92
2013	12391	385	1890	139
TOTAL	**54736**	**961**	**4670**	**368**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Table 4.17 – Number of Canada goose nests removed by WS in Illinois from FY 2011 to FY 2013

Federal Fiscal Year	Number of Nests
2011	196
2012	310
2013	340
Average	**282**

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed take level will have no adverse direct or indirect effects on Canada goose populations. Local populations of geese in Illinois are likely augmented by migrating birds during the winter months. WS does not typically remove geese during the migratory period; however, minimal numbers of geese may be removed during this period at airports for the protection of human safety. This minimal removal is not expected to have adverse direct or indirect effects on migratory goose populations. Like other native bird species, the take of Canada geese by WS to alleviate damage will only occur when permitted by the USFWS and the IDNR pursuant to the MBTA through the issuance of depredation permits.

Canada goose nests are authorized to be destroyed (which may involve treatment of eggs by oiling, puncturing, or addling to inhibit reproduction) by the USFWS and the IDNR through depredation permits issued to WS. Nest destruction methods (i.e., treatment of eggs in the nest) are considered non-lethal when conducted before the development of an embryo. Because the destruction of nests must be authorized by the USFWS and the IDNR, the number of geese lethally removed and the number of nests removed by WS annually would occur at levels permitted by the USFWS and IDNR pursuant to the MBTA. From FY 2011 to FY 2013 WS removed an average of 282 Canada goose nests to protect aviation and human safety (Table 4.17).

Additionally, the potential authorized removal from all non-WS entities combined with WS proposed removal and the annual harvest is not expected to create significant impacts to Canada goose populations. The removal of Canada geese by WS would only occur at levels authorized by the USFWS and the IDNR, which ensures WS' removal and removal by all entities, including hunter harvest, would be considered to achieve the desired population management levels of Canada geese in Illinois. Provided that the goose population allows for an annual harvest, WS' removal could be considered of low

magnitude when compared to the number of geese observed in Illinois annually and therefore will not hinder the ability of those interested persons to harvest geese during the hunting season.

Snow Goose Biology and Population Impacts

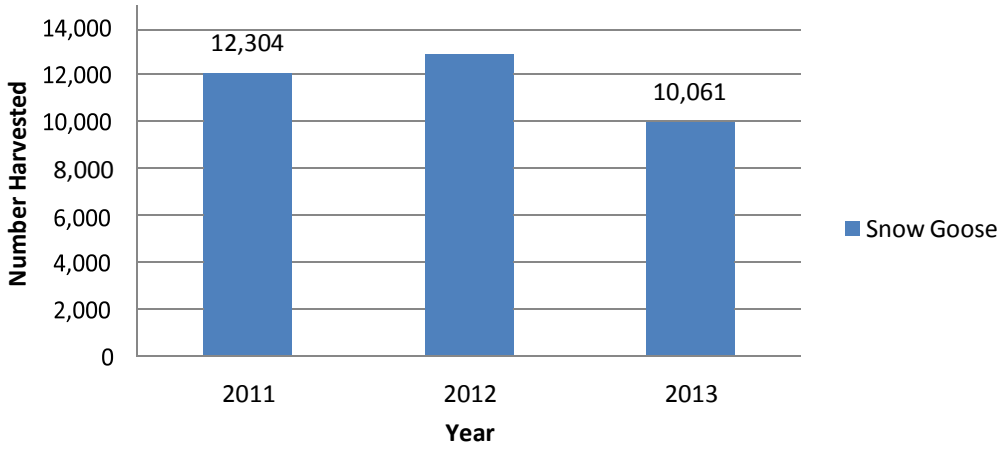
Mid-continent population estimate: 3,814,700 (USFWS 2014)
BBS Eastern Tallgrass Prairie, 1966-2012: NA
BBS Eastern Tallgrass Prairie, 2002-2012: NA
WS take as % of regional population: 0.003%
Cumulative take as % of regional population: 0.003%

WS proposed annual take: 100
BBS IL, 1966-2012: NA
BBS IL, 2002-2012: NA

Snow geese breed across the extreme northern portions of Canada and along the Arctic coast (Mowbray et al. 2000). No breeding populations of snow geese occur in Illinois. However, snow geese are common migrants through Illinois with large concentrations overwintering in the state. The fall migration period occurs from September through November with the spring migration occurring from late February through the first part of June (Mowbray et al. 2000). Requests for assistance to manage damage and threats associated with snow geese primarily originate from airports and military installations. Large flocks of snow geese on and around civil and military airports pose risks to aircraft operations and passenger safety due to the potential for bird-aircraft collisions.

Snow geese are considered migratory game birds and many states, including Illinois, have regulated hunting seasons for snow geese. Snow geese can be harvested in Illinois between October and January. They can also be harvested in the spring under the Spring light goose conservation order, which was authorized by congress under the Arctic Tundra Habitat Emergency Conservation act in 1999. The annual harvest numbers in Illinois for snow geese from 2011 through 2013 is shown in Figure 4.28 (Raftovich and Wilkins 2013; Raftovich et al. 2014). The number of snow geese observed during the SBC has shown a general increasing trend in Illinois from 2011 through 2013 (Beveroth 2014). The average number of snow geese observed in Illinois during the USFWS midwinter surveys from 2011 through 2013 has been 62,319 (Klimstra et al. 2014). Snow goose populations have increased dramatically since the mid-1970s and have reached historic highs across their breeding and wintering range. The observation of snow goose flocks on or near airports and the anticipated increase in requests for assistance to manage this species has prompted this analysis.

Figure 4.7 - Snow geese harvested during regular hunting seasons in Illinois, 2011-2013



The number of snow geese addressed in Illinois by WS and other entities to alleviate damage is shown in Table 4.18. The annual harvest of snow geese in Illinois averaged to 11,755 individuals per year from 2011-2013(Figure 4.7). WS' proposed take of 100 would account for less than 1% of the average annual harvest. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non WS entities.

Table 4.18 – Number of Snow Geese addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
All removal of snow geese by WS would occur only after a depredation permit had been issued by the USFWS either to WS or to the entities experiencing damage or threats of damage. If a permit was issued to an entity other than WS, WS participation in damage management activities requiring lethal removal would occur as an agent of the cooperating entity under the depredation permit. Due to the rapidly increasing population, WS proposed removal is expected to have no adverse direct or indirect effects on snow geese populations. Additionally, WS proposed removal combined with the potential removal of non-WS entities, including annual harvest, is not expected to create adverse cumulative impacts on snow geese populations. WS' limited proposed removal would not hinder the ability of those interested persons to harvest snow geese during the hunting seasons.

Herring Gull Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: -1.04%
BBS Eastern Tallgrass Prairie, 2002-2012: 0.52%
WS take as % of state population: NA

WS proposed annual take: 300 + 750 nests
BBS IL, 1966-2012: 6.70%
BBS IL, 2002-2012: 13.07%

Herring gulls are the largest of the five species of gulls that occur in Illinois and their population size in the Great Lakes region has increased dramatically (Belant et al. 1993). They can be found near garbage dumps, along lakes and rivers, and on rooftops within metropolitan areas. Biologists often only find out about their nesting sites on rooftops when the presence of the birds results in complaints and requests for assistance with damage management. Non-lethal exclusion methods are often sufficient to reduce the damage caused by gulls, where it is practical. Landfills and airports often require lethal reinforcement, as large areas of land cannot by fully excluded and still allow for operational use. Many of the sites where WS is asked to alleviate conflicts with herring gulls are nesting sites in urban areas, such as rooftops within cities. Key conflicts with gulls include damage to agricultural crops, damage to horticulture, safety issues at airports, nesting concentrations on rooftops, interference with industrial operations, seeking or stealing food from people eating out-of-doors, concerns about potential disease spread and impacts on human health, and/or encroachment or predation on other nesting waterbirds (Ryder 1993, Pierotti and Good 1994, USFWS 2000).

Herring gulls are commonly observed wintering in Illinois (Pierotti and Good 1994) as large numbers migrate south through the Mississippi Flyway. The North American Waterbird Conservation Plan ranked the herring gull as a species of *"low concern"* in North America (Kushlan et al. 2002).

Colonial waterbirds have been the subject of large-scale monitoring over much of the Great Lakes region for several decades. The USFWS and Canadian Wildlife Service (CWS) have coordinated three surveys spaces approximately 10 years apart (Cuthbert and Wires 2013). The total number of breeding pairs of gerring gulls along the Lake Michigan shoreline (which includes the states of Michigan, Indiana, Illinois, and Wisconsin) increased from 12,302 pairs in 50 colonies in 1970 to 18,122 pairs in 70 colonies in the 1989-91 survey, decreased to 16,455 pairs in 76 colonies in the 1997-99 survey and increased again to 21,403 breeding pairs in 60 colonies in the 2007-09 survey. The colonial waterbird survey only counts nests, so it also underestimates the gull population because it doesn't include non-breeding birds. Herring gulls generally take 4 years to reach reproductive maturity so a considerable portion of herring gull populations are not included in the waterbird survey numbers. The global herring gull population is estimated at 2,800,000 (NAS 2014). No current population estimates are available for the number of herring gulls in Illinois.

The number of herring gulls addressed in Illinois by all entities to alleviate damage is shown in Table 4.19. The highest combined authorized take by non-WS entities (925 birds) in addition to the WS proposed take was used to assess the cumulative take. Nest removal includes treatment of eggs to render them unviable (i.e., oiling, addling). The number of herring gull nests removed by WS in Illinois averaged 349 nests from FY 2011 to FY 2013 (Table 4.20).

Table 4.19 – Number of Herring Gulls addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	55227	57	880	9
2012	165119	159	855	4
2013	230145	115	925	20
TOTAL	**450491**	**331**	**2660**	**33**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Table 4.20 – Number of Herring Gull Nests Removed by WS in Illinois from FY 2011 to FY 2013

Federal Fiscal Year	Number of Nests
2011	436
2012	365
2013	247
Average	**349**

Direct, Indirect, and Cumulative Effects:

Herring gulls have an average clutch size of approximately three eggs, with little variation, and hatching success is high (60-80%) (Kadlec et al. 1969). Of those that hatch, only 50% fledge, and most of those deaths are in the first five days (Kadlec et al. 1969). That means that if WS took 750 nests, there would be 1,125 birds that had the potential to fledge that would not exist. No regional or national plan management plans for gulls have been developed. Generally, permits for gulls issued on a case-by-case basis have been sufficient for resolving local human-gull conflicts and gull impacts on other birds (Wires et al. 2010). Control at this level has not caused discernable negative impacts on regional gull populations (USFWS 2000). Given the low magnitude of this take level and the fact that the USFWS

provides oversight for cumulative and regional take, this ensures that WS take will not have an adverse direct or indirect impact to herring gull populations. Previous take levels did not appear to have a negative impact on the gull population and given that WS take impacts only a small amount of the area in the state, WS has concluded that the proposed level of herring gull take will not have an adverse cumulative impact to the state, regional, or national gull population.

Ring-billed Gull Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: 13.57%
BBS Eastern Tallgrass Prairie, 2002-2012: 19.12%
WS take as % of state population: NA

WS proposed annual take: 3,000 + 25,000 nests
BBS IL, 1966-2012: 15.26%
BBS IL, 2002-2012: 14.22%

In addition to increases in gull populations in natural habitats, there has been an increase in populations in urban areas where gulls have established colonies on buildings (Dolbeer et al. 1990). Ring-billed gulls are a common gull in Illinois and populations are concentrated near lakes, reservoirs, and other large bodies of water. Common feeding sites are open refuse dumps, livestock feedlots, fish hatcheries, open fields, food processing plants, parks, and sites with outdoor restaurants. Concerns exist regarding potential impacts that the high gull concentrations may be having on *E. coli* levels at public beaches and the need for swim bans (Rader et al. 2007). Ring-billed gulls can also become a significant problem at airports with 23 reported aircraft strikes from 2011 to 2013 in Illinois (FAA 2014). Data on the ring-billed gull population in Illinois is limited. Ring-billed gulls in Illinois are part of the larger Great Lakes population. Damage management actions in Illinois could conceivably result in birds moving along the Lake Michigan coast. Colonial species like gulls may not be adequately represented because shifts in bird use of colony sites and formation of new colonies may not be detected unless the colonies are located within survey routes.

In 2007 through 2010 a Colonial Waterbird Survey was conducted that covered the shoreline and Islands of the Great Lakes and some inland colonies near the shores of the Great Lakes. Survey data indicate that there was a total count of 143,706 pairs of ring-billed gulls on Lake Michigan's survey sites (Wires et al. 2010). Even this survey likely underestimated the number of ring-billed gulls in the region because it did not include any birds that might have been nesting on inland lakes and rivers or a complete census of rooftops and other nesting sites within metropolitan areas. It can be extremely difficult to locate all rooftop nesting locations in a major metropolitan area, such as Chicago. Biologists often only become aware of these types of sites when the presence of the birds results in complaints and requests for assistance with damage management.

The number of ring-billed gulls addressed in Illinois by all entities to alleviate damage is shown in Table 4.21. The highest combined authorized take by non-WS entities (2800 birds) in addition to the WS proposed take was used to assess the cumulative take. Nest removal includes treatment of eggs to render them unviable (i.e., oiling, addling). The number of ring-billed gull nests removed by WS in Illinois averaged 7,918 nests from FY 2011 to FY 2013 (Table 4.22).

Table 4.21 – Number of Ring-billed Gulls addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	203886	533	1825	267
2012	377510	885	1700	77
2013	159131	720	2800	71
TOTAL	**740527**	**2138**	**6325**	**415**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Table 4.22 – Number of Ring-billed Gull nests removed by WS in Illinois from FY 2011 to FY 2013

Federal Fiscal Year	Number of Nests
2011	13,246
2012	5,822
2013	4,688
Average	**7,918**

Direct, Indirect, and Cumulative Effects:
Based on the best available information described above, WS' potential impacts to populations of ring-billed gulls has been, and is expected to continue to be, insignificant to the overall viability and reproductive success of ring-billed gull populations on a local, regional, and nationwide scale. Egg oiling for a limited period of time and at limited sites in the region may inhibit population growth in the years in which it is conducted, but will not adversely impact viability of the population. Additionally, the potential authorized take from all non-WS entities combined with WS proposed take is not expected to create adverse cumulative impacts. The permitting of the take by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for ring-billed gulls in Illinois.

Red-tailed Hawk Biology and Population Impacts

IL population estimate: 34,000
BBS Eastern Tallgrass Prairie, 1966-2012: 2.38%
BBS Eastern Tallgrass Prairie, 2002-2012: 2.54%
WS take as % of state population: 1.47%
Cumulative take as % of state population: 1.98%

WS proposed annual take: 500
BBS IL, 1966-2012: 4.16%
BBS IL, 2002-2012: 2.69%

Red-tailed hawks are probably one of the best known and most common hawk species in North America with a breeding range extending from northern Canada and Alaska southward to northern and central Mexico (Preston and Beane 2009). Red-tailed hawks are capable of exploiting a broad range of habitats with the availability of structures for perching or nesting and the availability of prey items being the key factors. Red-tailed hawks are most commonly found in open areas interspersed with patches of trees or other similar structures. They have a wide distribution and are considered a resident species of Illinois.

Populations of red-tailed hawks in North America showed increasing trends during the mid to late 1900s. Those increases were likely caused by the conversion of forested areas to more open environments for agricultural production (Preston and Beane 2009). Since 1966, the number of red-tailed hawks observed along routes surveyed during the BBS has shown an increasing trend estimated at 1.9% annually across all routes surveyed in the United States (Sauer et al. 2014). Red-tailed hawks observed in areas surveyed during the CBC have also shown an increasing trend since 1966 (NAS 2010).

The open grassland habitats and the availability of perching structures often attract red-tailed hawks to airports where those birds pose a strike risk with aircraft. From 2011 to 2013 this species has been involved in 58 separate aircraft strikes in Illinois (FAA 2014). Raptors require special management to discourage their use of hazardous areas. Birds nesting on airports are especially problematic because the process of building nests and raising young increases the amount of flying adults must do to gather nesting supplies and forage for themselves and their young. Additionally, young birds will learn to fly on the airport, becoming a hazard to aviation themselves and likely returning to the area in future years. Removal of a nest and/or eggs reduces the hazards associated with having breeding birds on the airfield. Additionally, Illinois WS currently uses trapping and relocation to non-lethally remove hawks from airfields as part of an integrated management plan.

The number of red-tailed hawks addressed in Illinois by all entities to alleviate damage is shown in Table 4.23. The highest combined authorized take by non-WS entities (173 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.23 – Number of Red-tailed Hawks addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Relocated by WS[1]	Take under Depredation Permits		
			WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	76	177	37	95	9
2012	225	434	109	95	16
2013	319	193	76	173	17
TOTAL	**620**	**804**	**222**	**363**	**42**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct or indirect effects on hawk populations. Both the BBS and CBC indicate that red-tail hawk populations are increasing at a steady annual rate. Given the low magnitude of this take level, and considering the fact that the majority of the hawks are being relocated and managed non-lethally, there will be no adverse cumulative impact to the state, regional, or national population. The permitting of the take by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for red-tailed hawks in Illinois.

Rough-legged Hawk Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: NA
BBS Eastern Tallgrass Prairie, 2002-2012: NA
WS take as % of state population: NA

WS proposed annual take: 50
BBS IL, 1966-2012: NA
BBS IL, 2002-2012: NA

Rough-legged hawks are a species of raptor that breeds in the arctic and subarctic Alaska and Canada and migrate to southern Canada and the northern United States in the winter. Winter habitat includes open spaces that resemble the tundra habitat that they inhabit in the summer. This can include marshy areas, pastures, and in Illinois, airport property. Rough-legged hawk's summer diet includes small rodents. Winter diet is similar; however, carrion may be consumed when heavy snows limit small mammal abundance (Bechard and Swem 2002).

Limited data on the population status of rough-legged hawks exists, although the species is considered widespread and common in the arctic tundra breeding range, and there is no evidence of change in breeding populations (Bechard and Swem 2002). CBC data from 2003-2013 indicate that the population of rough-legged hawks is relatively stable in Illinois and nationwide (NAS 2014).

In Illinois, rough-legged hawks are commonly found on airports using the large open areas for hunting and airfield structures for perches. Loafing and foraging behaviors on airfields make them a hazard to aviation. From 2011 to 2013 this species has been involved in six separate aircraft strikes in Illinois (FAA 2014). Rough-legged hawks are difficult to disperse from sensitive areas through harassment, so lethal removal is often necessary to alleviate threats to aviation. The number of rough-legged hawks addressed in Illinois by all entities to alleviate damage is shown in Table 4.24. The highest combined authorized take by non-WS entities (10 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.24 – Number of Rough-legged Hawks addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	7	8	5	0
2012	8	4	5	0
2013	2	6	10	0
TOTAL	**17**	**18**	**20**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on scientific data, WS proposed take level will have no adverse direct or indirect effects on rough-legged hawk populations. WS anticipates the need to lethally remove up to fifty rough-legged hawks per year and relocate an additional fifty birds. The proposed level of take would have no significant cumulative impact on the population. The permitting of the take by the USFWS and the IDNR pursuant to the MBTA ensures take by WS and by other entities occurs within allowable take levels.

Great Blue Heron Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: 3.25%
BBS Eastern Tallgrass Prairie, 2002-2012: 2.20%
WS take as % of state population: NA

WS proposed annual take: 100
BBS IL, 1966-2012: 5.24%
BBS IL, 2002-2012: -2.35%

Great blue herons are the most widely distributed heron in the United States and are commonly seen in Illinois during the spring, summer, and fall. Herons are a common species observed on airports and are especially hazardous to aviation due to their large size and slow flight pattern. Adult herons seem to have no natural predators due to their large size (INHS 2014). Adult birds that are building nests and feeding young must fly more, increasing their chance of being struck. Nesting groups of herons, called rookeries, can be especially hazardous when located in the vicinity of an airfield. The recent establishment of heron rookeries near airports and anticipated requests for WS assistance with great blue herons has prompted this level of take and analysis.

The Upper Mississippi Valley Great Lakes Waterbird Conservation Plan classifies great blue herons as a species not at risk and estimates that there are >43,000 breeding pairs of great glue herons in Bird Conservation Region 22 which include the northern two thirds of the state (Wires et al. 2010). Great blue

herons usually don't breed until their second spring (>22 months old; Vennesland and Butler 2011), so the estimate of breeding pairs underestimates total population size.

The number of great blue herons addressed in Illinois by all entities to alleviate damage is shown in Table 4.25. The highest combined authorized take by non-WS entities (170 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.25 – Number of Great Blue Herons addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	137	22	167	14
2012	167	17	85	13
2013	123	15	170	14
TOTAL	**427**	**54**	**422**	**41**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct or indirect effects on heron populations. However, if assistance occurs in the spring, there could be an impact on the nesting success of individuals that are in close proximity to that area; this localized impact would be minimal and therefore would also not cause adverse indirect effects on the state heron populations. Additionally, the potential authorized take from all non-WS entities combined with WS proposed take is not expected to create adverse cumulative impacts. The permitting of the take by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for great blue herons in Illinois.

Killdeer Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: 2.32%
BBS Eastern Tallgrass Prairie, 2002-2012: 1.72%
WS take as % of state population: NA

WS proposed annual take: 300
BBS IL, 1966-2012: 4.12%
BBS IL, 2002-2012: 0.41%

The killdeer is by far the most widely-distributed and familiar of North American plovers because of its habitat, its tolerance of humans, its easily observed parental care, and its distinct vocalizations. They appear in the Midwest in February and are some of the last migrants to leave in the fall. Killdeer are probably more common today than at any time in their history as a result of habitat changes brought on by humans (Jackson and Jackson 2000). Survey data from the CBC indicates that the number of killdeer within the state has shown a generally stable trend since 1966 (NAS 2014). Based on broad-scale surveys, the United States Shorebird Conservation Plan estimated the population of killdeer in the United States to be approximately 2,000,000 birds in 2001 (Brown et al. 2001). Killdeer are unusual shorebirds in that they often nest and live far from water. Killdeer are commonly found in a variety of open areas, such as fields, pastures, airports, etc. Conflicts with killdeer in Illinois generally involve threats to aviation safety. Killdeer often nest next to runways and taxiways, then loaf on the movement areas where they are hazardous to aviation. From 2011 to 2013 this species has been involved in 106 separate aircraft strikes in Illinois (FAA 2014).

The number of killdeer addressed in Illinois by all entities to alleviate damage is shown in Table 4.26. The highest combined authorized take by non-WS entities (2280 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.26 – Number of Killdeer addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	748	154	2280	197
2012	1102	149	1010	146
2013	1240	129	1315	190
TOTAL	**3090**	**432**	**4605**	**533**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct or indirect effects on killdeer populations. The majority of the direct operational assistance conducted by WS on killdeer would occur at airports to protect aviation safety. The removal of 300 killdeer would represent 0.015% of the national population. Killdeer would continue to be addressed using primarily non-lethal harassment and dispersal methods. If habitat modification and non-lethal harassment methods occur within airport property to minimize the attraction of killdeer on the property, then there could be an indirect impact on the nesting and/or breeding success of individuals that originally nested on the airport property; this localized indirect impact would be minimal and therefore would not cause significant effects on the state killdeer populations. All take of killdeer would occur within the levels permitted by the USFWS pursuant to the MBTA and when permitted by the IDNR. Given that WS BDM activities are only conducted in a very small portion of the state and that the regional killdeer populations appear to be increasing, the proposed level of killdeer taken by WS will not have a cumulative impact on the state, regional, or national population.

Eastern Meadowlark Biology and Population Impacts

IL population estimate: 1,000,000
BBS Eastern Tallgrass Prairie, 1966-2012: -2.57%
BBS Eastern Tallgrass Prairie, 2002-2012: -2.60%
WS take as % of state population: 0.008 %
Cumulative take as % of state population: 0.03%

WS proposed annual take: 75
BBS IL, 1966-2012: -2.74%
BBS IL, 2002-2012: -2.92%

Meadowlarks are associated with grassy fields, pastures, cultivated areas, groves, open pinewoods, and prairies (Jaster et al. 2012). Eastern meadowlarks are generally not a species associated with damage situations, but their use of airport habitat to forage and nest causes conflicts with aviation safety. Even small birds can cause significant damage to an aircraft, including disabling engines. From 2011 to 2013 this species has been involved in 33 separate aircraft strikes in Illinois (FAA 2014). Habitat management, along with harassment, is highly recommended to dissuade meadowlarks from using the airfield. However this species habituates quickly to harassment techniques and will temporarily relocate short distances to avoid the harassment. Lethal reinforcement is often necessary to deter this species from using airfields.

As reported by the BBS, populations of Eastern meadowlarks in Illinois have decreased since 1966 at an estimated rate of -2.74% annually (Sauer et al. 2014). In the United States, meadowlarks are also showing a declining trend across all BBS survey routes estimated at -3.4% annually since 1966 (Sauer et

al. 2014). The Partners in Flight Science Committee (2013) estimated the current statewide population at 1,000,000 individuals. However, CBC data shows a slightly increasing trend for meadowlarks in Illinois since 1980 (NAS 2014).

The number of meadowlarks addressed in Illinois by all entities to alleviate damage is shown in Table 4.27. The highest combined authorized take by non-WS entities (210 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.27 – Number of Eastern Meadowlarks addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	92	0	50	0
2012	332	11	80	7
2013	383	37	210	36
TOTAL	**807**	**48**	**340**	**43**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Although there is a slight negative trend in the long-term data for the species, WS' proposed take of 75 birds (0.008% of the Eastern meadowlark population in Illinois) would not result in any adverse direct or indirect effect on the meadowlark populations. Combined with non-WS take, the cumulative take estimate (0.03%) is of a low magnitude and not likely to result in any adverse effects on meadowlarks. The permitting of the take by the USFWS and the IDNR through the issuance of depredation permits ensures there would be no cumulative impact of meadowlark populations. WS take impacts only a small amount of the area in the state, concluding that the proposed level of Eastern meadowlark take will not have an adverse cumulative impact to the state, regional, or national population.

Snowy Owl Biology and Population Impacts

IL population estimate: NA
BBS Eastern Tallgrass Prairie, 1966-2012: NA
BBS Eastern Tallgrass Prairie, 2002-2012: NA
WS take as % of state population: NA

WS proposed annual take: 10 + 50 relocate
BBS IL, 1966-2012: NA
BBS IL, 2002-2012: NA

Snowy owls breed in the open terrain of the artic barrens and can be found in similar open habitats during their winter migrations. During these migrations, snowy owls can be found across Canada, Alaska, and the northern edge of the United States (Parmelee 1992). The open habitats of airports provide ideal wintering areas for snowy owls. Their low-flying behavior, along with their large size and body mass, makes them a significant hazard for a damaging strike (Dolbeer et al. 2000 and Parmelee 1992). From 2011 to 2013 this species has been involved in seven separate aircraft strikes in Illinois (FAA 2014). Although some snowy owls migrate annually, their overall migration pattern is variable. Occassionally, mass migrations of snowy owls, known as irruptives, occur in response to harsh weather conditions and dispersal of individuals from the populations. During these irruptives, the number of snowy owls encountered during the winter may increase dramatically. In response to these mass migrations, WS increases the use of non-lethal management techniques including, trapping and relocation.

The population status of snowy owls is not well known and there are few population estimates available. The number of snowy owls observed during the CBC across all areas surveyed in the United States and in Illinois has shown a variable trend over the past 20 years (NAS 2014). This is as expected given that

snowy owls are only infrequent visitors to most locations in the U.S. CBC data are highly variable due to the irregular eruptions of migrating snowy owls from northern wintering grounds. CBC data do indicate a relatively stable population trend (NAS 2014). BBS results are not available for the breeding range of this species. The Partners in Flight Science Committee (2013) estimated the breeding population in North America at 100,000 snowy owls.

Unfortunately, snowy owls generally become easily habituated to harassment measures and quickly become non-responsive, moving only a short distance or not at all. Thus, additional methods for wildlife hazard management may be necessary. As part of an integrated approach to reducing threats, WS would first employ non-lethal methods (e.g., pyrotechnics, aversive noise, trap/relocation) to disperse or move snowy owls when appropriate and safe. From FY 2011 through FY 2014, WS has trapped and relocated 37 snowy owls from airports in Illinois, of which WS is aware of only three that have returned to the place where they were captured. If snowy owls are deemed an immediate threat to aviation safety (e.g. flying along an active runway) or if repeated non-lethal harassment methods have failed to encourage birds to disperse from sensitive locations, WS may need to implement lethal removal options as permitted by the USFWS and the IDNR.

The number of snowy owls addressed in Illinois by all entities to alleviate damage is shown in Table 4.28. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non WS entities.

Table 4.28 – Number of Snowy Owls addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	0	0	0
2012	20	3	0	0
2013	5	0	0	0
TOTAL	**25**	**3**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
As with other raptor species, WS would continue to primarily employ non-lethal methods to address damage and threats of damage. However, lethal removal could be conducted when immediate threats to human safety take place or when habituations to non-lethal methods occur. Based on the limited emergency take proposed and the permitting of the take by the USFWS and the IDNR, WS' lethal removal of snowy owls would not adversely impact snowy owl populations. The live-capture and translocation of owls to appropriate habitat would not adversely affect populations since the owls would be unharmed, but instead would benefit the population by preventing the snowy owls from lethal airstrikes and dangerous situations. Permitting by the USFWS and IDNR ensures that cumulative impacts are within allowable take levels.

Monk Parakeet Biology and Population Impacts

IL population estimate: 778 (Pruett-Jones et al 2011)
BBS Eastern Tallgrass Prairie, 1966-2012: NA
BBS Eastern Tallgrass Prairie, 2002-2012: NA
WS take as % of state population: 39%
WS proposed annual take: 300 + 25 nests
BBS IL, 1966-2012: NA
BBS IL, 2002-2012: NA

Monk parakeets are native to South America, occurring from Bolivia to southern Brazil to central Argentina. The species has been introduced and become established as a breeding species in the United States and Europe (Spreyer and Bucher 1998). Parakeets are popular as pets in the United States and localized free-ranging populations have become established from purposeful and accidental releases (Spreyer and Bucher 1998). Whether from purposeful or accidental releases by pet owners or pet shops, the first localized populations of monk parakeets in United States became established during the 1960s (Spreyer and Bucher 1998). Florida, Illinois, New York, Rhode Island, and Texas have some of the largest free-ranging populations of monk parakeets in the United States (Spreyer and Bucher 1998, Avery et al. 2002).

While the species is responsible for crop damage in South America, they are mostly a problem for utility companies in the U.S. This species builds nests on utility poles and substations, leading to fires and outages (Avery et al. 2002). A three year eradication effort was initiated in 1973 that resulted in the removal of 163 parakeets nationwide. Since then, the population has grown exponentially and expansion of the population shows no sign of leveling off (Van Bael and Pruett-Jones 1996). SBC data shows that the monk parakeet population in Illinois is continuing to increase (Beveroth 2014). Monk parakeets are primarily found in northern Illinois around the greater Chicago area. A survey of that region estimated a population of 778 birds based on the abundance of active nests found (Pruett-Jones et al. 2012). Since parakeets will quickly rebuild destroyed nests at the same location, the most effective approach to resolving the threat of damage associated with the nest is to remove the parakeets with the nest (Avery et al. 2002, Tillman et al. 2004).

The number of monk parakeets addressed in Illinois by WS to alleviate damage is shown in Table 4.29. Since monk parakeets are afforded no protection under the MBTA, depredation permits are not needed for the take of these birds and the reporting of take is not required. Therefore, the number of parakeets lethally removed by other entities is unknown and the cumulative take is not applicable.

Table 4.29 – Number of Monk Parakeets addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	WS' Take[1]
2011	0	0
2012	0	10
2013	0	0
TOTAL	**0**	**10**

[1]Data reported by federal fiscal year

Direct, Indirect, and Cumulative Effects:
Monk parakeets are not protected by the MBTA, and take of monk parakeets does not require depredation permits issued by either the USFWS or IDNR. Executive Order 13112 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, provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, 4) provide for environmentally sound control, and 5) promote public education on invasive species. WS' proposed activities to manage damage cause by monk parakeets are pursuant to Executive Order 13112. Although it is possible that the take of monk parakeets through WS activities may lead to a decrease in their local abundance, any reductions in the exotic monk parakeet population may be considered beneficial to native wildlife and natural resources.

Feral (Rock) Pigeons Biology and Population Impacts

IL population estimate: 280,000
BBS Eastern Tallgrass Prairie, 1966-2012: -3.06%
BBS Eastern Tallgrass Prairie, 2002-2012: -2.44%
WS take as % of state population: 7.14%

WS proposed annual take: 20,000
BBS IL, 1966-2012: -3.23%
BBS IL, 2002-2012: -2.56%

Pigeons, also known as rock pigeons, are an introduced non-native species to North America and are not protected under the MBTA or state regulations. Pigeons inhabit lofts, steeples, attics, caves, and buildings and are the most common bird pest associated with people (Williams and Corrigan 1994). Any lethal removal of pigeons by Illinois WS would likely be restricted to sites where pigeons are causing damage, or are considered a health threat or nuisance, and reduction or removal of a local population could be attempted. This action would be considered beneficial since it would protect the public from disease threats, aircraft strikes (i.e. human safety), and protect public and private property.

Natural fatality factors reduce pigeon populations by approximately 30% annually (Williams and Corrigan 1994). This means that a 30% mortality rate could be expected with or without WS' BDM take. Based on PIF population estimate for Illinois, 30% of that population would be 84,000 pigeons. The number of pigeons addressed in Illinois by WS to alleviate damage is shown in Table 4.41. Since pigeons are a non-native species and are, therefore, afforded no protection under the MBTA, the removal of pigeons to alleviate damage or to reduce threats can occur without the need for a depredation permit from the USFWS or IDNR. The number of pigeons lethally removed to alleviate damage or threats in Illinois is unknown since the reporting of pigeon removal is not required. The number of rock pigeons dispersed and lethally removed by WS from FY 2011 through FY 2013 can be seen in Table 4.30.

Table 4.30 – Number of Rock (Feral) Pigeons addressed by WS in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	WS' Take[1]
2011	45383	12071
2012	44178	12214
2013	34748	7128
TOTAL	**124309**	**31413**

[1]Data reported by federal fiscal year

Direct, Indirect, and Cumulative Effects:
WS' proposed pigeon damage management activities would be conducted pursuant to Executive Order 13112. The Executive 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 associated damages, 2) monitor invasive species populations, 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 on invasive species. Given the low magnitude of this take level, WS proposed take level will have no adverse direct or indirect effects on pigeon populations. While non-WS take is unknown, pigeon populations have remained relatively stable and have historically expanded their range throughout North America. Therefore, WS does not anticipate any significant cumulative impacts to pigeon populations.

American Robin Biology and Population Impacts

IL population estimate: 8,900,000
BBS Eastern Tallgrass Prairie, 1966-2012: 1.63%
BBS Eastern Tallgrass Prairie, 2002-2012: 0.80%
WS take as % of state population: 0.001 %
Cumulative take as % of state population: 0.001%

WS proposed annual take: 100
BBS IL, 1966-2012: 2.16%
BBS IL, 2002-2012: 0.30%

The American Robin is the largest, most abundant, and most widespread North American thrush (Vanderhoff et al. 2014). The conspicuous nature of the American Robin and the close association with human habitation, make the robin one of the most recognizable birds in the United States (Vanderhoff et al. 2014). Although robins nest in trees, they forage in more open habitats, often feeding on insects and worms on airfields. Worms pushed to the surface of the ground by rain events move on to the paved surfaces and attract robins and other species. Small flocks of American robins feeding on airfield movement surfaces can pose a substantial threat to aviation safety. With the decrease of available insects during the fall and winter months, robins resort to ripe fruits and berries. A small flock of robins can quickly remove the entire fruit crop of home gardens or commercial fruit growing farms (Link 2005).

The number of American robins addressed in Illinois by all entities to alleviate damage is shown in Table 4.31. The highest combined authorized take by non-WS entities (25 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.31 – Number of American Robins addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	0	0	0
2012	184	0	0	0
2013	327	3	25	3
TOTAL	**511**	**3**	**25**	**3**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
WS proposed take level will have no adverse direct or indirect effects on robin populations. All take of robins by WS would only occur after a depredation permit has been issued by the USFWS and only at levels allowed under the permit. Given the low magnitude of this take level (0.001%) compared to the estimated Illinois population size and that take would only occur at the discretion of the USFWS to meet the desired population objective for robins. WS has concluded that the proposed level of American robin take will not have an adverse cumulative impact to the state, regional, or national population.

House Sparrow Biology and Population Impacts

IL population estimate: 6,300,000
BBS Eastern Tallgrass Prairie, 1966-2012: -3.93%
BBS Eastern Tallgrass Prairie, 2002-2012: -3.35%
WS take as % of state population: 0.02%

WS proposed annual take: 1,000
BBS IL, 1966-2012: -4.05%
BBS IL, 2002-2012: -4.14%

House sparrows, also called English sparrows, are a non-native, invasive species that were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). Nesting locations often occur in areas of human activities and are considered "*...fairly gregarious at all*

times of year" with nesting occurring in small colonies or clumped distribution (Lowther and Cink 2006). Large flocks of sparrows can also be found in the winter as birds forage and roost together. House sparrows are found in nearly every habitat except dense forest, alpine, and desert enviornments. They prefer human-altered habitats and are abundant on farms, in cities, and suburbs (Lowther and Cink 2006).

Like European starlings and feral pigeons, because of their negative effects on native species and their competition with these species, house sparrows are considered by many wildlife biologists, ornithologists, and naturalists to be an undesirable component of North American ecosystems. Since house sparrows are an introduced, rather than native, species they are not protected by the MBTA, and removal of house sparrows does not require depredation permits issued by either the USFWS or the IDNR. Executive Order 13112 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 associated damages, 2) monitor invasive species populations, 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 on invasive species.

The number of house sparrows addressed in Illinois by WS to alleviate damage is shown in Table 4.32. Since house sparrows are afforded no protection under the MBTA or state regulations, removal permits are not needed for the take of these birds and the reporting of take is not required. Therefore, the number of sparrows lethally removed by other entities is unknown and the cumulative take is not applicable.

Table 4.32 – Number of House Sparrows addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	WS' Take[1]
2011	228	351
2012	1675	418
2013	2866	657
TOTAL	**4769**	**1426**

[1]Data reported by federal fiscal year

Direct, Indirect, and Cumulative Effects:
WS' removal of house sparrows to reduce damage and threats would be in compliance with Executive Order 13112. WS' proposed removal is only a fraction of a percent of the statewide population and therefore will have no adverse direct or indirect effects on sparrow populations. Although non-WS removal is unknown, house sparrow populations have remained relatively stable and have historically expanded their range throughout North America. Therefore, WS does not anticipate any significant cumulative impacts to sparrow populations.

European Starling Biology and Population Impacts

IL population estimate: 3,000,000
BBS Eastern Tallgrass Prairie, 1966-2012: -0.40%
BBS Eastern Tallgrass Prairie, 2002-2012: -0.86%
WS take as % of state population: 3.33 %

WS proposed annual take: 100,000 + 500 nests
BBS IL, 1966-2012: -0.49%
BBS IL, 2002-2012: -1.27%

The European starling is an Old World passerine species introduced in the eastern U.S. in the late 1800's. Starlings are considered an agricultural pest throughout North America. Additionally, they form large winter roosts in urban and suburban areas causing conflicts with society (Homan et al. 2012). The starling is found in virtually all Illinois habitats. Starlings nest in cavities and will readily evict most native hole-nesting species. In the absence of natural cities, they will nest in almost any enclosed area such as a street light, a mail box, or an attic (Brauning 1992). Starling nests and subsequent fecal deposits

and accumulation negatively affect the aesthetic qualities of a property and can also be a hazard to human health and the electrical systems, causing power outages and fires that can endanger utility workers. Cattle feedlots can host up to 100,000 starlings per day. These starlings can consume approximately 27,500 tons of livestock feed during winter months, spoil feed with their fecal matter, and cause substantial economic losses (Pimentel et al. 2000, Shwiff et al. 2012). European starlings can cause substantial damage to aircraft, especially when found in large flocks, and can also threaten human safety. From 2011 to 2013 this species has been involved in 54 separate aircraft strikes in Illinois (FAA 2014).

The estimated natural mortality of starlings is approximately fifty percent. Based on the 1974-75 wintering population estimate, about 56 million starlings die annually in the eastern states and about seventy million starlings die annually to natural mortality nationally (Meanly and Royall 1976).

The number of European starlings addressed in Illinois by WS to alleviate damage is shown in Table 4.33. Since starlings are afforded no protection under the MBTA or state regulations, depredation permits are not needed for the take of these birds and the reporting of take is not required. Therefore, the number of starlings lethally removed by other entities is unknown and the cumulative take is not applicable.

Table 4.33 – Number of European Starlings addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	WS' Take[1]	WS' Nests Removed[1]
2011	277,178	45,810	0
2012	290,928	49,972	49
2013	337,594	32,731	44
TOTAL	**905,700**	**128,513**	**93**

[1]Data reported by federal fiscal year

Direct, Indirect, and Cumulative Effects:
WS proposed take level will have no adverse direct or indirect effects on European starling populations. Since starlings are a non-native species that often competes with native birds for food and habitat, any take could be viewed as providing some benefit to the native environment in Illinois. They are not protected by the MBTA, and European starlings do not require depredation permits issued by either the USFWS or IDNR. WS' proposed activities to manage damage cause starlings are pursuant to Executive Order 13112. Additionally, starling populations have remained abundant enough that the USFWS has maintained the Federal Blackbird Depredation Order. Therefore, WS has concluded that the proposed level of European starlings take will not have an adverse cumulative impact to the state, regional, or national population.

Barn and Cliff Swallow Biology and Population Impacts

Barn Swallow:
IL population estimate: 1,200,000
BBS Eastern Tallgrass Prairie, 1966-2012: -0.11%
BBS Eastern Tallgrass Prairie, 2002-2012: 0.89%
WS take as % of state population: 0.008 %
Cumulative take as % of state population: 0.04%
WS proposed annual take: 100 + 50 nests
BBS IL, 1966-2012: 0.62%
BBS IL, 2002-2012: 1.19%

Cliff Swallow:

IL population estimate: 120,000
BBS Eastern Tallgrass Prairie, 1966-2012: 13.71%
BBS Eastern Tallgrass Prairie, 2002-2012: 18.51%
WS take as % of state population: 0.08 %
Cumulative take as % of state population: 0.14%

WS proposed annual take: 100 + 50 nests
BBS IL, 1966-2012: 16.24%
BBS IL, 2002-2012: 16.83%

Barn swallows and cliff swallows are common in Illinois on farms, airports, and other areas where they can forage for insects and build nests. Swallows frequently build nests on barns, buildings, bridges, highway structures, or other vertical surfaces that provide adequate shelter for the parents and young. Fecal accumulation under nests is often a problem for property owners. Swallows can cause conflicts at airports when flying to build nests, foraging, and young fledging intersect critical airspace for departing and arriving aircraft. While swallows are not large birds, concentrations in large numbers have the potential to damage an aircraft. From 2011 to 2013 these two species combined have been involved in 75 separate aircraft strikes in Illinois (FAA 2014). Human health concerns are also an issue when the swallows nesting activity accumulates fecal matter near homes and businesses. Eliminating nests encourages birds to find other places to nest and forage away from the damage site. Permits are required to remove nests that contain eggs, while empty nests may be removed with authorization from the IDNR to discourage continued nesting activity. Other non-lethal management techniques are often ineffective at reducing conflicts and threats associated with swallows and lethal reinforcement can be used to further reduce conflicts.

The number of barn swallows addressed in Illinois by all entities to alleviate damage is shown in Table 4.34. The number of cliff swallows addressed in Illinois by all entities to alleviate damage is shown in Table 4.36. The number of nests removed by WS for barn swallows and cliff swallows from FY 2011 to FY 2013 averaged 2 and 0 respecively (Tables 4.35 and 4.37). The highest combined authorized take by non-WS entities for each individual species in addition to the WS proposed take for each species was used to assess the cumulative take for the individual species.

Table 4.34 – Number of Barn Swallows addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	126	31	75	4
2012	216	1	170	6
2013	430	10	320	7
TOTAL	**772**	**42**	**565**	**17**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Table 4.35 – Number of Barn Swallow nests removed by WS in Illinois from FY 2011 to FY 2013

Federal Fiscal Year	Number of Nests
2011	0
2012	4
2013	1
Average	**2**

Table 4.36 – Number of Cliff Swallows addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	599	8	20	0
2012	550	2	20	0
2013	100	2	70	2
TOTAL	**1249**	**12**	**110**	**2**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Table 4.37 – Number of Cliff Swallow nests removed by WS in Illinois between FY 2011 to FY 2013

Federal Fiscal Year	Number of Nests
2011	0
2012	0
2013	0
Average	**0**

Direct, Indirect, and Cumulative Effects:
Removal of swallows by WS and other entities represents only a small fraction of the total state populations for these species. Based on the best scientific data, WS proposed take level will have no adverse direct effects on swallow populations. If assistance occurs in the spring, there could be an impact on the nesting and/or breeding success of individuals that are in close proximity to that area; this localized impact would be minimal and therefore would also not cause adverse indirect effects on swallow populations in Illinois. Additionally, the potential authorized take from all non-WS entities combined with WS proposed take is not expected to create adverse cumulative impacts. The permitting of removal by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for swallows in Illinois.

Mute Swan Biology and Population Impacts

IL population estimate: NA
BBS Eastern Region, 1966-2012: 3.71
BBS Eastern Region, 2002-2012: 5.94
WS take as % of state population: NA
WS proposed annual take: 50
BBS IL, 1966-2012: NA
BBS IL, 2002-2012: NA

Mute swans are native to parts of Europe and Asia and are thought to have been introduced into the United States by private individuals in New York prior to 1900. Today, mute swan populations have expanded to include much of the northeastern United States, the Upper Great Lakes region, and the Pacific Northwest from natural dispersal and accidental release or escape of captive birds. Mute swans often have negative effects on the environment by consuming large quantities of submerged aquatic vegetation that are essential to native fish and wildlife species (Stafford et al. 2012). Fenwick (1983) found that female mute swans consume an average of 43% of their body weight daily while male mute swans could consume an average of 35% of their body weight daily. Thus, large concentrations of mute swans can have devastating effects on submerged aquatic vegetation beds essential to many fish, wildlife, and invertebrate species. Mute swans also aggressively defend large nesting territories that often exclude native wildlife from those areas. Additionally, mute swans have been observed demonstrating aggressive behavior toward humans when defending nesting territories. In April 2012, a man drowned in Illinois when he was attacked by a mute swan that knocked him out of his kayak (Golab 2012).

Mute swans are not protected under United State Federal law and are considered an invasive species by the USFWS. The Mississippi Flyway Council policy includes removing pioneering mute swans and reducing existing mute swan populations with a long-term goal of reducing the flyway population to 4,000 birds or fewer by 2030 (Mississippi Flyway Council 2012). The majority of mute swans in the flyway are in Michigan and Ontario with 2011 estimates of more than 15,000 mute swans in Michigan and more than 3,000 mute swans in Ontario (Mississippi Flyway Council 2012). Status of mute swans in the Mississippi Flyway states varies. In Minnesota and Michigan, mute swans are classified as an invasive species and the states are working to reduce their population (USDA 2012) or prevent mute swans from becoming established (Minnesota; C. Henderson, Minnesota Department of Natural Resources, pers. comm. *in* USDA 2014). In Wisconsin, mute swans are classified as a non-native introduced species with control of the population through management (WDNR 2014). In contrast, Illinois gives non-native mute swans the same protections as native swan species.

The number of mute swans addressed in Illinois by all entities to alleviate damage is shown in Table 4.38. The cumulative take and WS take as percent of the population are the same values due to the fact the USFWS did not issue any permits to non WS entities.

Table 4.38 – Number of Mute Swans addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	0	0	0	0
2012	0	1	0	0
2013	0	0	0	0
TOTAL	**0**	**1**	**0**	**0**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Mute swans are considered by many wildlife biologists and ornithologists to be an undesirable component of North American native ecosystems due to their detrimental effects. Given the invasive status of mute swans, any reduction in mute swan populations or elimination of entire populations, could be considered a beneficial effect to the environment since native habitats and the fish, wildlife, and invertebrates that rely on them are being negatively impacted by the presence of mute swans. Executive Order 13112 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. Mute swans are viewed as an exotic species and are not protected by the USFWS under the MBTA; therefore a federal permit is not needed to remove a mute swan. However, mute swans are still considered a protected species in Illinois (520 ILCS 5/2.2) and therefore an IDNR permit is required to remove mute swans. Based on the above information, IDNR oversight, and the low level of proposed lethal take, WS would have a low magnitude of impact on the state mute swan population.

Turkey Vulture Biology and Population Impacts

IL population estimate: 50,000
BBS Eastern Tallgrass Prairie, 1966-2012: 6.58%
BBS Eastern Tallgrass Prairie, 2002-2012: 6.00%
WS take as % of state population: 0.1 %
Cumulative take as % of state population: 0.51%

WS proposed annual take: 50
BBS IL, 1966-2012: 7.28%
BBS IL, 2002-2012: 3.11%

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) and they are found in Illinois during the breeding season (Kirk and Mossman 1998). Similar to Black Vultures, Turkey Vultures occur in virtually all habitats but are most abundant where open land interrupts forest (Kirk and Mossman 1998). Turkey Vultures nest on rock cliffs, in tree cavities, and on the ground in thickets (Kirk and Mossman 1998). Turkey vultures are social and 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 (Brauning 1992). Vultures soar in circle-type patterns in search of food. When food is located by a single bird, other birds are quickly attracted to the site by behavior cues exhibited by the feeding bird. This can become a major problem when dealing with human safety at airports.

The number of turkey vultures addressed in Illinois by all entities to alleviate damage is shown in Table 4.39. The highest combined authorized take by non-WS entities (203 birds) in addition to the WS proposed take was used to assess the cumulative take.

Table 4.39 – Number of Turkey Vultures addressed in Illinois from FY 2011 to FY 2013

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Authorized Take for Other Entities[2]	Take by Other Entities[2]
2011	1360	9	102	1
2012	1258	12	120	5
2013	582	8	203	0
TOTAL	**3200**	**29**	**425**	**6**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed take level will have no adverse direct effects on vulture populations. The majority of the direct operational assistance conducted by WS on turkey vultures would occur in the winter when they are in their winter roost and therefore would have no indirect effects on vultures. However, if assistance occurs in the spring, there could be an impact on the nesting and/or breeding success of individuals that are in close proximity to that area; this localized impact would be minimal and therefore would also not cause adverse indirect effects on the state turkey vulture populations. Additionally, the potential authorized take from all non-WS entities combined with WS proposed take is not expected to create adverse cumulative impacts. The permitting of the take by the USFWS and the IDNR ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for turkey vultures in Illinois.

Other Target Species

Target species, in addition to the bird species analyzed above, are species that have been or could be taken or have nests removed in small numbers by WS during damage management activities. The bird species that have been lethally taken in small numbers, less than twenty, by WS from FY 11-13 include hooded merganser (*Lophodytes cucullatus*), wood duck (*Aix sponsa*), wild turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), great horned owl (*Bubo virginianus*), Northern flicker (*Colaptes auratus*) and Cooper's hawk (*Accipiter cooperii*). Other species that could be killed during BDM include any of the species causing damage and when a request for assistance is received. The number of other bird species taken by WS during BDM activities is expected to remain relatively at the same take levels as in the past years. Most of those birds listed are afforded protection under the MBTA and take is only allowed through the issuance of a depredation permit and only at those levels stipulated in the permit.

Therefore, those birds would be 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 for migratory birds, could impose restrictions on depredation take as needed to assure cumulative take does not adversely affect the continued viability of populations. This would assure that cumulative impacts on these bird populations would have no significant adverse impact on the quality of the human environment.

Wild turkeys maintain sufficient population densities to allow for annual harvest seasons in Illinois. The proposed removal of up to 20 individuals and up to 20 nests under the proposed action would be a minor component of the annual removal of wild turkeys during the regulated hunting seasons.

Some of the species addressed in this EA are listed as threatened or endangered by the IDNR. Take of these species would only occur with approval by the IDNR and under authority of all necessary permits. Take of state threatened or endangered species includes harassment as well as lethal take. If state listed species are live trapped, WS will coordinate with the IDNR regarding their relocation. The complete list of state listed wildlife in Illinois can be found in Appendix D. None of those species are federally-listed by the USFWS and/or the National Marine Fisheries Service pursuant to the ESA. However, the complete list of federally protected species found in Illinois is listed in Appendix C.

American black ducks (*Anas rubripes*), American wigeons (*Anas americana*), buffleheads (*Bucephala albeola*), canvasbacks (*Aythya valisineria*), gadwall (*Anas strepera*), goldeneyes (*Bucephala clangula*), Northern shovelers (*Anas clypeata*), redheads (*Aythya americana*), ring-necked ducks (*Aythya collaris*), greater white-fronted geese (*Anser albifrons*), Northern pintails (*Anas acuta*), ruddy ducks (*Oxyura jamaicensis*), and lesser scaup (*Aythya affinis*) maintain sufficient population densities to allow for annual harvest seasons. The proposed take of up to 20 individuals of those species, including 20 nests, under the proposed action would be a minor component of the annual take of those species during the regulated hunting seasons.

All of the birds addressed in this EA are species that could be or have been found at or near airports where those species represent strike hazards to aircraft. Previously, WS has addressed those species using non-lethal harassment methods to disperse those species from areas where they have posed strike risks to aircraft at or near airports. WS anticipates continuing to use primarily non-lethal harassment methods to address those species at or near airports to reduce the risks of aircraft striking those species. However, WS could be requested to lethally remove individuals of those species on a limited basis when those individuals represent immediate threats of being struck by aircraft. The take of those species would only occur by WS when permitted by the USFWS and the IDNR and only at take levels allowed under those depredation permits. The permitting of the take by the USFWS and the IDNR ensures the take of those species occurs within population management objectives for those species and is conducted pursuant to federal and state laws and regulations.

Based upon previous requests for assistance and in anticipation of an increase in future requests for WS assistance, WS predicts that no more than 20 individuals and no more than 20 nests and all eggs there within of other target species would be removed annually. This low level of take would not adversely affect state bird populations and would have a low magnitude of impact. Take levels will be monitored annually to ensure that other target species take is not approaching levels that would require analysis. If, during this monitoring, take of a certain species is increasing then proper analysis of WS take on that species, their populations, and the impacts to the human environment would be completed in a supplement to this EA.

Wildlife 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 would facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It would 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.[8] 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 would 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 would be targeted. Where possible, this sampling effort would 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 would focus on hunted species that are most likely to be exposed to a disease, have relatively direct migratory pathways from those areas to the United States, and commingle in 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 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

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

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 this 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).

Direct, Indirect, and Cumulative Effects:
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 create adverse direct or indirect effects on 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 direct or indirect 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 removal 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 create adverse cumulative impacts on the populations of any of the birds addressed in this EA nor would result in any removal of birds that would not have already occurred in the absence of disease sampling (e.g., hunter harvest).

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would not use lethal methods to resolve bird damage problems. Although some unintentional mortality might result from the use of bird capture devices like mist nets, these incidents are likely to be rare and would have negligible impacts on target species populations. Individuals, agencies and organizations would still be able to obtain permits for lethal bird removal from the USFWS and the IDNR. Efforts to reduce or prevent damage and risks to livestock and/or human health and safety risks would likely be higher than with Alternative 1. If BDM is conducted by individuals with limited training or experience, it is possible that additional birds may be taken in the course of attempts to resolve damage problems.

Direct, Indirect, and Cumulative Effects:
Depending upon the experience, training and methods available to the individuals conducting the BDM, potential adverse direct and indirect impacts on target bird populations would likely be the same or greater than with Alternative 1. However, for the same reasons shown under Alternative 1, it is unlikely that significant adverse direct or indirect effects would occur to target species' populations by implementation of this alternative. Direct and indirect impacts and potential risks of illegal toxicant use would be greater under this alternative than Alternative 1. DRC-1339 and Alpha-chloralose are currently only available for use by WS employees and would not be available under this alternative, although Starlicide, a product similar to DRC-1339 would be available for use by licensed pesticide applicators. It is possible that frustration caused by the inability to reduce damage by the public would lead to illegal use of toxicants which could increase adverse direct, indirect, or cumulative effects, however to an unknown degree. Because WS would be able to provide assistance with non-lethal BDM, risks of adverse cumulative impacts from actions by non-WS entities are lower than with Alternative 3.

Alternative 3 – No Bird Damage Management Conducted by WS

Under this alternative, WS would not conduct bird damage management activities. WS would have no direct involvement with any aspect of addressing damage caused by birds and would provide no technical assistance. No take of birds by WS would occur. Birds could continue to be lethally taken by other individuals to resolve damage and/or threats occurring either through depredation permits issued by the USFWS, under the blackbird and cormorant depredation orders, under the control order for Muscovy ducks, during the regulated hunting seasons, or in the case of non-native species, take could occur anytime using legally available methods. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Direct, Indirect, and Cumulative Effects:

Local bird populations could decline, stay the same, or increase depending on actions taken by those persons experiencing bird damage. The direct and indirect effects on bird populations would be variable and unknown. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of birds out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action.

Since birds would still be taken under this alternative, the potential direct, indirect, and cumulative effects on the populations of those bird species in Illinois would be similar among all the alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct bird damage management activities without WS' direct involvement. Therefore, any actions to resolve damage or reduce threats associated with birds could occur by other entities despite WS' lack of involvement under this alternative, and therefore the cumulative impact on those bird species could be similar to Alternative 1.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

As discussed previously, a concern is often raised about the potential impacts to non-target species, including T&E species, from the use of methods to resolve damage caused by birds. The potential effects on the populations of non-target wildlife species, including T&E species, are analyzed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird Damage (Proposed Action/No Action)

The potential adverse effects to non-targets occur from the employment of methods to address bird damage. Under the proposed action, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. The use of non-lethal methods as part of an integrated direct operational assistance program would be similar to those risks to non-targets discussed in the other alternatives.

WS personnel are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS would employ the most selective methods for the target species, would employ the use of attractants that are as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. SOPs to prevent and reduce any potential adverse impacts on non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target take during program activities, the potential for adverse impacts to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety. The unintentional take by the WS program in Illinois from FY 2011 through FY 2013 is shown in Table 4.40.

Table 4.40 – Unintentional take of birds by WS in Illinois – FY 2011 – FY2013

Species	Number of Individuals
Red-winged blackbird	3
Common grackle	1
European starling	1
TOTAL	**5**

Direct, Indirect, and Cumulative Effects:

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 birds, the use of such methods can result in the incidental removal of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the proposed action. WS' take of non-target species during activities to reduce damage or threats to human safety associated with birds is expected to be extremely low to non-existent. WS would monitor the removal of non-target species to ensure program activities or methodologies used in bird damage management do not create direct effects on non-target populations. Methods available to resolve and prevent bird damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS would annually report to the USFWS and/or the IDNR any non-target removal to ensure removal by WS is considered as part of management objectives established. The potential impacts to non-targets are similar to the other alternatives and are considered to be minimal to non-existent.

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. The use of auditory and visual dispersal methods used to reduce damage or threats caused by birds are also likely to disperse non-targets in the immediate area the methods are employed. Therefore, non-targets may be dispersed from an area while employing non-lethal dispersal techniques. However, like target species, 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 or relocating to other suitable habitats. Non-lethal methods would not be employed over large geographical areas or applied at such intensity that essential resources (e.g., food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal direct impacts on overall populations of wildlife since individuals of those species are unharmed. 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, if the area is large enough, adverse indirect effects on non-target species may occur. The use of non-lethal methods would not have adverse impacts on non-target populations under any of the alternatives.

Other non-lethal methods available for use under this alternative include live traps, nets, nest/egg destruction, translocation, and repellents. Live traps (e.g., cage traps, walk-in traps, decoy traps) and nets restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to capture non-target species. Trap and net placement in areas where target species are active and the use of target-specific attractants would likely minimize the capture of non-targets. If traps and nets are attended to appropriately, most non-targets captured can be released on site unharmed. Therefore, no direct effects are expected on non-targets.

Nets could include the use of net guns, net launchers, cannon/rocket nets, drop nets, bow nets, dipping nets, and mist nets. Nets would virtually be selective for target individuals since application would occur by attending personnel, with handling of wildlife occurring after deployment of the net or nets would be

checked frequently to address any live-captured wildlife. Therefore, any non-targets captured using nets could be immediately released on site. Any potential non-targets captured using non-lethal methods would be handled in such a manner as to ensure the survivability of the animal if released. Even though live-capture does occur from those methods, the potential for death of a target or non-target animal while being restrained or released does exist, primarily from being struck by the net gun/launcher weights, or cannon/rocket assemblies during deployment. The likelihood of non-targets being struck is extremely low and is based on being present when the net is activated and in a position to be struck. Nets would be positioned to envelop wildlife upon deployment and to minimize striking hazards. Baiting of the areas to attract target species often occurs when using nets; therefore, sites could be abandoned if non-target use of the area was high.

Nest destruction would not adversely affect non-target species since identification of the nest would occur prior to efforts to destroy the nest. Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage could be employed to elicit fright responses in target bird species. When employing those methods to disperse or harass target species, any non-targets near those methods when employed would also likely be dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species would also exclude access to non-target species. The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas by both target and non-target species where non-lethal methods were employed. Therefore, any use of non-lethal methods would have similar results on both non-target and target species. Although non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods could restrict or prevent access of non-targets to beneficial resources. Overall, potential impacts to non-targets from the use of non-lethal methods would not adversely affect populations since those methods would often be temporary.

Only those repellents registered with the EPA pursuant to the FIFRA and registered for use in the state would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative direct or indirect effects on non-target species when used according to label requirements. Most repellents for birds are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested. Two chemicals commonly registered with the EPA as bird repellents are methyl anthranilate and anthraquinone. Methyl anthranilate naturally occurs in grapes and has been used to flavor food, candy, and soft drinks. Anthraquinone naturally occurs in plants like aloe and can be used to make dye. Both products claim to be unpalatable to many bird species. Several products are registered for use to reduce bird damage containing either methyl anthranilate or anthraquinone. Formulations containing those chemicals are liquids that are applied directly to susceptible resources. Avitrol is a flock dispersing method available to manage damage caused by house sparrows, blackbirds, crows, starlings, and pigeons. When used in accordance with the label requirements, the use of Avitrol would also not adversely affect non-targets based on restrictions on baiting locations (Shafer et al. 1974).

Immobilizing drugs are applied through hand-baiting that targets specific individuals or groups of target species. Therefore, immobilizing drugs are only applied after identification of the target occurs prior to application. Pre-baiting and acclimation of the target waterfowl occurs prior to the application of alpha chloralose which allows for the identification of non-targets that may visit the site prior to application of the bait. All unconsumed bait is retrieved after the application session has been completed. Since sedation occurs after consumption of the bait, personnel are present on site at all times to retrieve waterfowl. This constant presence by WS' personnel would allow for continual monitoring of the bait to ensure non-targets are not present. Based on the use pattern of alpha chloralose by WS, no adverse direct effects to non-targets would be expected from the use of alpha chloralose.

Reproductive Inhibitors - Nicarbazin has been registered with the EPA for use in addressing problems with urban resident Canada geese and rock pigeons. This product is currently registered for use in Illinois by the IDOA (Reg. No. 80224). However, use of this product is prohibited in Illinois under Illinois Compiled Statute 520 ILCS 2.33g which states, "it is unlawful to use poisons, chemicals or explosives for the purpose of taking any species protected by this act". Rock pigeons are not a protected species and nicarbazin could be used to inhibit their reproduction in Illinios. Since nicarbazin could be used on rock pigeons and the status of this product could change for resident Canada geese, the impacts of the use of this product are included in the following impact analysis. Additionally, products containing the active ingredient nicarbazin could be commercially available and purchased by people with a certified applicators license, the use of the product could occur under any of the alternatives discussed in the EA; therefore, the effects of the use would be similar across all the alternatives if the product were used according to label instructions.

Nicarbazin baits for geese are to be used at sites, office complexes, golf courses, residential communities, and municipalities. Although it is possible that other egg-laying species such as birds, reptiles, amphibians, fish, and invertebrates, could feed on the baits, which could reduce their egg-laying potential, the sites where the bait would be used are not as conducive to attracting many species of egg-laying animals. These areas are also places where T&E species are typically not found. Birds in urban and suburban habitats are typically common species that have adapted to the presence of humans. Only a few other species are expected to consume the baits, primarily mallards, domestic waterfowl, and possibly gulls, crows, and rock pigeons. In an Oregon field study, the primary nontarget avian species to consume the bait were American crows, ravens and mallards. However, because most bait consumption by non-target species is expected to be occasional or intermittent and the bait must be consumed regularly throughout the breeding season to inhibit reproduction, nicarbazin is not expected to have any significant impact on these species. Additionally, the size of the baits will prevent small birds and songbirds from eating the baits; small pieces of bait will be removed during the manufacturing process by sifting through screens. Studies on waterfowl in the Fort Collins, Colorado area have shown that most mallards will not eat the bait; they pick up the bait, manipulate it with their bill and then spit it out. However, mallards that are use to being fed by people could eventually eat the bait after the Canada geese on site began eating the bait. Since Canada geese will typically aggressively protect their food sources, they are expected to chase away any other birds attempting to eat the bait offered. WS will also monitor the site prior to and during bait application to ensure that non-target species access to the site is limited to nonexistent and that there is no state or federally listed species that could consume the bait present at the site. Unconsumed bait will be picked up after the bait application period.

Canada geese typically nest earlier in the year than most other waterfowl species that would consume the bait and before many songbirds. Nicarbazin bait will be offered as early as February and will end in early April. Nicarbazin bait must be consumed for several days to achieve blood levels that affect the hatchability of eggs that are forming. Since most waterfowl do not begin to nest until at least May, no effects on the hatchability of eggs of non-target waterfowl that do consume bait are expected as bait exposure will stop before their nesting season is beginning.

Risk of non-target species access to nicarbazin when used for rock pigeons is likely to be lower due to differences in the application strategy. As with the goose formulation, nicarbazin for pigeons is only registered for use in urban areas, applicators must ensure that children and pets do not come into contact with the product, the product cannot be used within 20 feet of any body of water, and the product may only be applied on rooftops or other flat paved or concrete surfaces. Applicators must confirm by visual observation that rock pigeons are eating the bait and nontargets are not feeding on the bait. The label stipulates that the bait application must be discontinued at sites if nontargets are observed feeding on the bait. As with the goose formulation, no excess bait may remain after feeding. The chemistry of the active ingredient assures that there is low risk of any effect on a raptor. To have an effect, the bird must

consume the bait. Once Nicarbazin is digested and absorbed, it is no longer biologically available to another bird and there is effectively no risk of secondary toxicity.

Studies of the effects of nicarbazin on animals other than birds that lay eggs have been limited to snakes. When brown tree snakes were treated with nicarbazin, the number of eggs laid, the hatchability of the eggs, and the health of the offspring were not affected by treatment. It is possible, but not probable, that other egg-laying species could feed on the bait such as turtles. However, WS will monitor the site prior to and during bait application and will remove the bait and/or change the bait application system to avoid exposure to nontarget species.

Toxicity studies in birds and mammals given short and long-term doses of nicarbazin show minimal effects. The volume of Nicarbazin bait that would have to be consumed by nontarget birds and mammals precludes them from being killed by exposure to the bait. For example, a rat would have to consume over 2.2 pounds of the Nicarbazin bait in a singe feeding to reach the lethal dose required to kill 50% of the rats that consume that level of bait (LD_{50}). Extrapolations from data on chickens indicate that crows would have to eat 1.4 lbs of bait each day for 84 days before they would reach the LD_{50} (Bynam et al. 2005). Mammalian predators of geese that have eaten bait could also be exposed to the bait. However, calculations of a worst case scenario by Bynam et al. (2005) indicate that a coyote would have to eat over 40 geese in a single day in order to reach the acute (one dose) LD_{50} for Nicarbazin determined for dogs weighing 25 lbs., or over 13 geese per day for 163 days to reach the chronic (repeated dose) LD_{50}.

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by birds under this alternative would include shooting and DRC-1339. In addition, birds could be euthanized once live-captured by other methods. Available methods and the application of those methods to resolve bird damage are further discussed in Appendix B.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse effects to non-targets would be anticipated from use of this method. The euthanasia of birds by WS' personnel would be conducted in accordance with WS Directive 2.505. Chemical methods used for euthanasia would be limited to carbon dioxide administered in an enclosed chamber after birds have been live-captured. Since live-capture of birds using other methods occurs prior to the administering of euthanasia chemicals, no adverse effects to non-targets would occur under this alternative. WS' recommendation that birds be harvested during the regulated season by private entities to alleviate damage would not increase risks to non-targets.

During the migration period, eagles occur throughout the United States and parts of Mexico (Buehler 2000). Under the Bald and Golden Eagle Act, activities that could result in the "take" of eagles cannot occur unless the USFWS allows those activities to occur through the issuance of a permit. Take could occur through purposeful take (e.g., harassing an eagle from an airport using pyrotechnics to alleviate aircraft strike hazards) or non-purposeful take (e.g., unintentionally capturing an eagle in a trap). Both purposeful take and non-purposeful take require a permit from the USFWS (see 50 CFR 22.26, 50 CFR 22.27). In those cases where purposeful take could occur or where there is a high likelihood of non-purposeful take occurring, WS would apply for a permit for those activities.

However, routine activities conducted by WS' personnel under the proposed action alternative could occur in areas where bald eagles were present, which could disrupt the current behavior of an eagle or eagles that were nearby during those activities. As discussed previously, "take" as defined by the Bald and Golden Eagle Protection Act includes those actions that "disturb" eagles. Disturb has been defined under 50 CFR 22.3 as those actions that cause or are likely to cause injury to an eagle, a decrease in

productivity, or nest abandonment by substantially interfering with their normal breeding, feeding, or sheltering behavior.

WS has reviewed those methods available under the proposed action alternative and the use patterns of those methods. The routine measures that WS conducts would not meet the definition of disturb requiring a permit for the non-purposeful take of bald eagles. The USFWS states, "Eagles are unlikely to be disturbed by routine use of roads, homes, or other facilities where such use was present before an eagle pair nesting in a given area. For instance, if eagles build a nest near your existing home, cabin, or place of business you do not need a permit" (USFWS 2010). Therefore, activities that are species specific and are not of a duration and intensity that would result in disturbance as defined by the Act would not result in non-purposeful take. Activities, such as walking to a site, discharging a firearm, or riding an ATV along a trail, generally represent short-term disturbances to sites where those activities take place. WS would conduct activities that were located near eagle nests using the National Bald Eagle Management Guidelines (USFWS 2007*b*). The categories that would encompass most of these activities are Category D (Off-road vehicle use), Category F (Non-motorized recreation and human entry), and Category H (Blasting and other loud, intermittent noises). These categories generally call for a buffer of 330 to 660 feet for category D and F, and a ½-mile buffer for category H. WS would take active measures to avoid disturbance of bald eagle nests by following the National Bald Eagle Management Guidelines. However, other routine activities conducted by WS do not meet the definition of "disturb" as defined under 50 CFR 22.3. Those methods and activities would not cause injuries to eagles and would not substantially interfere with the normal breeding, feeding, or sheltering behavior of bald eagles.

DRC-1339 is the primary avicide used for BDM in Illinois. A common concern regarding the use of DRC-1339 is the potential risks to non-targets. All label requirements of DRC-1339 would be followed to minimize non-target hazards. As required by the label, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets are observed feeding on the pre-bait, the plots are abandoned and no baiting would occur at those locations. Treated bait is mixed with untreated bait per label requirements when applied to bait sites to minimize the likelihood of non-targets finding and consuming bait that has been treated. The bait type selected can also limit the likelihood that non-target species would consume treated bait since some bait types are not preferred by non-target species.

By acclimating target bird species to a feeding schedule, baiting can occur at specific times to ensure bait is quickly consumed by target bird species, especially when large flocks of target species are present. The acclimation period allows treated bait to be applied only when birds are conditioned to be present at the site and provides a higher likelihood that treated bait would be consumed by the target species, which makes it unavailable to non-targets. In addition, many bird species, when present in large numbers, tend to exclude non-targets from a feeding area due to their aggressive behavior and by the large number of conspecifics present at the location. Therefore, risks to non-target species from consuming treated bait only occurs when treated bait is present at a bait location and few target individuals are present. Any treated bait remaining at the location after target birds had finished feeding would be removed to avoid attracting non-targets. WS would retrieve all dead birds to the extent possible following treatment with DRC-1339.

DRC-1339 Primary Hazard Profile - DRC-1339 was selected for reducing bird damage because of its high toxicity to blackbirds (DeCino et al. 1966, West et al. 1967, Schafer, Jr. 1972) and low toxicity to most mammals, sparrows, and finches (Schafer, Jr. and Cunningham 1966, Apostolou 1969, Schafer, Jr. 1972, Schafer, Jr. et al. 1977, Matteson 1978, Cunningham et al. 1979, Cummings et al. 1992, Sterner et al. 1992). The likelihood of a non-target bird obtaining a lethal dose is dependent on: (1) frequency of encountering the bait, (2) length of feeding bout, (3) the bait dilution rate, (4) the bird's propensity to select against the treated bait, and (5) the susceptibility of the non-target species to the toxicant. Birds

that ingest DRC-1339 probably die because of irreversible necrosis of the kidney and subsequent inability to excrete uric acid (*i.e.*, uremic poisoning) (DeCino et al. 1966, Felsenstein et al. 1974, Knittle et al. 1990). Birds ingesting a lethal dose of DRC-1339 usually die in one to three days.

The median acute lethal dose (LD_{50})[9] values for starlings, blackbirds, and magpies (Corvidae) ranges from one to five mg/kg (Eisemann et al. 2003). For American crows, the median acute lethal dose has been estimated at 1.33 mg/kg (DeCino et al. 1966). The acute oral toxicity (LD_{50}) of DRC-1339 has been estimated for over 55 species of birds (Eisemann et al. 2003). DRC-1339 is toxic to mourning doves, pigeons, quail (*Coturnix coturnix*), chickens and ducks (*Anas* spp.) at ≥5.6 mg/kg (DeCino et al. 1966). In cage trials, Cummings et al. (1992) found that 2% DRC-1339-treated rice did not kill savannah sparrows (*Passerculus sandwichensis*). Gallinaceous birds and waterfowl may be more resistant to DRC-1339 than blackbirds, and their large size may reduce the chances of ingesting a lethal dose (DeCino et al. 1966). Avian reproduction does not appear to be affected from ingestion of DRC-1339 treated baits until levels are ingested where toxicity is expressed (USDA 2001).

There have been concerns expressed about the study designs used to derive acute lethal doses of DRC-1339 for some bird species (Gamble et al. 2003). The appropriateness of study designs used to determine acute toxicity to pesticides has many views (Lipnick et al. 1995). The use of small sample sizes was the preferred method of screening for toxicity beginning as early as 1948 to minimize the number of animals involved (Dixon and Mood 1948). In 1982, the EPA established standardized methods for testing for acute toxicity that favored larger sample sizes (EPA 1982). More recently, regulatory agencies have again begun to debate the appropriate level of sample sizes in determining acute toxicity based on a growing public concern for the number of animals used for scientific purposes.

Based on those concerns, the Ecological Committee on FIFRA Risk Assessment (ECOFRAM) was established by the EPA to provide guidance on ecological risk assessment methods (EPA 1999). The committee report recommended to the EPA that only one definitive LD_{50} be used in toxicity screening either on the mallard or northern bobwhite and recommended further testing be conducted using the up-and-down method (EPA 1999). Many of the screening methods used for DRC-1339 prior to the establishment of EPA guidelines in 1982 used the up-and-down method of screening (Eisemann et al. 2003).

A review of the literature shows that LD_{50} research using smaller sample sizes conducted prior to EPA established guidelines are good indicators of LD_{50} derived from more rigorous designs (Bruce 1985, Bruce 1987, Lipnick et al. 1995). Therefore, acute and chronic toxicity data gathered prior to EPA guidance remain valid and to ignore the data would be inappropriate and wasteful of animal life (Eisemann et al. 2003).

DRC-1339 Secondary Hazards - Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds that died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1979). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers.

DRC-1339 is rapidly metabolized and excreted and does not bioaccumulate, which probably accounts for its low secondary hazard profile (Schafer, Jr. 1991). For example, cats, owls, and magpies would be at risk only after exclusively eating DRC-1339-poisoned starlings for 30 continuous days (Cunningham et al. 1979). No probable risk is expected to American kestrels based on the low hazard quotient value for

[9] An LD_{50} is the dosage in milligrams of material per kilogram of body weight required to cause death in 50% of a test population of a species.

marsh hawks used as a surrogate species (Schafer, Jr. 1970). The risk to mammalian predators from feeding on birds killed with DRC-1339 appears to be low (Johnston et al. 1999).

The risks associated with non-target animal exposure to DRC-1339 baits have been evaluated in rice fields in Louisiana (Glahn et al. 1990, Cummings et al. 1992, Glahn and Wilson 1992), poultry and cattle feedlots in several western states (Besser 1964, Ford 1967, Royall et al. 1967), ripening sunflower fields in North Dakota (Linz et al. 2000), and around blackbird staging areas in east-central South Dakota (Knutsen 1998, Linz et al. 1999, Smith 1999). Smith (1999) used field personnel and dogs to search for dead non-target animals and found no non-target carcasses that exhibited histological signs consistent with DRC-1339 poisoning. The other studies also failed to detect any non-target birds that had succumbed to DRC-1339. However, DRC-1339 is a slow-acting avicide and thus, some birds could move to areas not searched by the study participants before dying.

DRC-1339 Environmental Degradation - DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation and has a half-life of less than two days. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. The chemical tightly binds to soil and has low mobility. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (EPA 1995). Therefore, WS does not expect any adverse indirect effects on non-target species through chemical contamination from soil or water supplies.

Additional concerns have been raised regarding the risks to non-target wildlife associated with crows caching bait treated with DRC-1339. Crows are known to cache surplus food usually by making a small hole in the soil using the bill, by pushing the food item under the substrate, or covering items with debris (Verbeek and Caffrey 2002). Distances traveled from where the food items were gathered to where the item is cached varies, but some studies suggest crows can travel from 100 meters (Kilham 1989) and up to 2 kilometers (Cristol 2001, Cristol 2005). Caching activities appear to occur throughout the year, but may increase when food supplies are low. Therefore, the potential for treated baits to be carried from a bait site to surrounding areas exists as part of the food cache behavior exhibited by crows.

Several mitigating factors must be overcome for non-target risks to occur from bait cached by a crow. Those factors being: (1) the non-target wildlife species would have to locate the cached bait, (2) the bait-type used to target crows would have to be palatable or selected for by the non-target wildlife, (3) the non-target wildlife species consuming the treated bait would have to consume a lethal dose from a single bait, (4) if a lethal dose is not achieved by eating a single treated cached bait, the non-target wildlife would have to ingest several treated baits (either from cached bait or from the bait site) to obtain a lethal dose which could vary by the species, and (5) DRC-1339 degrades very rapidly in the environment when exposed to sunlight and/or water. Based on these many factors, WS feels that the risk of non-target species encountering baits cached by crows and that bait having negative effects on the non-target to be low.

SLS Hazard Profile - WS anticipates using SLS as an additional method to manage blackbird damage. SLS is a wetting agent for managing European starlings, red-winged, yellow-headed, and Brewer's blackbirds, cowbirds, grackles, American crows, common ravens, feral pigeons, and magpie roosts. SLS is a surfactant commonly used in soap products and the Food and Drug Administration lists SLS as a food additive and generally recognizes it as safe. Furthermore, the Environmental Protection Agency concluded that SLS should not result in unreasonable adverse effects to human health or the environment (EPA 1993). Application of SLS and water is through a ground-based sprinkler-head spray system in areas of the target roost where it will be most effective in bird coverage. When applied to birds, SLS allows water to penetrate and saturate the feathers so that with low temperatures (<41^{o}F) and sufficient water, birds die of hypothermia (NWRC 2008). During 2004-2007, WS' NWRC and the WS program in

Missouri conducted field tests to investigate the effectiveness of SLS in removing urban blackbird roosts. Results document that SLS caused mortality in starlings and blackbirds and may be useful as part of IWDM programs designed to reduce local blackbird populations. Birds died as soon as 30 minutes after exposure to SLS. In 1996, the EPA exempted 31 minimum-risk pesticides from requirements of FIFRA if the pesticides satisfy certain conditions. In general, conditions claiming that a pesticide should be exempt from registration under FIFRA Section 25(b) are that claims cannot be made regarding control of public-health pests, and the product cannot be used on food or feed crops. SLS (Chemical Abstract Service No. 151-21-3) was included on the list of 31 exempt compounds. The Organization for Economic Co-operation and Development report (1997) concluded that, "The human health hazard assessment for SLS shows that at present the substance is of no concern for the general public (consumers) and for workers." SLS is considered a minimum-risk pesticide with the exception that it is moderately toxic to aquatic organisms and possibly harmful to some plants. WS anticipates using this method in the future, particularly to manage blackbird conflicts and roosts in urban areas.

There are no residual effects of SLS on target bird species. WS could also use other population management methods, such as DRC-1339, in the absence of SLS. Therefore, the use of SLS would not contribute to additive mortality of any target species. No cumulative effects are expected when used according to label instructions.

Herbicides

The U.S. Department of Transportation (DOT), Federal Aviation Administration (FAA) recognizes that proper storm water management and management of emergent vegetation are essential for an integrated wildlife hazard management plan (Cleary and Dolbeer 1999). Standing water is an attractant to many bird species. Nationwide, waterfowl and gulls are two of the species most commonly involved in damaging wildlife-aircraft strikes (Dolbeer et al. 2014). The FAA recommends that storm water basins only detain water for a maximum of 48 hours (FAA 2007). If emergent aquatic vegetation is allowed to grow in the bottom of the basin it can reduce the rate of the water outflow. Emergent aquatic vegetation is an attractant for blackbirds, waterfowl, and wading birds, and is used by birds for nesting and roosting. Consequently, the FAA strongly recommends preventing emergent aquatic vegetation from growing in storm water basins (FAA 2007). Preference is given to the use of mechanical methods to control emergent aquatic vegetation, but weather and soil conditions can severely limit when maintenance personnel are able to use mowing. Therefore, it is important to aviation safety that chemical applications are available to use as an alternative method to manage emergent vegetation.

Airport properties encompass large land areas where weeds or other vegetation may attract hazardous wildlife. Broad-leaf weeds provide food, cover, and space for birds and small mammals to feed, hide, and travel. The preferred habitat on airports is a dense monoculture of grass that is managed to a designated height as to deter the airport's hazardous species. Dense grass cover restricts ground movements of birds and reduces the attraction of an area to hazardous wildlife. When compared to grass, broadleaf weeds provide more forage and cover for birds and small mammals (Washburn and Seamas 2004). Species of clover or other forbs may encroach into the grass areas, as well as invasive species, such as teasel. Selective removal of these species, while preserving the grass is necessary to discourage wildlife from using airfields.

The WS program is proposing to use the herbicide Rodeo ™ (glyphosate N-(phosphonomethyl) glycine and isopropylamine salt) for management of emergent vegetation at airports and other locations where damaging birds are attracted to emergent aquatic vegetation. Glyphosate-based herbicides, such as Rodeo™ and Roundup™, are mixed with a surfactant to increase the absorption of the glyphosate by the plant's foliage (Giesy et al. 2000). Formulations of glyphosate herbicides vary, with Rodeo™ being formulated for use on aquatic/emergent vegetation. Vegetation must have a significant proportion of its

foliage above water as it is not effective underwater. Each application is designed to kill all plants present at that time, with reapplications likely necessary to effectively control plants throughout an entire season (Giesy et al. 2000). Application may be conducted using back pack sprayers, aerial application, or other equipment, as available/necessary. After application, Rodeo™ binds tightly to soil becoming almost immobile; therefore, it is not taken up by roots nor is it leached into water sources (Baumann et al. 1999). It also degrades quickly with the average half-life being 47 days (Herbicide Handbook 2002). Rodeo™ is an amino acid inhibitor that affects pathways unique to plants (Geisy et al. 2000, Baumann et al. 1999). WS personnel would only use Rodeo ™ according to the label directions.

WS anticipates using aquatic formulations of glyphosate herbicides (Rodeo™) per label instructions to reduce wildlife attractants at airports. Per the Rodeo™ label, there are no grazing restrictions except for lactating cattle on treated sites. Additionally, there are no restrictions on the use of treated water for irrigation, recreation, or domestic purposes (Dow 2006). Rodeo™ toxicology testing has demonstrated that material is practically non-toxic to birds on an acute basis (Dow 2011). While WS anticipates that concentrations of birds may disperse from treatment sites due to habitat modifications, no short or long-term health impacts are expected. WS typically does not perform the same project functions at the same site and same time frame as other entities. Therefore, no cumulative effects are expected as WS would not apply Rodeo™ in concert with other applicators.

WS anticipates using 2,4-D (Crosssbow™) per label instruction to reduce wildlife attractants at airports. Use of broad-leaf herbicides to maintain grasslands on airports could occur as warranted, within label guidelines. WS typically does not perform the same project functions at the same site and same time frame as other entities. Therefore, no cumulative effects are expected as WS would not apply 2,4-D in concert with other applicators.

Glyphosate Herbicide

Rodeo™ is a glyphosate general use herbicide closely related to Roundup™ and is composed to 53.5% glyphosate and 46.5% water. It is a broad spectrum herbicide for annual and perennial vegetation management in wetlands that acts systemically through contact with the foliage, not the plants' roots. Rodeo™ is practically non-toxic to fresh-water fish and aquatic invertebrates. In mammals, glyphosate was excreted in the urine and did not bioaccumulate (USFS 1997). Glyphosate also does not bioaccumulate in fish or mammals (Geisy 2000). Glyphosate has been used extensively to control aquatic vegetation with no documented cases of adverse effects on fish or aquatic invertebrates when used according to label directions (Geisy 2000). Impacts to non-target species are expected to be low to non-existent when the product is used according to label instructions.

Broad-leaf Herbicides

2,4-Dichlororphenoxyacetic aid (2,4-D, trade name Crossbow™) is a broad-leaf herbicide that has little effect on species of grass. 2,4-D works by causing cells in the plant tissues to grow and divide without stopping (NPIC 2009). WS is proposing to use this herbicide on airports where invasive species or weeds are increasing the attraction of wildlife to the airfield. 2,4-D has been demonstrated to be effective on invasive species, such as teasel (*Dipsacus spp.*) when applied during the growing season (Bentivegna and Smeda 2008), as well as clovers (*Trifolium spp.*) and forbs that are an attractive food resource for wildlife. While the ester forms of 2,4-D can be highly toxic to aquatic life (NPIC 2009), WS is not proposing to use it near any water bodies, eliminating the risk to aquatic species. Application may be conducted using back pack sprayers or other equipment, as available/necessary. 2,4-D has a half-life of approximately 6.2 days in soil and is considered to be moderately to practically non-toxic to birds on an acute basis (EPA 2005*a*). In order to reduce any ecological risk, it is recommended to take all measures to reduce wind drift, using the lowest application rate possible, and to follow all label directions (Dow AgroSciences 2010). WS would only apply 2,4-D per label directions.

Crossbow™, a 2,4-D based herbicide, is a broad-leaf herbicide used to control annual and perennial broadleaves, woody plants and brush without affecting grasses. It contains 34.4% 2,4-D esters, 16.5% triclopyr BEE, and 49.1% other ingredients. It is most effective when used during the growing period, as it causes uncontrolled cell division as its mode of action. 2,4-D has a short half-life in soils (6.2 days), thought may persist longer in aquatic environments. The ester derivatives of 2,4-D generally have low acute toxicity for humans, birds and insects, while it is highly toxic to aquatic life (EPA 2005*a*, NPIC 2009). Therefore, 2,4-D will not be applied in aquatic habitats or in a manner where drift could enter waterways. Since the goal of airport habitat management is to maintain a dense grass monoculture, removal of any non-listed, broad-leaf plant on an airport is beneficial to achieving the goal and WS does not anticipate having any adverse effects on non-target species.

While the Rodeo™ mode of action is specific for plants, the herbicide may exist in aquatic habitats for a limited amount of time. There are several mussel species listed in Illinois that could come into contact with herbicides. The toxicity of glyphosate herbicides on mussels is not well established and seemingly dependent on the surfactant that accompanies the herbicide (Bringolf et al. 2007). Aquastar™, a herbicide with the same active ingredients as Rodeo™ that is also formulated for aquatic use, was used in a study to determine toxicity of glyphosate to freshwater mussels. Aquastar™ was determined to not be acutely toxic to the mussels (Bringolf et al. 2007). According to that study;

"Increased growth of mussels in low and intermediate treatment concentrations partially may be explained by the additional carbon or nitrogen from test compounds available for microorganisms, which in turn could provide a supplemental food source for the mussels [32,33]. At higher test concentrations, toxicity would preclude any beneficial effects. Additional research is needed to definitively determine the effects of glyphosate-based chemicals on growth" (Bringolf et al. 2007).

The mussels that are federally listed in Illinois are found in larger rivers or free flowing streams. Snuffbox (*Epioblasma triquetra*) may be found in small to medium-sized creeks in areas with a swift current and some larger rivers. Sheepnose (*Plethobasus cyphyus*) and spectaclecase (*Cumberlandia monodonta*) mussels are found in large rivers and streams. The rabbitsfoot mussel (*Quadrula cylindrical cylindrical*) currently exists in the Illinois portions of the Ohio River, the North Fork Vermillion River, and the Middle Branch North Fork Vermillion River. These rivers and habitats do not occur on airports in Illinois. Water features on airports are generally discouraged or removed, but some wet areas, such as necessary drainage structures or low areas, remain as wildlife attractants that may contain. While water from application sites may drain into larger water bodies, the chemical properties of Rodeo™ (e.g. half-life and binding properties) make it highly unlikely that it would be present in water in high concentrations. These factors indicate that WS activities will have no effect on listed mussels in Illinois.

There are nine federally listed plant species in Illinois that could potentially be affected by the use of glyphosate or 2,4-D. Airports are generally maintained as short grass habitats, with frequent mowing, reducing habitat available for non-grass species. The potential for an endangered species to take hold without assistance is low. Because the proposed herbicides are highly effective, each site considered for a treatment will be evaluated to ensure there are no T&E species in the vicinity and the USFWS and IDNR will be consulted, as necessary, to determine the presence of listed species. Studies conducted at Chicago O'Hare airport prior to the O'Hare Modernization Project demonstrated there were no listed species present on the airport (FAA 2005). Other airports may have similar documentation in place, which will be used to determine the presence of listed species on the property. Should such species be found, WS would recommend other methods for removing the unwanted vegetation. Therefore, WS will have no effect on listed species through the application of SLS, glyphosate, or 2,4-D.

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 birds, the use of such methods can result in the incidental take of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the proposed action. WS' take of non-target species during activities to reduce damage or threats to human safety associated with birds in Illinois is expected to be extremely low to non-existent. WS would monitor the take of non-target species to ensure program activities or methodologies used in bird damage management do not adversely impact non-targets. Methods available to resolve and prevent bird damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS would annually report to the USFWS and/or the IDNR any non-target take to ensure take by WS is considered as part of management objectives established. The potential impacts to non-targets are similar to the other alternatives and are considered to be minimal to non-existent.

Summary

WS does not anticipate any adverse cumulative impacts on non-target species from the implementation of the proposed bird damage management methods. Based on the methods available to resolve bird damage and/or threats, WS does not anticipate the number of non-targets removed to reach a magnitude where declines in those species' populations would occur. Therefore, removal under the proposed action of non-targets will not create adverse cumulative effects on non-target species. DRC-1339 and alpha chloralose are currently only available for use by WS employees; therefore, no adverse cumulative impacts are expected from the use of these chemicals due to no additional contribution of these chemicals into the environment from non-WS entities. Starlicide, a product similar to DRC-1339, would be available for use by licensed pesticide applicators. However, no adverse cumulative impacts are expected because Starlicide has a similar hazard profile to DRC-1339.

The proposed bird damage management could benefit many other wildlife species that are impacted by predation or competition for resources. For example, crows are generally very aggressive nesting area colonizers and will force other species from prime nesting areas. American crows and fish crows often feed on the eggs, nestlings, and fledglings of other bird species. Fish crows are known to feed heavily on colonial waterbird eggs (McGowan 2001). This alternative has the greatest possibility of successfully reducing bird damage and conflicts to wildlife species since all available methods could possibly be implemented or recommended by WS.

T&E Species Effects

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. SOPs to avoid T&E effects are described in Chapter 3 of this EA.

Federally Listed Species - The current list of species designated as threatened and endangered in Illinois as determined by the USFWS and the National Marine Fisheries Services (NMFS) was obtained and reviewed during the development of this EA. Appendix C contains the list of species currently listed in the state along with common and scientific names. As part of the developental process associated with this EA, WS has re-inititated consultation with the USFWS pursuant to Section 7 of the ESA and the USFWS concluded that the proposed action alternative would have no adverse effects on federally listed species or adversely modify designated critical habitat. WS will continue to consult with the USFWS to evaluate activities to resolve bird damage to ensure the protection of threatened or endangered species and to comply with the ESA.

State Listed Species – The current list of species designated as endangered, threatened, or special concern by the state, as determined by the IDNR, was obtained and reviewed during the development of the EA

(see Appendix D and E). WS has consulted with the IDNR regarding the potential impacts of the proposed alternative to species of concern and WS received concurrence that the proposed action alternative would have no effect on state-listed species at the population level.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, risks to non-target species from WS actions would likely be limited to the use of frightening devices, exclusionary devices, and the risks of unintentional capture of a bird in a live-capture device as outlined under Alternative 1. Although the availability of WS assistance with non-lethal BDM methods could decrease incentives for non-WS entities to use lethal BDM methods, non-WS efforts to reduce or prevent damage could result in less experienced persons implementing bird damage management methods and lead to a greater take of non-target wildlife.

Direct, Indirect, and Cumulative Effects:
Hazards to T&E species could be greater under this alternative than Alternative 1. Similar to Alternative 3, it is possible that frustration from the resource owner due to the inability to reduce losses could lead to illegal use of toxicants, or other non-specific damage management methods by others could lead to unknown affects to non-target species populations, including T&E species (Appendix D). Potential direct or indirect effects to non-target species could therefore be greater under this alternative if methods that are less selective or toxicants that cause secondary poisoning are used by non-WS entities. Direct effects on non-targets from non-lethal methods of bird damage management conducted by WS would be similar to Alternative 1. Since WS would be able to employ non-lethal methods under this alternative, indirect effects on non-target species could occur when implementing exclusionary devices if the area is large enough, but these indirect effects are expected to be minimal. The ability to reduce negative effects caused by birds to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing BDM programs. It is possible that frustration caused by the inability to reduce losses would lead to non-specific damage management methods or illegal use of toxicants by others which could increase adverse cumulative impacts, however to unknown degree. While cumulative impacts would be variable, WS does not anticipate any significant cumulative impacts from this alternative.

Alternative 3 – No Bird Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with damage management activities. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Birds could continue to be taken under depredation permits issued by the USFWS and the IDNR, take would continue to occur during the regulated harvest season, non-native bird species could continue to be taken without the need for a permit, blackbirds and cormorants could still be taken under the depredation orders, and Muscovy ducks could be lethally taken under the control order. Risks to non-targets and T&E species would continue to occur from those who implement bird damage management activities on their own or through recommendations by the other federal, state, and private entities. Although some risks occur from those people that implement bird damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

Direct, Indirect, and Cumulative Effects:
Under this alternative, WS would not be directly involved with damage management activities. Therefore, no direct or indirect impacts to non-targets or T&E species would occur by WS under this alternative.

The ability to reduce damage and threats of damage caused by birds to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative. The risks to non-targets and T&E species would be similar across the alternatives since most of those methods described in Appendix B would be available across the alternatives. If those methods available were applied as intended, risks to non-targets would be minimal to non-existent. If methods available were applied incorrectly or applied without knowledge of bird behavior, risks to non-target wildlife would be higher under this alternative. If frustration from the lack of available assistance causes those persons experiencing bird damage to use methods that were not legally available for use, risks to non-targets would be higher under this alternative. People have resorted to the use of illegal methods to resolve wildlife damage that have resulted in the lethal take of non-target wildlife (e.g., White et al. 1989, USFWS 2001, FDA 2003). Therefore, adverse direct, indirect, or cumulative impacts to non-targets, including T&E species, could occur under this alternative; however WS does not anticipate any significant cumulative impacts.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

A common concern is the potential adverse effects that available methods could have on human health and safety. The threats to human safety of methods available under the alternatives are evaluated below by each of the alternatives.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird Damage (Proposed Action/No Action)

The cooperator requesting assistance is made aware through a MOU, cooperative service agreement, inter-agency agreement, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator. The cooperator is then aware of the use of those methods on property they own or manage and can identify any risks to human safety associated with the use of those methods.

WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and, if necessary, additional methods could be employed. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS and would be similar to those risks addressed by the other alternatives.

Lethal methods available under the proposed action would include the use of firearms, chemical applications, live-capture followed by euthanasia, and the recommendation that birds be harvested during the regulated hunting season established for those species by the USFWS and the IDNR. The use and reccomendation to use these methods could, in certain situations, be hazardous to safety if they are used incorrectly. Although some formulations of the avicide DRC-1339 are restricted to use by WS only, a similar product containing the same active ingredient as DRC-1339 could be made available for use as a restricted use pesticide by other entities.

WS' employees who conduct BDM activities would be knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. That knowledge would be incorporated into the decision-making process inherent with the WS' Decision Model that would be applied when addressing threats and damage caused by birds. Prior to and during the utilization of lethal methods, WS' employees would consider risks to human safety based on location and method. Risks to

human safety from the use of methods would likely be greater in urban areas when compared to rural areas that are less densely populated. Consideration would also be given to the location where damage management activities would be conducted based on property ownership. If locations where methods would be employed occur on private property in rural areas where access to the property is controlled and monitored, the risks to human safety from the use of methods would likely be less. If damage management activities occur at parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety increases. Activities would generally be conducted when human activity is minimal (e.g., early mornings, at night) or in areas where human activities are minimal (e.g., in areas closed to the public).

The use of live-capture traps has also been identified as a potential concern. Live-capture traps are typically set in situations where human activity is minimal to ensure public safety. Traps rarely cause serious injury and are triggered through direct activation of the device. Live-capture traps available for birds are typically walk-in style traps where birds enter, but are unable to exit. Therefore, human safety concerns associated with live traps used to capture birds require direct contact to cause bodily harm.

Other live-capture devices, such as cannon nets, pose minor safety hazards to the public since activation of the device occurs by trained personnel after target species are observed in the capture area of the net. Lasers also pose minimal risks to the public since application occurs directly to target species by trained personnel; thereby, limiting exposure of the public to misuse of the method.

Safety issues can arise related to misusing firearms and the potential human hazards associated with firearm use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearm safety training course and to remain certified for firearm use, WS' employees must attend a re-certification safety training course in accordance with WS Directive 2.615. WS' employees who carry and use firearms as a condition of employment are required to sign a form certifying that they have not been convicted of a misdemeanor crime of domestic violence. A thorough safety assessment would be conducted before firearms were deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS would work closely with cooperators requesting assistance to ensure all safety issues were considered before the use of firearms was deemed appropriate. All methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of methods.

All WS' personnel who handle and administer chemical methods would be properly trained in the use of those methods. Training and adherence to agency directives would ensure the safety of employees applying chemical methods. Birds euthanized by WS or taken using chemical methods would be disposed of in accordance with WS Directive 2.515 and applicable federal and state permits. All euthanasia would occur in the absence of the public to further minimize risks and stress on the animal. SOPs are further described in Chapter 3 of this EA.

The recommendation of repellents or the use of those repellents registered for use to disperse birds could occur under the proposed action as part of an integrated approach to managing bird damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Risks to human safety from the use of avicides could occur either through direct exposure of the chemical or exposure to the chemical from birds that have been lethally taken. The only avicide currently registered for use in Illinois is DRC-1339 (3-chloro-p-toluidine hydrochloride) that could be used for bird damage management. The mixing, drying, and storage of DRC-1339 treated bait occurs in controlled areas that are not accessible by the public. Therefore, risks to public safety from the preparation of DRC-1339 are minimal. Some risks do occur to the handlers during the mixing process from inhalation and direct exposure on the skin and eyes. Adherence to label requirements during the mixing and handling of DRC-1339 treated bait for use of personal protective equipment ensures the safety of WS' personnel handling and mixing treated bait. Therefore, risks to handlers and mixers that adhere to the personal protective equipment requirements of the label are low.

Locations where treated bait may be placed are determined based on product label requirements (*e.g.*, distance from water, specific location restrictions), the target bird species use of the site (determined through prebaiting and an acclimation period), on non-target use of the area (areas with non-target activity are not used or abandoned), and based on human safety (e.g., in areas restricted or inaccessible by the public or where warning signs have been placed). Once appropriate locations were determined, treated baits would be placed in feeding stations or would be broadcast using mechanical methods (ground-based equipment or hand spreaders) and by manual broadcast (distributed by hand) per label requirements. Once baited using the diluted mixture (treated bait and untreated bait) when required by the label, locations would be monitored for non-target activity and to ensure the safety of the public. After each baiting session, all uneaten bait would be retrieved. The prebaiting period allows treated bait to be placed at a location only when target birds were conditioned to be present at the site and provides a higher likelihood that treated bait would be consumed by the target species, which makes it unavailable for potential exposure to humans. To be exposed to the bait, someone would have to approach a bait site and handle treated bait. If the bait had been consumed by target species or was removed by WS, then treated bait would no longer be available and human exposure to the bait could not occur. Therefore, direct exposure to treated bait during the baiting process would only occur if someone approached a bait site that contained bait and if treated bait was present, would have to handle treated bait.

Factors that minimize any risk of public health problems from the use of DRC-1339 are: 1) its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions, DRC-1339 is not applied to feed materials that livestock can feed upon), 2) DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours; in general, DRC-1339 on treated bait material is almost completely broken down within a week if not consumed or retrieved, 3) the chemical is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people, 4) application rates are extremely low (EPA 1995), 5) a human would need to ingest the internal organs of birds found dead from DRC-1339 to be exposed, and 6) the EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995).

Of additional concern is the potential exposure of people to crows harvested during the regulated hunting season that have ingested DRC-1339 treated bait. The hunting season for crows occurs from October to November and January through mid-March with no daily harvest (bag) limit or possession limit. Under the proposed action, baiting using DRC-1339 to reduce crow damage could occur during the period of time when crows can be harvested. Although baiting could occur in rural areas during those periods, most requests for assistance to manage crow damage during the period of time when crows can be harvested occur in urban areas associated with urban crow roosts. Crows using urban communal roost locations often travel long distances to forage before returning to the roost location during the evening.

For a crow that ingested DRC-1339 treated bait to pose a potential risk to human safety to someone harvesting crows during the hunting season, a hunter would have to harvest a crow that ingested DRC-1339 treated bait and subsequently consume certain portions of the crow. The mode of action of DRC-1339 requires ingestion by crows so handling a crow harvested or found dead would not pose any primary risks to human safety. Although not specifically known for crows, in other sensitive species, DRC-1339 is metabolized and/or excreted quickly once ingested. In starlings, nearly 90% of the DRC-1339 administered dosages well above the LD_{50} for starlings was metabolized or excreted within 30 minutes of dosage (Cunningham et al. 1979). In one study, more than 98% of a DRC-1339 dose delivered to starlings could be detected in the feces within 2.5 hours (Peoples and Apostolou 1967) with similar results found for other bird species (Eisemann et al. 2003). Once death occurs, DRC-1339 concentrations appear to be highest in the gastrointestinal tract of birds, but some residue could be found in other tissue of carcasses examined (Giri et al. 1976, Cunningham et al. 1979, Johnston et al. 1999) with residues diminishing more slowly in the kidneys (Eisemann et al. 2003). However, most residue tests to detect DRC-1339 in tissues of birds have been completed using DRC-1339 dosages that far exceeded the known acute lethal oral dose for those species tested and far exceeds the level of DRC-1339 that would be ingested from treated bait. Johnston et al. (1999) found DRC-1339 residues in breast tissue of boat-tailed grackles (*Quiscalus major*) using acute doses ranging from 40 to 863 mg/kg. The acute lethal oral dose of DRC-1339 for boat-tailed grackles has been estimated to be ≤ 1 mg/kg, which is similar to the LD_{50} for crows (Eisemann et al. 2003). In those boat-tailed grackles consuming a trace of DRC-1339 up to 22 mg/kg, no DRC-1339 residues were found in the gastrointestinal track nor found in breast tissue (Johnston et al. 1999).

In summary, nearly all of the DRC-1339 ingested by sensitive species is metabolized or excreted quickly, normally within a few hours. Residues of DRC-1339 have been found in the tissues of birds consuming DRC-1339 at very high dosage rates that exceed current acute lethal dosages achieved under the label requirements of DRC-1339. Residues of DRC-1339 ingested by birds appear to be primarily located in the gastrointestinal tract of birds.

Under the proposed action, the controlled and limited circumstances in which DRC-1339 would be used would prevent any exposure of the public to this chemical. Based on current information, the human health risks from the use of DRC-1339 would be virtually nonexistent under this alternative.

Reproductive inhibitors are formulated on bait and are administered to target wildlife through consumption of treated bait. Therefore, the current concern, outside of transport and storage, is the risks directly to the handler and support staff during the handling and distributing the bait on the ground for consumption.

Threats to human safety from the use of nicarbazin would likely be minimal if labeled directions are followed. The use pattern of nicarbazin would also ensure threats to public safety are minimal. The label requires an acclimation period, which assists with identifying risks, requires the presence of the applicator at the location until all bait is consumed, and requires any unconsumed bait be retrieved. The EPA has characterized nicarbazin as a moderate eye irritant. The FDA has established a tolerance of nicarbazin residues of four 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 when 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*b*). Based on the use pattern of the nicarbazin and if label instructions are followed, risks to human safety would be low with the primary exposure occurring to those handling and applying the product. Safety procedures required by the label, when followed, would minimize risks to handlers and applicators.

Alpha-chloralose is an immobilizing agent available only for use by WS. The FDA has approved the use of alpha chloralose as an INAD (INAD #6602) to be used for the immobilization and capture of certain species of birds by trained WS' personnel. Alpha-chloralose is administered to target individuals, either as a tablet or liquid solution contained within a bread ball or as a powder formulated on whole kernel corn. All unconsumed baits are retrieved. Since applicators are present at all times during application of alpha chloralose, the risks to human safety are low. All WS' employees using alpha chloralose are required to successfully complete a training course on the proper use and handling of alpha chloralose. All WS' employees who use alpha chloralose would wear the appropriate personal protective equipment required to ensure the safety of employees.

Of additional concern with the use of immobilizing drugs and reproductive inhibitors is the potential for human consumption of meat from waterfowl that have been immobilized using alpha chloralose or have consumed nicarbazin. Since waterfowl are harvested during a regulated harvest season and consumed, the use of immobilizing drugs and potentially reproductive inhibitors is of concern. The intended use of immobilizing drugs is to live-capture waterfowl. Waterfowl are conditioned to feed during a period in the day when consumption of treated bait ensures waterfowl do not disperse from the immediate area where the bait is applied. The use of immobilizing drugs and reproductive inhibitors targets waterfowl in urban environments where hunting and the harvest of waterfowl does not occur or is unlikely to occur (e.g., due to city ordinances preventing the discharge of a firearm within city limits). However, it could be possible for target waterfowl to leave the immediate area where baiting is occurring after consuming bait and enter areas where hunting could occur. To mitigate this risk, withdrawal times are often established. A withdrawal time is the period established between when the animal consumed treated bait to when it is safe to consume the meat of the animal by humans. In compliance with FDA use restrictions, the use of alpha chloralose is prohibited for 30 days prior to and during the hunting season on waterfowl and other game birds that could be hunted. In the event that WS were requested to immobilize waterfowl or use nicarbazin during a period of time when harvest of waterfowl was occurring or during a period of time where a withdrawal period could overlap with the start of a harvest season, WS would not use either immobilizing drugs or nicarbazin. In those cases, other methods would be employed.

The recommendation by WS that birds be harvested during the regulated hunting season, which is established by the IDNR under frameworks determined by the USFWS, would not increase risks to human safety above those risks already inherent with hunting those species. Recommendations of allowing hunting on property owned or managed by a cooperator to reduce bird populations, which could then reduce damage or threats would not increase risks to human safety. Safety requirements established by the IDNR for the regulated hunting season would further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized populations of birds would not increase those risks.

Direct, Indirect, and Cumulative Effects:

No adverse direct or indirect effects to human safety have been reported from WS' use of methods to alleviate bird damage from FY 2009 through FY 2013. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low. No adverse direct effects to human health and safety are expected through the use of live-capture traps and devices or other non-lethal methods. Since WS personnel are required to complete and maintain firearms safety training, no adverse direct effects to human health and safety are expected as a result of the misuse of firearms by WS personnel. Additionally, all WS personnel are properly trained on all chemicals handled and administered in the field, ensuring their safety as well as the safety of the public. Therefore, adverse direct effects to human health and safety from chemicals used by WS are anticipated to be very low. The amount of chemicals used or stored by WS and cooperating agencies would be minimal to ensure human safety. No adverse indirect effects are anticipated from the application of any of the chemicals available for WS. According to the hazard profile for DCR-1339, it is not likely to cause

contamination of the water supply, especially when used in accordance to label requirements. Based on potential use patterns, the chemical and physical characteristics of the above mentioned toxicants and repellents, and factors related to the environmental fate, no cumulative impacts are expected from the chemical components used or recommended by the WS program in Illinois. Since DCR-1339 and alpha chloralose are only available to WS and Starlicide, which is available to licensed pesticide applicators, has a similar hazard profile to DCR-1339, WS does not anticipate any adverse cumulative impacts to human health and safety from the use of these chemicals. Since the IDNR requires hunter and trapper safety training for all sportsmen, WS does not expect any additional adverse cumulative impacts to human safety from the use of firearms when recommending that birds be harvested during regulated hunting seasons to help alleviate damage.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would not use lethal BDM methods. Concerns about human health risks from WS' use of lethal bird damage management methods would be alleviated because no such use would occur. However, Avitrol and the toxicant "Starlicide", which has the same active ingredient as DRC-1339, would be available to licensed pesticide applicators.

Benefits to the public from WS BDM activities will depend on the ability of WS to resolve problems using non-lethal methods and the effectiveness of non-WS BDM efforts. In situations where risks to human health and safety from birds cannot be resolved using nonlethal methods, benefits to the public will depend on the efficacy of non-WS use of lethal BDM methods. If lethal BDM programs are implemented by individuals with less experience than WS, they may not be able to effectively resolve the problem or it may take longer to resolve the problem than with a WS program.

Direct, Indirect, and Cumulative Effects:
Since most methods available to resolve or prevent bird damage or threats are available to anyone, the direct, indirect, and cumulative effects to human safety from the use of those methods are similar between the alternatives. Private efforts to reduce or prevent damage would be expected to increase, and would likely result in less experienced persons implementing chemical or other damage management methods which may have variable adverse direct, indirect, and/or cumulative effects to human and pet health and safety than under Alternative 1. Ignorance and/or frustration caused by the inability to reduce losses could lead to illegal use of toxicants by others which could lead to unknown direct, indirect, and/or cumulative impacts to humans and pets. DRC-1339 and alpha chloralose would not be available under this alternative to non-WS entities experiencing damage or threats from birds and WS would not use DCR-1339 under this alternative since it is lethal, therefore no cumulative impacts to human health and safety should occur from these chemicals.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no bird damage management alternative, WS would not be involved with any aspect of managing damage associated with birds, including technical assistance. Due to the lack of involvement in managing damage caused by birds, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from birds from conducting damage management activities in the absence of WS' assistance. Many of the methods discussed in Appendix B would be available to those persons experiencing damage or threats and could be used to take birds if permitted by the USFWS and/or the IDNR. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Direct, Indirect, and Cumulative Effects:

Since most methods available to resolve or prevent bird damage or threats are available to anyone, the adverse direct, indirect, and cumulative effects to human safety from the use of those methods are similar between the alternatives. Non-chemical methods available to alleviate or prevent damage associated with birds generally do not pose risks to human safety when used correctly. Since most non-chemical methods available for bird damage management involve the live-capture or harassment of birds, those methods are generally regarded as posing minimal adverse direct or indirect effects to human safety. Habitat modification and harassment methods are also generally regarded as posing minimal adverse direct and indirect effects to human safety. Although some risks to safety are likely to occur with the use of pyrotechnics, propane cannons, and exclusion devices, those risks are minimal when those methods are used appropriately and in consideration of human safety. The only methods that would be available under this alternative that would involve the direct lethal taking of birds are shooting and nest destruction. Under this alternative, shooting and nest destruction would be available to those persons experiencing damage or threats of damage when permitted by the USFWS and the IDNR. Firearms, when handled appropriately and with consideration for safety, pose minimal risks to human safety.

Similar to the technical assistance only alternative, DRC-1339 and alpha chloralose would not be available under this alternative to those experiencing damage or threats from birds, therefore no adverse direct, indirect, or cumulative imapcts to human health and safety should occur from these chemicals. Since most methods available to resolve or prevent bird damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those persons not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Effects on the Aesthetic Values of Birds

People often enjoy viewing, watching, and knowing birds exist as part of the natural environment and gain aesthetic enjoyment in such activities. Those methods available to alleviate damage are intended to disperse and/or remove birds. Non-lethal methods are intended to exclude or make an area less attractive, which disperses birds to other areas. Similarly, lethal methods are intended to remove those birds identified as causing damage or posing a threat of damage. The effects on the aesthetic value of birds as it relates to the alternatives are discussed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird Damage (Proposed Action/No Action)

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of birds to resolve damage and threats. In some instances where birds are dispersed or removed, the ability of interested persons to observe and enjoy those birds would likely temporarily decline.

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

The use of lethal methods would result in temporary declines in local populations resulting from the removal of birds to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those birds responsible for the resulting damage.

Therefore, the ability to view and enjoy birds would remain if a reasonable effort is made to locate birds outside the area in which damage management activities occurred. Those birds removed by WS are those that could be removed by the person experiencing damage in the absence of WS involvement.

All activities are conducted where a request for assistance has been received and only after agreement for such services have been agreed upon by the cooperator. Some aesthetic value would be gained by the removal of birds and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by high bird densities.

Direct, Indirect, and Cumulative Effects:
Since those birds removed by WS under this alternative could be removed with a depredation or nuisance wildlife removal permit issued by the USFWS and/or IDNR under depredation orders, under control orders, without the need for a permit (non-native species), or the regulated hunting seasons, WS' involvement in taking those birds would not likely be additive to the number of birds that could be taken in the absence of WS' involvement.

WS' take of birds from FY 2011 through FY 2013 has been of low magnitude compared to the total mortality and populations of those species. WS' activities are not likely additive to the birds that would be taken in the absence of WS' involvement. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of birds, WS' bird damage management activities conducted pursuant to the proposed action is not expected to cause adverse direct or indirect effects on the aesthetic value of birds. However, WS involvement could lead to positive indirect effects resulting in the return of additional native bird species that otherwise would not be there, which would increase the enjoyment of viewing native birds. The impact on the aesthetic value of birds and the ability of the public to view and enjoy birds under the proposed action would be similar to the other alternatives and is likely insignificant.

When damage caused by birds has occurred, any removal of birds by the property or resource owner would likely occur whether WS was involved with taking the birds or not. Therefore, the activities of WS are not expected to have any cumulative adverse effects on this element of the human environment if occurring at the request of a property owner and/or manager. No significant cumulative impact is expected because the bird populations are a renewable resource and therefore will be replaced with new birds in the following years. The purpose of WS involvement is to alleviate the damage caused by the bird, not to eradicate the species.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would not conduct any lethal BDM, but may conduct harassment of birds that are causing damage. Other non-lethal methods may be conducted as well under this alternative to help alleviate damage caused by birds.

Direct, Indirect, and Cumulative Effects:
Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the direct and indirect impacts would then be similar to Alternative 1 as well.

Assuming property owners would choose to allow and pay for the implementation of non-lethal methods by WS, this alternative could result in birds relocating to other sites where they would likely cause or aggravate similar problems for other property owners. Thus, this alternative would likely result in more property owners experiencing adverse direct and/or indirect effects on the aesthetic values of their properties than the Proposed Action Alternative. If WS is providing direct operational assistance in

relocating such birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no BDM by WS alternative, the actions of WS would have no impact on the aesthetic value of birds. Those persons experiencing damage or threats from birds would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. The degree to which damage management activities would occur in the absence of assistance by WS is unknown but likely lower compared to damage management activities that would occur where some level of assistance was provided. Birds could still be dispersed or removed under this alternative by those persons experiencing damage or threats of damage. Take could also occur during the regulated harvest season, under issuance of a depredation permit by USFWS and/or IDNR, pursuant to the blackbird and cormorant depredation orders, pursuant to the Muscovy duck control order, and in the case of non-native species, take could occur any time without the need for a depredation permit.

Direct, Indirect, and Cumulative Effects:
The potential direct and indirect effects on the aesthetic values of birds could be similar to the proposed action if similar levels of damage management activities are conducted by those persons experiencing damage or threats or is provided by other entities. If no action is taken or if activities are not permitted by the USFWS and the IDNR, then no direct or indirect impact on the aesthetic value of birds would occur under this alternative.

Since birds could continue to be taken under this alternative despite WS' lack of involvement, the ability to view and enjoy birds would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of birds dispersed or taken since WS' has no authority to regulate take or the harassment of birds. The USFWS and the IDNR have management authority over birds and would continue to adjust all take levels based on population objectives for those bird species. Therefore, the number of birds lethally taken annually through hunting, under the depredation/control orders, and pursuant to depredation permits are regulated and adjusted by the USFWS and the IDNR. The cummulative impacts to the aesthetic value of birds would be similar to the other alternatives.

4.2 CUMULATIVE IMPACTS

No significant cumulative environmental impacts are expected from any of the proposed actions analyzed in this supplement. Under the Current/Proposed Action, the lethal removal of birds by WS has not and would not have a significant impact on overall bird populations in Illinois or nationwide, but some local reductions may occur. No risk to public safety is expected when WS' services are provided and accepted by continuing the BDM program since only trained and experienced wildlife biologists/specialists would conduct and recommend bird damage management activities. Although some persons will likely be opposed to WS' participation in bird damage management activities on public and private lands, the analysis in this EA indicates that WS integrated BDM program would not result in significant adverse cumulative impacts on the quality of the human environment.

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APPENDIX A

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APPENDIX B

BIRD DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE

NON-LETHAL METHODS - NONCHEMICAL

Agricultural producer and property owner practices. These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by the agricultural producer or property owners/managers. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include:

Cultural methods. These may include altering planting dates so that crops are not young and more vulnerable to damage when the damage-causing species is present, or the planting of crops that are less attractive or less vulnerable to such species. At feedlots or dairies, cultural methods generally involve modifications to the level of care or attention given to livestock which may vary depending on the age and size of the livestock. Animal husbandry practices include, but are not limited to, techniques such as night feeding, indoor feeding, closed barns or corrals, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994).

Environmental/Habitat modification can be an integral part of bird damage management. Wildlife production and/or presence are directly related to the type, quality, and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain bird species or to repel certain birds. In most cases, the resource or property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of bird damage management strategies at or near airports to reduce bird aircraft strike problems by eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport properties can be minimized through management of vegetation and water from areas adjacent to aircraft runways. Habitat management is often necessary to minimize damage caused by crows and blackbirds that form large roosts during late autumn and winter. Bird activity can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand.

Animal behavior modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods that are included by this category are bird-proof barriers, electronic guards, propane exploders, pyrotechnics, distress calls and sound producing devices, chemical frightening agents, repellents, scarecrows, mylar tape, lasers, and eye-spot balloons.

These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium-filled eyespot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective, but usually for only a short time before birds become accustomed and learn to ignore them (Arhart 1972, Rossbach 1975, Conover 1982, Shirota et al. 1983, Schmidt and Johnson 1984, Mott 1985, Bomford 1990). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

Paintball guns are used as a non-lethal harassment method to disperse birds from areas using physical harassment. Paintballs are most often used to harass waterfowl. Paintballs can be used to produce physically and visually negative-reinforcing stimuli that can aid in the dispersement of birds from areas where damages or threats of damages are occurring.

Bird proof barriers can be effective, but are often cost-prohibitive, particularly because of the aerial mobility of birds which requires overhead barriers as well as peripheral fencing or netting. Exclusion adequate to stop bird movements can also restrict movements of livestock, people and other wildlife (Fuller-Perrine and Tobin 1993).

Overhead wire grids can deter crow use of specific areas where they are causing a nuisance. The birds apparently fear colliding with the wires and thus avoid flying into areas where the method has been employed. Netting can be used to exclude birds from a specific area by the placement of bird proof netting over and around the specific resource to be protected. Exclusion may be impractical in most settings (e.g., commercial agriculture), however it can be practical in small areas (e.g., personal gardens) or for high-value crops (e.g., grapes). Although this alternative would provide short-term relief from damage, it may not completely deter birds from feeding, loafing, staging, or roosting at that site. A few people would find exclusionary devices such as netting unsightly, trashy, and cause a decreased aesthetic value of the neighborhood when used over personal gardens.

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scare crows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective, but usually only for a short period of time before birds become accustomed and learn to ignore them (Arhart 1972, Rossbach 1975, Shirota et al. 1983, Schmidt and Johnson 1984, Mott 1985, Bomford 1990). Williams (1983) reported an approximate 50% reduction in blackbirds at two south Texas feedlots as a result of pyrotechnics and propane cannon use. However, they are often not practical in dairy or feedlot situations because of the disturbance to livestock, although livestock can generally be expected to habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Visual scaring techniques such as use of Mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly give birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, and Tobin et al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Lasers are a non-lethal technique recently evaluated by the NWRC (Glahn and Blackwell 2000, Blackwell et al. 2002). For best results and to disperse numerous birds from a roost, the laser is most effectively used in periods of low light, such as after sunset and before sunrise. In the daytime, the laser can also be used during overcast conditions or in shaded areas to move individual and small numbers of birds, although the effective range of the laser is much diminished. Blackwell et al. (2002) tested lasers on several bird species and observed varied results among species. Lasers were ineffective at dispersing mallards with birds habituating in approximately 5 minutes and 20 minutes, respectively (Blackwell et al. 2002). As with other bird damage management tools lasers are most effective when used as part of an integrated management program.

Live traps (although live traps are non-lethal, birds may be euthanized upon capture). In most situations, live trapped birds are subsequently euthanized. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances; habitats in other areas are generally already occupied; and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS' policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats. Live traps include:

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by McCracken (1972) and Johnson and Glahn (1994). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Nest box traps may be used by WS for corrective damage management and are effective in capturing cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976).

Mist nets are more commonly used for capturing small-sized birds, but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced into the United States in the 1950s from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping pockets in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds and use mortar projectiles to propel a net up and over birds which have been baited to a particular site.

Raptor traps are varied in form and function and includes but is not limited to Bal-chatri, Dho Gaza traps, Phai hoop traps, and Swedish goshawk traps. These traps could be used specifically to live-trap raptors.

Corral traps could be used to live-capture birds, primarily geese and other waterfowl. Corral traps can be effectively used to live capture Canada geese during the annual molt when birds are unable to fly. Each year for a few weeks in the summer, geese are flightless as they are growing new flight feathers. Therefore, geese can be slowly guided into corral-traps.

Funnel traps could be used to live-capture waterfowl. Traps are set up in shallow water and baited. Funnel traps allow waterfowl to enter the trap but prevents the ducks from exiting. Traps would be checked regularly to address live-captured waterfowl. Captured ducks can be relocated or euthanized.

Nest/egg destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas, which may create nuisances or safety issues for home and business owners. Removal of nests is intended to deter birds from nesting in the same area again. Birds generally attempt to re-nest, so the method may need to be conducted repeatedly throughout the nesting season, and over several years. Heusmann and Bellville (1978) reported that nest removal was an effective, but time-consuming, method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Egg Treatment (addling/shaking, puncturing, or oiling) is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos to arrest their development and eliminate hatching. Treated eggs are returned to the nest and the adult bird remains attached to the nest site. Treatment of eggs is typically done where the current number of birds is tolerable, but additional birds would not be.

Treatment of eggs will not reduce the overall problem bird population, but may slow its growth and make adult birds more responsive to harassment (also see *Egg oiling* below).

Lure crops/alternate foods. When damage cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the loss potential. Lure crops are planted or left for consumption by wildlife as an alternative food source. This approach provides relief for critical crops by sacrificing less important or specifically planted fields. Establishing lure crops is sometimes expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area.

Alter aircraft flight patterns. In cases where the presence of birds at airports results in threats to air traveler safety and when such problems cannot be resolved by other means, the alteration of aircraft flight patterns or schedules may be recommended. However, altering operations at airports to decrease the potential for hazards is not feasible unless an emergency situation exists. Otherwise, the expense of interrupted flights and the limitations of existing facilities make this practice prohibitive.

Relocation of damaging birds to other areas following live capture generally would not be effective or cost-effective. Since Starlings, Blackbirds, Rock Pigeons, and most other damaging species are common and numerous throughout Illinois, they are rarely if ever relocated because habitats in other areas are generally already occupied. Relocation of wildlife often involves stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats, or they simply leave the area.

However, there are exceptions to the rule for relocating birds. Relocation of damaging birds might be a viable solution and acceptable to the public when the birds were considered to have high value such as raptors or T/E species. In these cases, WS would consult with the USFWS and IDNR to coordinate capture, transportation, and selection of suitable relocation sites.

Dogs can be effective at harassing birds and keeping them off turf and beaches (Conover and Chasko 1985, Woodruff and Green 1995). Around water, this technique appears most effective when the body of water to be patrolled is ≤ 2 acres in size (Swift 1998). In New York, use of dogs was particularly effective when combined with remote controlled boats to harass geese that had moved into the water to avoid the dogs (Pecor et al. 2007). Although dogs can be effective in keeping birds off individual properties, they do not contribute to a solution for the larger problem of overabundant/anthropogenic abundant bird populations (Castelli and Sleggs 1998). Swift (1998) and numerous individuals in New York have reported that when harassment with dogs ceases, the number of birds usually return to pre-treatment numbers. WS has recommended and encouraged the use of dogs where appropriate.

NON-LETHAL METHODS - CHEMICAL

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, blackbirds, starlings, and house sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding. When a treated particle is consumed, affected birds begin to broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted-use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used

during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is non-accumulative in tissues and rapidly metabolized by many species (Schafer, Jr. 1991).

Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning and during field use only magpies and crows appear to have been affected (Schafer, Jr. 1991). However, a laboratory study by Schafer, Jr. et al. (1974) showed that magpies exposed to two to 3.2 times the published LD_{50} in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. Some hazards may occur to predatory species consuming unabsorbed chemical in the GI tract of affected or dead birds (Schafer, Jr. 1991).

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be a promising repellent for many bird species, including waterfowl. Cummings et al. (1995) found effectiveness of MA declined significantly after 7 days. Belant et al. (1996) found MA ineffective as a bird grazing repellent, even when applied at triple the recommended label rate. MA is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et al. 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[11]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[12]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient.

Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb. with retreating required every 3-4 weeks. Cost of treating turf areas would be similar on a per acre basis. In addition, MA completely degrades in about 3 days when applied to water, which indicates the repellent effect is short-lived.

Another potentially more cost effective method of MA application is by use of a fog-producing machine. The fog drifts over the area to be treated and is irritating to the birds, while being non-irritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment site. Applied at a rate of about 0.25 lb/acre of water surface, the cost is considerably less than when using the turf or water treatment methods.

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or the FDA.

[11] An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

[12] An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles. It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998).

Tactile repellents. A number of tactile repellent products are on the market which reportedly deters birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse. The repellency of tactile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove pigeons, waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981). Alpha-chloralose is typically delivered in a well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS' personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis based on critical element screening; therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer, Jr. 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990), but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Egg oiling is a method for suppressing reproduction of nuisance birds by spraying a small quantity of food grade vegetable oil or mineral oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability (Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not re-nest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

Contraception. Inhibiting reproduction is one way of reducing some bird populations. However, in long-lived species like geese exclusive use of contraceptive methods may take a period of years to reduce local bird populations. Contraceptive methods are likely to be most valuable as a means of maintaining waterfowl populations at desired levels.

The NWRC has been instrumental in the development and registration of a new product, **nicarbazin** (OvoControl-GTM; CAS 330-95-0/4, 4-dinitrocarbanilide (DNC, CAS 587-90-6)/ 2-hydroxy-4,6-dimethylpyrimidine (HDP, CAS 108-79-2) (1:1)), which is an infertility agent for Rock Pigeons in urban areas. Nicarbazin is available to certified pesticide applicators and is not restricted to use by WS. Use of baits containing nicarbazin would allow the numbers of small to moderate sized groups of Rock Pigeons to be controlled by reducing the hatchability of eggs laid by treated birds without requiring the location of each individual nest to be determined (as is the case for egg oiling/addling/destruction).

Nicarbazin is thought to induce infertility in birds by two main mechanisms. Nicarbazin may disrupt the membrane surrounding the egg yolk, resulting in intermixing of egg yolk and white (albumin) components, creating conditions in which the embryo cannot develop. Nicarbazin may also inhibit incorporation of cholesterol into the yolk, a step that is necessary for yolk formation, thereby limiting energy for the developing embryo. If the yolk does not provide enough energy, the embryo will not completely form and the egg will never hatch. Nicarbazin bait must be consumed for several days to achieve blood levels that affect the hatchability of eggs that are forming. Nicarbazin is undetectable in the plasma of mallards and chickens by 4-6 days after consumption of nicarbazin bait has stopped. The levels of active ingredient in the blood are reduced by half within one day after bait consumption stops. If the level of active ingredient falls by approximately one half its peak levels, no effects on egg formation can be seen. By two days after bait consumption has stopped, no effects on the egg being formed are seen. Consequently, the bait must be offered to the birds each day of the nesting period for best impact on reproduction.

In a field study conducted in Oregon (Yoder et al. 2005), use of nicarbazin reduced hatchability of poultry eggs 35.6% ($P = 0.062$). When considering the success of individual nests at sites rather than flocks as a whole, percent hatchability was significantly reduced 50.7% ($P < 0.001$). Under current label guidelines, the cost for nicarbazin (Ovocontrol®) applications exceeds the cost of other control methods (Cooper and Keefe 1997) until the bird population reaches a critical threshold of approximately > 80 birds (Caudell and Shwiff 2006).

Resource Management. Resource management includes a variety of practices that may be used by resource owners to reduce the potential for wildlife damage. Implementation of these practices is appropriate when the potential for damage can be reduced without significantly increasing a resource owner's costs or diminishing his/her ability to manage resources pursuant to goals. Resource management recommendations are made through WS technical assistance efforts.

LETHAL METHODS - MECHANICAL

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Normally shooting is conducted with shotguns, rifles or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. All firearm safety precautions are followed by WS when conducting bird damage management activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their

appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS' employees, who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Sport hunting is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the IDNR and the USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for crow damage management around crops or other resources.

Cervical dislocation is sometimes used to euthanize birds which are captured in live traps. The bird is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as a humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds (Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al. 2001).

Snap traps are modified rat snap traps used to remove individual birds, and other cavity using birds. The trap treadle is baited with peanut butter or other food attractants and attached near the damage area caused by the offending bird. These traps pose no imminent danger to pets or the public, and are usually located in positions inaccessible to people and most non-avian animals. They are very selective because they are usually set in the defended territory of the target birds.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the FIFRA (administered by the EPA). WS' personnel that use restricted-use chemical methods are certified as pesticide applicators by the State of Illinois and are required to adhere to all certification requirements set forth in FIFRA and Illinois pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO_2 is sometimes used to euthanize birds which are captured in live traps. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO_2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the AVMA (Beaver et al. 2001). CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (DeCino et al. 1966, Besser et al. 1967, West et al. 1967). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and dispersing crow roosts in urban/suburban areas (Boyd and Hall 1987). Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to

sensitive species but only slightly toxic to non-sensitive birds, predatory birds, and mammals (Schafer, Jr. 1981, Schafer, Jr. 1991, Johnston et al. 1999). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors (Schafer, Jr. 1981), sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (EPA 1995). Secondary poisoning has not been observed with DRC-1339 treated baits, except crows eating gut contents of pigeons (Kreps 1974). During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1979). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent (Schafer, Jr. 1984, Schafer, Jr. 1991, Johnston et al. 1999). DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (*i.e.*, degradation chemicals) have low toxicity. Although DRC-1339 is highly toxic to aquatic invertebrates (EPA 1995), following labeling requirements eliminates the risks to non-target mussel species. These label requirements include application more than 50 feet from a body of water, observation and pre-baiting to ensure the rapid uptake of treated bait by the target bird species.

Sodium Lauryl Sulfate (SLS) (Stepan Co., Northfield, IL) is a wetting agent for managing European starlings, red-winged, yellow-headed, and Brewer's blackbirds, cowbirds, grackles, American crows, common ravens, feral pigeons, and magpie roosts. SLS is a surfactant commonly used in soap products. Application of SLS and water is through a ground-based sprinkler-head spray system in areas of the target roost where it will be most effective in bird coverage. When applied to birds, SLS allows water to penetrate and saturate the feathers so that with low temperatures (<41^{o}F) and sufficient water, birds die of hypothermia (NWRC 2008). During 2004-2007, WS' NWRC and the WS program in Missouri conducted field tests to investigate the effectiveness of SLS in removing urban blackbird roosts. Results document that SLS caused mortality in starlings and blackbirds and may be useful as part of IWDM programs designed to reduce local blackbird populations. Birds died as soon as 30 minutes after exposure to SLS. In 1996, the EPA exempted 31 minimum-risk pesticides from requirements of FIFRA if the pesticides satisfy certain conditions. In general, conditions claiming that a pesticide should be exempt from registration under FIFRA Section 25(b) are that claims cannot be made regarding control of public-health pests, and the product cannot be used on food or feed crops. SLS (Chemical Abstract Service No. 151-21-3) was included on the list of 31 exempt compounds. WS anticipates using this method in the future, particularly to manage blackbird conflicts and roosts in urban areas.

SLS is a surfactant used as a flea and tick repellant for cats and dogs and commonly used in shampoos and fruit juices. The Food and Drug Administration lists SLS as a food additive and generally recognizes it as safe. Furthermore, the Environmental Protection Agency concluded that SLS should not result in unreasonable adverse effects to human health or the environment (EPA 1993). The Organization for Economic Co-operation and Development report (1997) concluded that, "The human health hazard assessment for SLS shows that at present the substance is of no concern for the general public (consumers) and for workers." SLS is considered a minimum-risk pesticide with the exception that it is moderately toxic to aquatic organisms and possibly harmful to some plants. When applied to birds, SLS allows water to penetrate and saturate the feathers so that with low temperatures (<41 °F) and sufficient

water, birds die of hypothermia. It works by washing oils off the bird feathers. It must be used in upland situations, to keep SLS from entering wetland ecosystems with permanent water bodies. In 1996, the EPA exempted 31 minimum-risk pesticides from requirements of FIFRA if the pesticides satisfy certain conditions. In general, conditions claiming that a pesticide should be exempt from registration under FIFRA Section 25(b) are that claims cannot be made regarding control of public-health pests, and the product cannot be used on food or feed crops. SLS (Chemical Abstract Service No. 151-21-3) was included on the list of 31 exempt compounds.

APPENDIX C

USFWS Listing of Threatened and Endangered Species in Illinois

Summary of Animals listings

Animal species listed in this state and that occur in this state (19 species)	
Status	**Species**
E	Amphipod, Illinois cave Entire (*Gammarus acherondytes*)
E	Bat, grat Entire (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Butterfly, Karner blue Entire (*Lycaeides Melissa samuelis*)
E	Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
E	Dragonfly, Hine's emerald (*Somatochlora hineana*)
E	Fanshell (*Cyprogenia stegaria*)
E	Higgins eye (pearlymussel) Entire (*Lampsilis higginsii*)
E	Mucket, pink (pearlymussel) Entire (*Lampsilis abrupta*)
E	Mussel, sheepnose (*Plethobasus cyphyus*)
E	Mussel, snuffbox (*Epioblasma triquetra*)
E	Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
E	Plover, piping Great Lakes watershed (*Charadrius melodus*)
E	Pocketbook, fat Entire (*Potamilus capax*)
T	Rabbitsfoot (*Quadrula cylindrical cylindrical*)
E	Snail, Iowa Pleistocene Entire (*Discus macclintocki*)
E	Spectaclecase (mussel) (*Cumberlandia monodonta*)
E	Sturgeon, pallid Entire (*Scaphirhynchus albus*)
E	Tern, least interior pop. (*Sterna antillarum*)

Animal species listed in this state that do not occur in this state (13 species)	
Status	**Species**
E	Bean, rayed (*Villosa fabalis*)
E	Beetle, American burying Entire (*Nicrophorus americanus*)
E	Blossom, tubercled (Pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma torulosa torulosa*)
E	Mussel, scaleshell (*Leptodea leptodon*)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
E	Puma (=cougar), eastern Entire (*Puma (=Felis) concolor couguar*)

	Animal species listed in this state that do not occur in this state (13 species)
Status	**Species**
E	Purple Cat's paw (Purple Cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma obliquata obliquata*)
E	Riffleshell, northern Entire (*Epioblasma torulosa rangiana*)
E	Ring pink (mussel) (*Obovaria retusa*)
T	Skipper, Dakota (*Hesperia dacotae*)
T	Snake, copperbelly water Indiana north of 40 degrees north latitude, Michigan, Ohio (*Nerodia erythrogaster neglecta*)
E	Wartyback, white (pearlymussel) (*Plethobasus cicatricosus*)
E	Wolf, gray U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, MA, MD, ME, MO, MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, VA, VT and WV; those portions of AZ, NM, and TX not included in an experimental population; and portions of IA, IN, IL, ND, OH, OR, SD, UT, and WA. Mexico. (*Canis lupus*)

Summary of Plant listings

Plant species listed in this state and that occur in this state (9 species)	
Status	**Species**
T	Aster, decurrent false (*Boltonia decurrens*)
T	Bush-clover, prairie (*Lespedeza leptostachya*)
T	Daisy, Lakeside (*Hymenoxyx herbacea*)
T	Milkweed, Mead's (*Asclepias meadii*)
T	Orchid, eastern prairie fringed (*Plantanthera leucophaea*)
T	Pogonia, small whorled (*Isotria medeoloides*)
T	Potato-bean, Price's (*Apios priceana*)
E	Prairie-clover, leafy (*Dalea foliosa*)
T	Thistle, Pitcher's (*Cirsium pitcher*)

Plant species listed in this state that do not occur in this state (1 species)	
Status	**Species**
E	Clover, running buffalo (*Trifolium stoloneferum*)

Notes:

- This report shows the listed species associated in some way with this state.
- This list does not include experimental populations and similarity of appearance listings.
- This list includes non-nesting sea turtles and whales in State/Territory coastal waters.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.

Obtained from the USFWS website at
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=IL&s8fid=112761032792&s8fid=112762573902
on 10/30/14.

APPENDIX D

STATE AND FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES IN ILLINOIS

E – State Endangered, T – State Threatened, * Federal Threatened, **Federal Endangered, *** Federal Candidate

PLANTS

Moschatel - *Adoxa moschatellina* (E)
Speckled Alder - *Alnus incana subsp. rugosa* (E)
Shadbush - *Amelanchier sanguinea* (E)
Marram Grass - *Ammophila breviligulata* (E)
Smooth False Indigo - *Amorpha nitens* (E)
Bearberry - *Arctostaphylos uva-ursi* (E)
Dragon Wormwood - *Artemisia dracunculus* (E)
Wooly Milkweed - *Asclepias lanuginosa* (E)
Mead's Milkweed - *Asclepias meadii* (E)**
Oval Milkweed - *Asclepias ovalifolia* (E)
Narrow-leaved Green Milkweed - *Asclepias stenophylla* (E)
Bradley's Spleenwort - *Asplenium bradleyi* (E)
Black Spleenwort - *Asplenium resiliens* (E)
Large Ground Plum - *Astragalus crassicarpus var. trichocalyx* (E)
Bent Milk Vetch - *Astragalus distortus* (E)
Tennessee Milk Vetch - *Astragalus tennesseensis* (E)
Yellow Wild Indigo - *Baptisia tinctoria* (E)
Screwstem - *Bartonia paniculata* (E)
American Slough Grass - *Beckmannia syzigachne* (E)
Allegheny Barberry - *Berberis canadensis* (E)
Yellow Birch - *Betula alleghaniensis* (E)
Prairie Moonwort - *Botrychium campestre* (E)
Daisyleaf Grape Fern - *Botrychium matricariifolium* (E)
Northern Grape Fern - *Botrychium multifidum* (E)
Dwarf Grape Fern - *Botrychium simplex* (E)
Blue Grama - *Bouteloua gracilis* (E)
Wooly Buckthorn - *Bumelia lanuginosa* (E)
Bluejoint Grass - *Calamagrostis insperata* (E)
Water Arum - *Calla palustris* (E)
Oklahoma Grass Pink Orchid - *Calopogon oklahomensis* (E)
Grass Pink Orchid - *Calopogon tuberosus* (E)
Wild Hyacinth - *Camassia angusta* (E)
Cuckoo Flower - *Cardamine pratensis var. palustris* (E)
Winged Sedge - *Carex alata* (E)
Arkansas Sedge - *Carex arkansana* (E)
Brownish Sedge - *Carex brunnescens* (E)
Silvery Sedge - *Carex canescens var. disjuncta* (E)
Cordroot Sedge - *Carex chordorrhiza* (E)
Crawford's Sedge - *Carex crawfordii* (E)
Yellow Sedge - *Carex cryptolepis* (E)
Sedge - *Carex cumulata* (E)
Cypress-knee Sedge - *Carex decomposita* (E)
Sedge - *Carex diandra* (E)
Shortleaf Sedge - *Carex disperma* (E)
Sedge - *Carex echinata* (E)
Sedge - *Carex formosa* (E)
Elk Sedge - *Carex garberi* (E)
Large Sedge - *Carex gigantea* (E)
Plains Sedge - *Carex inops subsp. heliophila* (E)
Black-edged Sedge - *Carex nigromarginata* (E)
Few-seeded Sedge - *Carex oligosperma* (E)
Bellow's Beak Sedge - *Carex physorhyncha* (E)
Plaintain-leaved Sedge- *Carex plantaginea* (E)
Reniform Sedge - *Carex reniformis* (E)
Three-seeded Sedge - *Carex trisperma* (E)
Tuckerman's Sedge - *Carex tuckermanii* (E)
Pale Hickory – *Carya pallida* (E)
Downy Yellow Painted Cup - *Castilleja sessiliflora* (E)
Redroot - *Ceanothus herbaceus* (E)
Fairy Wand - *Chamaelirium luteum* (E)
Seaside Spurge - *Chamaesyce polygonifolia* (E)
Spotted Wintergreen - *Chimaphila maculata* (E)
Pipsissewa - *Chimaphila umbellata* (E)
American Bugbane - *Cimicifuga americana* (E)

False Bugbane - *Cimicifuga racemosa* (E)
Small Enchanter's Nightshade - *Circaea alpina*(E)
Yellowwood - *Cladrastis lutea* (E)
Blue Jasmine - *Clematis crispa* (E)
Mountain Clematis - *Clematis occidentalis* (E)
Leatherflower - *Clematis viorna* (E)
Violet Collinsia - *Collinsia violacea* (E)
Sweetfern - *Comptonia peregrina* (E)
Hemlock Parsley - *Conioselinum chinense* (E)
Bunchberry - *Cornus canadensis* (E)
Golden Corydalis - *Corydalis aurea* (E)
Hale's Corydalis - *Corydalis halei* (E)
Pink Corydalis - *Corydalis sempervirens* (E)
Beaked Hazelnut - *Corylus cornuta* (E)
Cynosciadium - *Cynosciadium digitatum* (E)
Moccasin Flower - *Cypripedium acaule* (E)
Small Yellow Lady's Slipper - *Cypripedium parviflorum var. makasin* (E)
Showy Lady's Slipper - *Cypripedium reginae* (E)
Laurentian Fragile Fern - *Cystopteris laurentiana* (E)
Leafy Prairie Clover - *Dalea foliosa* (E)**
Hay-scented Fern - *Dennstaedtia punctilobula* (E)
Hairgrass - *Deschampsia flexuosa* (E)
Northern Panic Grass - *Dichanthelium boreale* (E)
Panic Grass - *Dichanthelium joorii* (E)
Hemlock Panic Grass - *Dichanthelium portoricense* (E)
Ravenel's Panic Grass - *Dichanthelium ravenelii* (E)
Panic Grass - *Dichanthelium yadkinense* (E)
Whitlow Grass - *Draba cuneifolia* (E)
Round-leaved Sundew - *Drosera rotundifolia* (E)
Log Fern - *Dryopteris celsa* (E)
Small Burhead - *Echinodorus tenellus* (E)
Capitate Spikerush - *Eleocharis olivacea* (E)
Few-flowered Spikerush - *Eleocharis pauciflora* (E)
Dwarf Scouring Rush - *Equisetum scirpoides* (E)
Woodland Horsetail - *Equisetum sylvaticum* (E)
Rusty Cotton Grass - *Eriophorum virginicum* (E)
Eryngo - *Eryngium prostratum* (E)
American Strawberry Bush - *Euonymus americanus* (E)
Hyssop-leaved Thoroughwort - *Eupatorium hyssopifolium* (E)
Spurge - *Euphorbia spathulata* (E)
Queen-of-the- Prairie - *Filipendula rubra* (E)
Vahl's Fimbristylis - *Fimbristylis vahlii* (E)
Boykin's Dioclea - *Galactia mohlenbrockii* (E)
Wild Licorice - *Galium lanceolatum* (E)
Dwarf Bedstraw - *Galium virgatum* (E)
Northern Cranesbill - *Geranium bicknellii* (E)
Arkansas Manna Grass - *Glyceria arkansana* (E)
Hedge Hyssop- *Gratiola quartermaniae* (E)
Oak Fern - *Gymnocarpium dryopteris* (E)
Scented Oak Fern - *Gymnocarpium robertianum* (E)
Stickseed - *Hackelia deflexa var. americana* (E)
Silverbell Tree - *Halesia carolina* (E)
Tall Sunflower - *Helianthus giganteus* (E)
Slender Heliotrope - *Heliotropium tenellum* (E)
Mud Plantain - *Heteranthera reniformis* (E)
Crested Coralroot Orchid - *Hexalectris spicata* (E)
False Heather - *Hudsonia tomentosa* (E)
One-flowered Hydrolea - *Hydrolea uniflora* (E)
Shore St. John's Wort - *Hypericum adpressum* (E)
Kalm's St. John's Wort - *Hypericum kalmianum* (E)
Kankakee Mallow - *Iliamna remota* (E)
Bloodleaf - *Iresine rhizomatosa* (E)
Butler's Quillwort - *Isoetes butleri* (E)
Whorled Pogonia - *Isotria verticillata* (E)
Vasey's Rush - *Juncus vaseyi* (E)
Trailing Juniper - *Juniperus horizontalis* (E)
Water Willow - *Justicia ovata* (E)
Prairie Bush Clover - *Lespedeza leptostachya* (E)*
Silvery Bladderpod - *Lesquerella ludoviciana* (E)
Red Honeysuckle - *Lonicera dioica var. glaucescens* (E)
Yellow Honeysuckle - *Lonicera flava* (E)
Hairy Woodrush - *Luzula acuminata* (E)
Bog Clubmoss - *Lycopodiella inundata* (E)
Running Pine - *Lycopodium clavatum* (E)
Ground Pine - *Lycopodium dendroideum* (E)
Creeping Loosestrife - *Lysimachia radicans* (E)

Narrow-leaved Crabapple - *Malus angustifolia* (E)
False Mallow - *Malvastrum hispidum* (E)
Climbing Milkweed - *Matelea decipiens* (E)
Indian Cucumber Root - *Medeola virginiana* (E)
Water Marigold - *Megalodonta beckii* (E)
White Melanthera - *Melanthera nivea* (E)
Two-Flowered Melic Grass - *Melica mutica* (E)
Yellow Monkey Flower - *Mimulus glabratus* (E)
Hairy Umbrella-wort - *Mirabilis hirsuta* (E)
Baby Blue-eyes - *Nemophila triloba* (E)
Prairie Dandelion - *Nothocalais cuspidata* (E)
Fragile Prickly Pear - *Opuntia fragilis* (E)
Clustered Broomrape - *Orobanche fasciculata* (E)
Illinois Wood Sorrel - *Oxalis illinoensis* (E)
Bead Grass - *Paspalum dissectum* (E)
Short-sepaled Beard Tongue - *Penstemon brevisepalus* (E)
Large-flowered Beard Tongue - *Penstemon grandiflorus* (E)
Tube Beards Tongue - *Penstemon tubaeflorus* (E)
Ozark Phacelia - *Phacelia gilioides* (E)
Long Beech Fern - *Phegopteris connectilis* (E)
Sangamon Phlox - *Phlox pilosa subsp. sangamonensis* (E)
Jack Pine - *Pinus banksiana* (E)
Shortleaf Pine - *Pinus echinata* (E)
Red Pine - *Pinus resinosa* (E)
Heart-leaved Plantain - *Plantago cordata* (E)
Orange Fringed Orchid - *Platanthera ciliaris* (E)
Wood Orchid - *Platanthera clavellata* (E)
Tubercled Orchid - *Platanthera flava var. flava* (E)
Eastern Prairie Fringed Orchid - *Platanthera leucophaea* (E)*****
Purple Fringed Orchid - *Platanthera psycodes* (E)
Grove Bluegrass - *Poa alsodes* (E)
Weak Bluegrass - *Poa languida* (E)
Wolf's Bluegrass - *Poa wolfii* (E)
Snake-mouth - *Pogonia ophioglossoides* (E)
James' Clammyweed - *Polanisia jamesii* (E)
Pink Milkwort - *Polygala incarnata* (E)
Downy Solomon's Seal - *Polygonatum pubescens* (E)
Halbred-leaved Tearthumb - *Polygonum arifolium* (E)
Carey's Heartsease - *Polygonum careyi* (E)
Balsam Poplar - *Populus balsamifera* (E)
White-stemmed Pondweed - *Potamogeton praelongus* (E)
Spotted Pondweed - *Potamogeton pulcher* (E)
Fern Pondweed - *Potamogeton robbinsii* (E)
Stiff Pondweed - *Potamogeton strictifolius* (E)
Bird's-eye Primrose - *Primula mistassinica* (E)
Mock Bishop's Weed - *Ptilimnium nuttallii* (E)
Nuttall's Oak - *Quercus texana* (E)
Alder Buckthorn - *Rhamnus alnifolia* (E)
Dull Meadow Beauty - *Rhexia mariana* (E)
Clustered Beak Rush - *Rhynchospora glomerata* (E)
Northern Gooseberry - *Ribes hirtellum* (E)
Bristly Rose - *Rosa acicularis* (E)
Purple-flowering Raspberry - *Rubus odoratus* (E)
Prairie Rose Gentian - *Sabatia campestris* (E)
Arrowhead - *Sagittaria australis* (E)
Autumn Willow - *Salix serissima* (E)
Dune Willow - *Salix syrticola* (E)
Red-berried Elder - *Sambucus racemosa subsp. pubens* (E)
American Burnet - *Sanguisorba canadensis* (E)
Southern Sanicula - *Sanicula smallii* (E)
Pitcher Plant - *Sarracenia purpurea* (E)
Early Saxifrage - *Saxifraga virginiensis* (E)
False Melic Grass - *Schizachne purpurascens* (E)
Weak Bulrush - *Schoenoplectus purshianus* (E)
Smith's Bulrush - *Schoenoplectus smithii* (E)
Bulrush - *Scirpus hattorianus* (E)
Bulrush - *Scirpus microcarpus* (E)
Muhlenberg's Nut Rush - *Scleria muhlenbergii* (E)
Carolina Whipgrass - *Scleria pauciflora* (E)
Buffaloberry - *Shepherdia canadensis* (E)
Ovate Catchfly - *Silene ovata* (E)
Royal Catchfly - *Silene regia* (E)
Mountain Blue-eyed Grass - *Sisyrinchium montanum* (E)
American Mountain Ash - *Sorbus americana* (E)
American Burreed - *Sparganium americanum* (E)
Green-fruited Burreed - *Sparganium emersum* (E)
Yellow-lipped Ladies' Tresses - *Spiranthes lucida* (E)

Spring Ladies' Tresses - *Spiranthes vernalis* (E)
Great Chickweed - *Stellaria pubera* (E)
Grass-leaved Lily - *Stenanthium gramineum* (E)
Patterson's Bindweed - *Stylisma pickeringii* (E)
Bigleaf Snowbell Bush - *Styrax grandifolius* (E)
Snowberry - *Symphoricarpos albus var. albus* (E)
Hairy Synandra - *Synandra hispidula* (E)
Fameflower - *Talinum calycinum* (E)
Lakeside Daisy - *Tetraneuris herbacea** (E)
New York Fern - *Thelypteris noveboracensis* (E)
White Basswood - *Tilia heterophylla* (E)
Pole Manna-grass - *Torreyochloa pallida* (E)
Filmy Fern - *Trichomanes boschianum* (E)
Tufted Bulrush - *Trichophorum cespitosum* (E)
Star-flower - *Trientalis borealis* (E)
Nodding Trillium - *Trillium cernuum* (E)
Ill-scented Trillium - *Trillium erectum* (E)
Green Trillium - *Trillium viride* (E)
Rock Elm - *Ulmus thomasii* (E)
Horned Bladderwort - *Utricularia cornuta* (E)
Small Bladderwort - *Utricularia minor* (E)
Highbush Blueberry - *Vaccinium corymbosum* (E)
Large Cranberry - *Vaccinium macrocarpon* (E)
Small Cranberry - *Vaccinium oxycoccos* (E)
Deerberry - *Vaccinium stamineum* (E)
Marsh Valerian - *Valeriana uliginosa* (E)
Corn Salad - *Valerianella chenopodifolia* (E)
Corn Salad - *Valerianella umbilicata* (E)
American Brooklime - *Veronica americana* (E)
Hairy White Violet - *Viola blanda* (E)
Canada Violet - *Viola canadensis* (E)
Primrose Violet - *Viola primulifolia* (E)
Rusty Woodsia - *Woodsia ilvensis* (E)
White Camass - *Zigadenus elegans* (E)
Pale False Foxglove - *Agalinis skinneriana* (T)
Shadbush - *Amelanchier interior* (T)
Forked Aster - *Aster furcatus* (T)
Supple-Jack- *Berchemia scandens* (T)
Kitten Tails - *Besseya bullii* (T)
Decurrent False Aster - *Boltonia decurrens* (T)*
Southern Grape Fern - *Botrychium biternatum* (T)
Bluehearts- *Buchnera americana* (T)
Sea Rocket - *Cakile edentula* (T)
Sedge - *Carex atlantica* (T)
Golden Sedge - *Carex aurea* (T)
Sedge - *Carex bromoides* (T)
Fibrous-rooted Sedge - *Carex communis* (T)
Swollen Sedge - *Carex intumescens* (T)
Sharp-scaled Sedge - *Carex oxylepis* (T)
Drooping Sedge - *Carex prasina* (T)
Little Green Sedge - *Carex viridula* (T)
Willdenow's Sedge - *Carex willdenowii* (T)
Pretty Sedge - *Carex woodii* (T)
Water Hickory - *Carya aquatica* (T)
Leatherleaf - *Chamaedaphne calyculata* (T)
Black Cohosh - *Cimicifuga rubifolia* (T)
Pitcher's (Dune) Thistle - *Cirsium pitcheri**
Spotted Coral-root Orchid - *Corallorhiza maculata* (T)
Umbrella Sedge - *Cyperus grayioides* (T)
Galingale- *Cyperus lancastriensis* (T)
White Lady's Slipper - *Cypripedium candidum* (T)
Wild Blue Larkspur- *Delphinium carolinianum* (T)
French's Shootingstar - *Dodecatheon frenchii* (T)
Narrow-leaved Sundew - *Drosera intermedia* (T)
Beaked Spike Rush - *Eleocharis rostellata* (T)
Bearded Wheat Grass - *Elymus trachycaulus* (T)
Downy Willow Herb - *Epilobium strictum* (T)
Meadow Horsetail - *Equisetum pratense* (T)
Narrow-leaved Sunflower - *Helianthus angustifolius* (T)
Cliff Clubmoss - *Huperzia porophila* (T)
Old Plainsman - *Hymenopappus scabiosaeus* (T)
Richardson's Rush- *Juncus alpinus* (T)
Ground Juniper - *Juniperus communis* (T)
Tamarack - *Larix laricina* (T)
Pale Vetchling - *Lathyrus ochroleucus* (T)
Pinweed - *Lechea intermedia* (T)
Blazing Star - *Liatris scariosa* var. *nieuwlandii* (T)
Climbing Milkweed - *Matelea obliqua* (T)
Bunchflower - *Melanthium virginicum* (T)
Squirting Cucumber - *Melothria pendula* (T)
Buckbean - *Menyanthes trifoliata* (T)
Slender Sandwort - *Minuartia patula* (T)
Small Sundrops - *Oenothera perennis* (T)
Broomrape - *Orobanche ludoviciana* (T)
Lea's Bog Lichen- *Phaeophyscia leana* (T)
Water Elm - *Planera aquatica* (T)
Tubercled Orchid - *Platanthera flava* var. *herbiola* (T)

Grass-leaved Pondweed - *Potamogeton gramineus* (T)
Rock Chestnut Oak - *Quercus montana* (T)
Willow Oak - *Quercus phellos* (T)
Prairie Buttercup - *Ranunculus rhomboideus* (T)
Beaked Rush - *Rhynchospora alba* (T)
Dwarf Raspberry - *Rubus pubescens* (T)
Bristly Blackberry - *Rubus schneideri* (T)
Missouri Orange Coneflower - *Rudbeckia missouriensis* (T)
Blue Sage - *Salvia azurea* subsp. *pitcheri* (T)
Hall's Bulrush - *Schoenoplectus hallii* (T)
Bulrush - *Scirpus polyphyllus* (T)
American Orpine - *Sedum telephioides* (T)
Eastern Blue-eyed Grass - *Sisyrinchium atlanticum* (T)
Cliff Goldenrod - *Solidago sciaphila* (T)
Storax - *Styrax americana* (T)
Sullivantia - *Sullivantia sullivantii* (T)
Small Flower-of-an-hour - *Talinum parviflorum* (T)
False Asphodel - *Tofieldia glutinosa* (T)
Ear-leafed Foxglove - *Tomanthera auriculata* (T)
Prairie Spiderwort - *Tradescantia bracteata* (T)
Buffalo Clover - *Trifolium reflexum* (T)
Common Bog Arrowgrass - *Triglochin maritima* (T)
Slender Bog Arrowgrass - *Triglochin palustris* (T)
Flat-leaved Bladderwort - *Urtica chamaedryoides* (T)
Nettle - *Utricularia intermedia* (T)
Marsh Speedwell - *Veronica scutellata* (T)
Arrowwood - *Viburnum molle* (T)
Dog Violet - *Viola conspersa* (T)

FISH

Lake Sturgeon - *Acipenser fulvescens* (E)
Western Sand Darter - *Ammocrypta clarum* (E)
Bluebreast Darter - *Etheostoma camurum* (E)
Harlequin Darter - *Etheostoma histrio* (E)
Cypress Minnow - *Hybognathus hayi* (E)
Bigeye Chub - *Hybopsis amblops* (E)
Pallid Shiner - *Hybopsis amnis* (E)
Northern Brook Lamprey - *Ichthyomyzon fossor* (E)
Redspotted Sunfish – *Lepomis miniats* (E)
Sturgeon Chub - *Macrhybopsis gelida* (E)
Greater Redhorse - *Moxostoma valenciennesi* (E)
River Chub - *Nocomis micropogon* (E)
Pugnose Shiner - *Notropis anogenus* (E)
Bigeye Shiner - *Notropis boops* (E)
Blacknose Shiner - *Notropis heterolepis* (E)
Taillight Shiner - *Notropis maculatus* (E)
Weed Shiner - *Notropis texanus* (E)
Northern Madtom - *Noturus stigmosus* (E)
Pallid Sturgeon - *Scaphirhynchus albus* (E)**
Eastern Sand Darter - *Ammocrypta pellucidum* (T)
Longnose Sucker *Catostomus catostomus* (T)
Cisco - *Coregonus artedi* (T)
Gravel Chub - *Erimystax x-punctatus* (T)
Iowa Darter - *Etheostoma exile* (T)
Banded Killifish - *Fundulus diaphanous* (T)
Starhead Topminnow - *Fundulus dispar* (T)
Least Brook Lamprey - *Lampetra aepyptera* (T)
Bantam Sunfish - *Lepomis symmetricus* (T)
River Redhorse - *Moxostoma carinatum* (T)
Ironcolor Shiner - *Notropis chalybaeus* (T)
Blackchin Shiner - *Notropis heterodon* (T)

AMPHIBIANS

Silvery Salamander - *Ambystoma platineum* (E)
Hellbender - *Cryptobranchus alleganiensis* (E)
Spotted Dusky Salamander - *Desmognathus conanti* (E)
Jefferson Salamander - *Ambystoma jeffersonianum* (T)
Eastern Narrowmouth Toad - *Gastrophryne carolinesnsis* (T)
Four-toed Salamander - *Hemidactylium scutatum* (T)
Bird-voiced Treefrog - *Hyla avivoca* (T)
Illinois Chorus Frog - *Pseudacris streckeri* (T)
Mudpuppy – *Necturus maculosus* (T)

REPTILES

Smooth Softshell – *Apalone mutica* (E)
Spotted Turtle - *Clemmys guttata* (E)
Great Plains Ratsnake - *Elaphe emoryi* (E)
Illinois Mud Turtle - *Kinosternon flavescens* (E)
Alligator Snapping Turtle - *Macrochelys temminckii* (E)
Coachwhip - *Masticophis flagellum* (E)
Broad-banded Watersnake - *Nerodia fasciata* (E)

River Cooter - *Pseudemys concinna* (E)
Eastern Massasauga - *Sistrurus catenatus* (E)***
Yellow Mud Turtle - Kinosternon flavescens (E)
Kirtland's Snake - *Clonophis kirtlandi* (T)
Timber Rattlesnake - *Crotalus horridus* (T)
Blanding's Turtle - *Emydoidea blandingii* (T)
Western Hognose Snake - *Heterodon nasicus* (T)
Mississippi Green Watersnake - *Nerodia cyclopion* (T)
Flathead Snake - *Tantilla gracilis* (T)
Eastern Ribbon Snake - *Thamnophis sauritus* (T)
Lined Snake - *Tropidoclonion lineatum* (T)

BIRDS

Short-eared Owl - *Asio flammeus* (E)
Upland Sandpiper - *Bartramia longicauda* (E)
American Bittern - *Botaurus lentiginosus* (E)
Swainson's Hawk - *Buteo swainsoni* (E)
Piping Plover - *Charadrius melodus* (E)**
Black Tern - *Chlidonias niger* (E)
Northern Harrier - *Circus cyaneus* (E)
Little Blue Heron - *Egretta caerulea* (E)
Snowy Egret - *Egretta thula* (E)
Common Moorhen - *Gallinula chloropus* (E)
Loggerhead Shrike - *Lanius ludovicianus* (E)
Black Rail - *Laterallus jamaicensis* (E)
Swainson's Warbler - *Limnothlypis swainsonii* (E)
Yellow-crowned Night-heron - *Nyctanassa violacea* (E)
Black-crowned Night-heron - *Nycticorax nycticorax* (E)
Osprey - *Pandion haliaetus* (E)
Wilson's Phalarope - *Phalaropus tricolor* (E)
King Rail - *Rallus elegans* (E)
Least Tern - *Sterna antillarum* (E)**
Forster's Tern - *Sterna forsteri* (E)
Common Tern - *Sterna hirundo* (E)
Bewick's Wren - *Thryomanes bewickii* (E)
Greater Prairie Chicken - *Tympanuchus cupido* (E)
Barn Owl - *Tyto alba* (E)
Hydrobiid Cave Snail - *Fontigens antroecetes* (E)
Ebonyshell - *Fusconaia ebena* (T)
Illinois Cave Amphipod - *Gammarus acherondytes* (E)**
Yellow-headed Blackbird - *Xanthocephalus xanthocephalus* (E)
Black-billed Cuckoo - *Coccyzus erythropthalmus* (T)
Cerulean Warbler - *Dendroica cerulea* (T)
Peregrine Falcon - *Falco peregrinus* (T)
Mississippi Kite – *Ictinia mississippiensis* (T)
Least Bittern - *Ixobrychus exilis* (T)

MAMMALS
Rafinesque's Big-eared Bat - *Corynorhinus rafinesquii* (E)
Southeastern Myotis - *Myotis austroriparius* (E)
Gray Bat - *Myotis grisescens* (E)**
Indiana Bat - *Myotis sodalis* (E)**
Eastern Woodrat - *Neotoma floridana* (E)
Gray/Timber Wolf - *Canis lupus* (T)
Golden Mouse - *Ochrotomys nuttalli* (T)
Rice Rat - *Oryzomys palustris* (T)
Franklin's Ground Squirrel - *Spermophilus franklinii* (T)

INVERTEBRATES

Redveined Prairie Leafhopper - *Aflexia rubranura* (T)
Slippershell - *Alasmidonta viridis* (T)
Arogos Skipper - *Atrytone arogos* (E)
Isopod - *Caecidotea lesliei* (E)
Isopod - *Caecidotea spatulata* (E)
Swamp Metalmark - *Calephelis muticum* (E)
Anomalous Spring Amphipod - *Crangonyx anomalus* (E)
Packard's Cave Amphipod - *Crangonyx packardi* (E)
Spectaclecase - *Cumberlandia monodonta* (E)
Purple Wartyback - *Cyclonaias tuberculata* (T)
Fanshell - *Cyprogenia stegaria* (E)**
Iowa Pleistocene Snail - *Discus macclintocki* (E)**
Butterfly - *Ellipsaria lineolata* (T)
Elephant-ear - *Elliptio crassidens* (T)
Spike - *Elliptio dilatata* (T)
Snuffbox - *Epioblasma triquetra* (E)

Cobweb Skipper - *Hesperia metea* (T)
Ottoe Skipper - *Hesperia ottoe* (E)
Hoary Elfin - *Incisalia polios* (E)
Pink Mucket - *Lampsilis abrupta* (E)**

Wavy-rayed Lampmussel - *Lampsilis fasciola* (E)
Higgins Eye - *Lampsilis higginsii* (E)**

INVERTEBRATES – cont.

Black Sandshell - *Ligumia recta* (T)
Karner Blue Butterfly - *Lycaeides melissa samuelis* (E)**
Elfin Skimmer - *Nannothemis bella* (T)
Indiana Crayfish - *Orconectes indianensis* (E)
Kentucky Crayfish - *Orconectes kentuckiensis* (E)
Shrimp Crayfish - *Orconectes lancifer* (E)
Bigclaw Crayfish - *Orconectes placidus* (E)
Eryngium Stem Borer - *Papaipema eryngii* (E)
Leafhopper - *Paraphlepsius lupalus* (E)
Orangefoot Pimpleback - *Plethobasus cooperianus* (E)**
Sheepnose - *Plethobasus cyphyus* (E)
Clubshell - *Pleurobema clava* (E)**
Ohio Pigtoe - *Pleurobema cordatum* (E)
Fat Pocketbook - *Potamilus capax* (E)**
Kidneyshell - *Ptychobranchus fasciolaris* (E)
Rabbitsfoot - *Quadrula cylindrica* (E)
Salamander Mussel - *Simpsonaias ambigua* (E)
Hine's Emerald Dragonfly - *Somatochlora hineana* (E)**
Regal Fritillary - *Speyeria idalia* (T)
Iowa Amphipod - *Stygobromus iowae* (E)
Purple Lilliput - *Toxolasma lividus* (E)
Rainbow - *Villosa iris* (E)
Little Spectaclecase - *Villosa lienosa* (T)
Shawnee Rocksnail - *Lithasia obovata* (E)
Northern Riffleshell- *Epioblasma rangiana* (E)**
Common Striped Scorpion- *Centruroides vittatus* (E)
Madonna Cave Springtail- *Pygrarrhopalites madonnensis* (E)
Robust Springfly- *Diploperla robusta* (E)
Central Forestfly- *Prostoia completa* (E)
Leafhopper- Athysanella incongrua (E)

Source: Illinois. Endandered Species Protection Board, One Natural Resources Way, Springfield, IL 62702

APPENDIX E

ILLINOIS WILDLIFE SPECIES OF GREATEST CONSERVATION NEED (December 2014)

INVERTEBRATES

Spindle Lymnaea – *Acella haldemani*
Slippershell Mussel – *Alasmidonta viridis*
Rock Pocketbook – *Arcidens confragosus*
Midland Slitsnail – *Cincinnatia inetgra*
Purple Wartyback – *Cyclonaias tuberculata*
Fanshell Mussel – *Cyprogenia stegaria*
Spectacle Case Mussel – *Cumberlandia monodonta*
Low a Pleistocene Snail – *Discus macclintocki*
Butterfly – *Ellipsaria lineolata*
Elephant-ear Mussel – *Elliptio crassidens*
Spike – *Elliptio dilatata*
Snuffbox Mussel – *Epioblasma triquetra*
Carinate Pillsnail – *Euchemotrema hubrichti*
Hoosier Amnicola – *Fontigens aldrichi*
Hydrobiid Cavesnail – *Fontigens antroecetes*
Ebonyshell – *Fusconaia ebena*
Snaggletooth Snail – *Gastrocopta rogersensis*
Pink Mucket – *Lamsilis abrupta*
Wavy-rayed Lampmussel – *Lampsilis fasciola*
Higgins Eye – *Lampsilis higginsii*
Creek Heelspliter – *Lasmigona compressa*
Fluted Shell – *Lasmigona costata*
Black Sandshell – *Ligumia recta*
Armored Rocksnail – *Lithasia armigera*
Shawnee Rocksnail – *Lithasia obovata*
Varicose Rocksnail – *Lithasia verrucosa*
Ozark Mantleslug – *Megapallifera ragsdalei*
Sampson Sprite – *Micromenetus sampsoni*
Louisiana Ambersnail – *Oxyloma salleanum*
Domed Supercoil – *Paravitrea significans*
Orange-foot Pimpleback – *Plethobasus cooperianus*
Sheepnose Mussel – *Plethobasus cyphyus*
Clubshell – *Pleurobema clava*
Ohio Pigtoe – *Pleurobema cordatum*
Rugged Hornsnail – *Pleurocera alveare*
Fat Pocketbook Pearly Mussel – *Potamilus capax*
Kidneyshell Mussel – *Ptychobranchus fasciolaris*
Moss Pyrg – *Pyrgulopsis scalariformis*
Rabbitsfoot Mussel – *Quadrula cylindrical*
Monkeyface – *Quadrula metanerva*
Salamander Mussel – *Simpsonaias ambigua*
Sandbar Pebblesnail – *Somatogyrus depressus*
Coldwater Pondsnail – *Stagnicola woodruffi*
Eightfold Pinecone – *Strobilops affinis*
Spotted Ambersmail – *Succinea forsheyi*
Rivercliff Threetooth – *Triodopsis discoidea*
Baffled Three-tooth – *Triodopsis fradulenta*
Purple Lilliput Mussel – *Toxolasma lividus*
Purplecap Valvata – *Valvata perdepressa*
Multirib Vallonia – *Vallonia gracilicosa*
Ellipse – *Venustaconcha ellipsiformis*
Rainbow Mussel – *Villosa iris*
Little Spectacle Case Mussel – *Villosa lienosa*
Rotund Mysterysnail – *Viviparus intertextus*
Olive Mysterysnail – *Viviparus subpurpureus*
Sharp Wedge – *Xolotrema obstrictum*
Dull Gloss – *Zonitoides limatulus*

CRUSTACEANS

Short-tail Bactrurid – *Bactrurus brachycaudus*
Crayfish – *Cambarus laevis*
A Cave Obligate Isopod – *Caecidotea beattyi*
A Cave Obligate Isopod – *Caecidotea bicrenata*
Isopod – *Caecidotea lesliei*
A Cave Obligate Isopod – *Caecidotea packardi*
A Cave Obligate Isopod – *Caecidotea spatulata*
Subterranean Isopod – *Caecidotea tridentata*
Anomolous Spring Amphipod – *Crangonyx anomalus*
Amphipod – *Crangonyx packardi*
A Cave Obligate Copepod – *Diacyclops clandestinus*
Illinois Cave Amphipod – *Gammarus acherondytes*
Bousfield's Amphipod – *Gammarus bousfieldi*
Illinois Crayfish – *Orconectes illinoisensis*
Indiana Crayfish – *Orconectes indianesis*
Kentucky Crayfish – *Orconectes kentuckiensis*
Shrimp Crayfish – *Orconectes lancifer*
Bigclaw Crayfish – *Orconectes placidus*
Crayfish – *Orconected stannardi*
Low A Amphipod – *Stygobromus iowae*
Subtle Cave Amphipod – *Stygobromus subtilis*

INSECTS

Well-marked Cutworm – *Abargrotis orbis*
Pecatonica River Mayfly – *Acanthametropus pecatonica*
Acontia lactipennis
Acrolepiopsis leucoscia
Triton Dagger Moth – *Acronicta tritona*
Spatterdock Darner – *Aeshna mutate*
Redveined Prairie Leafhopper – *Aflexia rubranura*
Agonopterix hyperella
Agonopterix lythrella
Spotted Dart Moth – *Agrotis stigmosa*
Illinois Snowfly – *Allocapnia illinoensis*
Ambesa laetella
Lace-winged Roadeside-skipper – *Amblyscirtes aesculapius*
Carolina Roadside-skipper – *Amblyscirtes carolina*
Linda's Roadside-skipper – *Amblyscirtes linda*
Revered Roadside-skipper – *Amblyscirtes reversa*
Ancylis semiovana
Apainea lutosa
Apamea (Agroperina) lutosa
Apamea (Crymodes) relicina
Apamea alia
Apamea impulsa
Apamea indocilis
Apamea lignicolora
Apamea plutonia
Apodrepanulatrix liberaria
Archanara laeta
Archanara subflava
Aristotelia elegantella
Arphia pseudonietana
Atascosa glareosella
Aterpia approximana
Arogos Skipper – *Atrytone arogos*
Dusted Skipper – *Atrytonopsis hianna*
Attenuipyga vanduzeei
Auridius helvus
Bagisara gulnare
Silver-bordered Fritillary - *Boloria selene myrina*
Southern Plaines Bumblebee – *Bombus fraternus*
Bruchomorpha extensa
Bruchomorpha occulata
Northern Metalmark – *Calephelis borealis*
Swamp Metalmark – *Calephelis muticum*
Frosted Elfin – *Callophrys irus*
Hoary Elfin - *Callophrys polios*
Canadian Owlet Moth - *Calyptra canadensis*
Camelobaetidius waltzi
Curved Halter Moth - *Capis curvata*
Reed-boring Crambid Moth - *Carectocultus perstrialis*
Carmenta anthrasipennis
Abbreviated Underwing - *Catocala abbreviatella*
Three-staff Underwing - *Catocala amestris*
Sweetfern Underwing - *Catocala antinympha*
Brou's Underwing - *Catocala atocala*
Quiet Underwing – *Catocala dulciola*
Graceful Underwing - *Catocala gracilis*
Marbled Underwing – *Catocala marmorata*
Praeclara Underwing - *Catocala praeclara*
White Underwing - *Catocala relicta*
Similar Underwing - *Catocala similis*
Sordid Underwing - *Catocala sordida*
Whitney's Underwing – *Catocala whitneyi*
Centroptilum walshi
Chlorotettix dentatus
Chlorotettix fumidus
Chlorotettix limosus
Gorgone Checkerspot - *Chlosyne gorgone Carlota*
Harris's Checkerspot - *Chlosyne harrisii*
Narrow-winged Borer - *Chortodes (Hypocoena) defecta*
Chortodes (Hypocoena) enervate
Tufted Sedge Moth - *Chortodes (Hypocoena) inquinata*
Leafhopper – *Cicaudula cyperacea*
Leafhopper – *Cicaudula straminea*
Appalachian Tiger Beetle – *Cicindela ancocisconensis*
Cloeon cognatum
Commellus colon
Cosmotettix beirni
Cosmotettix bilineatus
Cosmotettix delector
Cosmotettix luteocephalus
Crambus girardellus
Crambus murellus
Crambus watsonellus
Cryptocala acadiensis
Cyclophora pendulinaria
Deltocephalus gnarus

Derrima stellate
Destria fumida
Diapheromera velii
Diceroprocta vitripennis
Variegated false water penny beetle – *Dicranopselaphus*
Digrammia ordinate
Chalcedony midget moth – *Elaphria chalcedonia*
Creole pearly-eye – *Enodia creola*
Epipaschiinae
Broad-lined erastria moth – *Erastria coloraria*
Eromobina jocasta
Velvet-striped grasshopper – *Eritettix simplex*
Dreamy duskywing – *Erynnis icelus*
Columbine duskywing – *Erynnis lucilius*
Mottled duskywing – *Erynnis martialis*
Persius duskywing – *Erynnis persius*
Looper moth – *Euchlaena milnei*
Olympia marble – *Euchloe olympia*
Fringed dart moth – *Eucoptocnemis fimbriaris*
Eucosma bipunctella
Eucosma fulminana
Eucosma n.s.
Eucosma palbundana
Eucosma pandana
Eucosma rusticana
Eucosma sombreana
Two-spotted skipper – *Euphyes bimacula*
Dion skipper – *Euphyes dion*
Duke's skipper – *Euphyes dukesi*
Euphyes niveilinea
Euscelis sahlbergi
Euxoa albipennis
Dune cutworm – *Euxoa aurulenta*
Mixed dart moth – *Euxoa immixta*
Euxoa manitobana
White cutworm moth – *Euxoa scandens*
Spirea leaftier – *Evora hemidesma*
Marsh fern moth – *Fagitana littera*
Robertson's planthopper – *Fitchiella robertsoni*
Leafhopper – *Flexamia abbreviate*
Leafhopper – *Flexamia albida*
Leafhopper – *Flexamia areolata*
Leafhopper – *Flexamia atlantica*
Leafhopper – *Flexamia grammica*
Leafhopper – *Flexamia pyrops*
Wet sand savannah moth – *Babara subnivosella*
Silvery blue – *Glaucopsyche lygdamus*
Skillet clubtail – *Gomphus ventricosus*
Leafhopper – *Graminella oquaka*
Three-lined grapholita moth – *Grapholita tristrigana*
Prairie mole cricket – *Gryllotalpa major*
Capsule moth – *Hadena capsularis*
Hadena ectypa
Hebecephalus signatifrons
Slender clearwing – *Hemaris gracilis*
Buck moth – *Hemileuca maia*
Nevada buck moth – *Hemileuca nevadensis*
Mayfly – *Heptahenia patoka*
Heptagrotis phyllophora
Dotted skipper – *Hesperia attalus*
Dakota skipper – *Hesperia dacotae*
Leonard's skipper – *Hesperia leonardus*
Cobweb skipper – *Hesperia metea*
Ottoe skipper – *Hesperia ottoe*
Indian skipper – *Hesperia sassacus*
Brush-legged mayfly – *Homoeoneuria ammophila*
Northern scurfy quaker moth- *Homorthodes furfurata*
Hop vine borer moth – *Hydraecia immanis*
Hydraecia stramentosa
Pink prominent moth – *Hyparpax aurora*
Austin springfly – *Hydroperla fugitans*
Hoary elfin – *Incisalia polios*
White-eyed borer moth – *Iodopepla u-album*
Rock Island springfly – *Isogenoides varians*
Itame amboflava
Leafhopper – *Kansendria kansiensis*
Small green leafhopper – *Laevicephalus minimus*
Laevicephalus peronatus
Fingered lemmeria moth – *Lemmeria digitalis*
Appalachian brown – *Lethe appalachia*
Leucania extincta
Leafhopper- *Limotettix elegans*
Leafhopper- *Limotettix nigrax*
Leafhopper- *Limotettix parallelus*
Leafhopper- *Limotettix pseudospagneticus*
Leafhopper- *Limotettix truncates*
Lonatura catalina
Loxagrotis grotei
Loxocrambus awemensis
Karner blue butterfly- *Lycaeides melissa sameulis*
Purplish copper- *Lycaena helloides*
Great copper- *Lycaena xanthoides*
Two-striped snout-mouth- *Macrochilo bivittata*
Angulate fan-foot- *Macrochilo litophora*
Louisiana snout-mouth- *Macrochilo louisiana*

Macrosteles pottoria
Black arches moth- *Melanchra assimilis*
Melanomma auricinctaria
Dawson grasshopper- *Melanoplus dawsoni*
Leafhopper- *Memnonia panzer*
Multicolored sedgeminer moth- *Meropleon diversicolor*
Mesamia straminea
Elfin skimmer- *Nannothemis bella*
Slender conehead- *Neoconocephalus lyristes*
Nephopterix dammersi
American burying beetle- *Nicrophorus americanus*
Low-ridged pygmy grasshopper- *Nomotettix parvus*
Powesheik skipperling- *Oarisma powesheik*
Short-grass prairie cicada- *Okanagana balli*
Olethreutes comandrana
Olethreutes osmundana
Oligia obtuse
Oncocnemis riparia
Oncocnemis saundersiana
Oncocnemis viriditincta
Cave isopod springtail- *Oncopodura iowae*
Three-horned moth- *Pachypolia atricornis*
Paecetes abrostoletta
Palus bilineatus
Palus delector
Palus luteocephalus
Pangrapta decoralis
Paraleptophlebia sticta
Leafhopper- *Paraphlepsius lupalus*
Papaipema aerata
Aralia shoot borer moth- *Papaipema araliae*
Blazing star stem borer- *Papaipema beeriana*
Papaipema birdi
Papaipema cerina
Papapema cerrusata
Rattlesnake-master borer moth- *Papaipema eryngii*
Papaipema eupatorii
Papaipema harrissi
Papaipema inquaesita
Papaipema leucostigma
Papaipema limpida
Papaipemalysimachiae
Papaipema maritima
Papaipema necopina
Papaipema nelita
Papaipema nepheleptena
Papaipema pterisii
Papaipema rigida
Papaipema rutila
Culver's root borer- *Papaipema sciata*
Silphium borer moth- *Papaipema silphii*
Grundy county papaipema- *Papaipema* sp. 10
Papaipema speciosissima
Papaipema unimoda
Paraphilaenus parallelus
Paraphlepsius altus
Paraphlepsius carolinus
Paraphlepsius electus
Paraphlepsius humidus
Paraphlepsius incisus
Paraphlepsius lascivius
Paraphlepsius lupalus
Paraphlepsius maculosus
Paraphlepsius nebulosus
Paraphlepsius rossi
Paraphlepsius solidaginis
Paraphlepsius texanus
Paraphlepsius umbrosus
Paraponyx maculalis
Pediasia abnaki
Peltonotellus histrionicus
Petlesta golconda
Petrophora subaequaria
Phalaenostola hanhami
Phytometra ernestinana
West Virginia white- *Pieris virginiensis*
Plagiomimicus spumosum
Plagiomimicus heitzmani
Platyperigea meralis
Platytes vobisne
Plauditus veteris
Plusia venusta
Poanes viator
Polyamia compacta
Polyamia dilata
Polyamia herbida
Polyamia interrupta
Polyamia obtecta
Polyamia rossi
Polyamia similaris
Prairiana cinerea
Prionapteryx achatina
Prionapteryx nebulifera
Byssus skipper – *Problema byssus*
Procloeon irrubrum
Procloeon mendax
Procloeon quaesitum
Procloeon simplex

Proserpinus guarae
Protorthodes incincta
Psectraglaea carnosa
Illinois cave beetle- *Pseudanophthalmus illinoisensis*
Pseudeva purpruigera
Pseudexentera vaccinii
Sprague's pygarctic – *Pygarctia spraguei*
Pyla arenaeola
Pyrausta laticlavia
Pyrausta orphisalis
Rhodoecia aurantiago
Richia n. sp.
Rimulincola divalis
Rosenus cruciatus
Satyrium edwardii
Scaphytopius abbreviatus
Scaphytopius cinereus
Scaphytopius dorsalis
Scaphytopius rubellus
Scaphytopius vaccinium
Schinia gloriosa
Bifascia – *Schinia gracilenta*
Schinia guarae
Schinia indiana
Schinia jaguarina
Schinia lucens
Schinia nundina
Schinia oleagina
Schinia saturata
Schinia septentrionalis
Plain schizura- *Schizura apicalis*
Scudderia pistillata
Semiothisa eremiata
Firson's serratellan mayfly- *Seratella frisoni*
Siphlonurus marshalli
Sitochroa dasconalis
Hine's emerald dragonfly- *Somatochlora hineana*
Spartiniphaga includens
Spartiniphaga inops
Spartiniphaga panatela
Speyeria aphrodite
Diana fritillary- *Speyeria diana*
Regal fritillary- *Speyeria idalia*
Sphinx eremitus
Sphinx luscitosa
Stegasta bosquella
Stethophyma lineatum
Stroggylocephala mixtus
Elusive clubtail- *Sytlurus notatus*
Suleima hilianthana
Tarachida binocula
Tebenna silphiella
Tetralopha baptisiella
Texananus cumulatus
Texananus decorus
Thaumatopsis pectinifer
Tricholita notata
Trichosilia manifesta
Triclonella determinatella
Trimerotropis maritima
Trimerotropis saxatilis
Ulolonche modesta
Vaxi auratella
Vaxi critica
Xerophloea peltata
Zomaria interuptolineana

FLATWORMS

Sphalloplana hubrichti

MILLIPEDES

Semionellus placidus
Tingupa pallida
Zosteractis interminata

ARACHNIDS

Striped scorpion- *Centruroides vittatus*
Mundochthonius cavernicola

FISHES

Lake sturgeon- *Acipenser fulvescens*
American eel- *Anguilla rostrata*
Brown bullhead- *Ameiurus nebulosis*
Western sand darter- *Ammocrypta clara*
Eastern sand darter- *Ammocrypta pellucida*
Largescale stoneroller- *Campostoma oligolepis*
Highfin carpsucker- *Carpoides velifer*
Longnose sucker- *Catostomus catostomus*
Flier- *Centrarchus macropterus*
Cisco- *Coregonus artedi*
Lake whitefish- *Coregonus clupeaformis*
Mottled sculpin- *Cottus bairdi*
Banded sculpin- *Cottus carolinae*
Lake chub- *Couesius plumbeus*
Crystal darter- *Crystallaria asprella*
Brook stickleback- *Culaea inconstans*

Blue sucker- *Cycleptus elongatus*
Blacktail shiner- *Cyprinella venusta*
Banded pygmy sunfish- *Elassoma zonatum*
Gravel chub- *Erimystax x-punctatus*
Lake chubsucker- *Erimyzon sucetta*
Northern pike- *Esox lucius*
Muskellunge- *Esox masquinongy*
Bluebreast darter- *Etheostoma camurum*
Bluntnose darter- *Etheostoma chlorosomum*
Fringed darter- *Etheostoma crossopterum*
Iowa darter- *Etheostoma exile*
Harlequin darter- *Etheostoma histrio*
Cypress darter- *Etheostoma proelaire*
Spottail darter- *Etheostoma squamiceps*
Spring cavefish- *Forbesichthys agassizi*
Banded killifish- *Fundulus diaphanus*
Starhead topminnow- *Fundulus dispar*
Cypress minnow- *Hybognathus hayi*
Bigeye chub- *Hybopsis amblops*
Pallid shiner- *Hybopsis amnis*
Northern brook lamprey- *Ichthyomyzon fossor*
Silver lamprey- *Ichthyomyzon unicupsis*
Least brook lamprey- *Lampetra aepyptera*
American brook lamprey- *Lampetra appendix*
Redspotted sunfish- *Lepomis miniatus*
Bantam sunfish- *Lepomis symmetricus*
Ribbon shiner- *Lythrurus fumeus*
Sturgeon chub- *Macrhybopsis gelida*
Sicklefin chub- *Macrhybopsis meeki*
Smallmouth bass- *Micropterus dolomieu*
Spotted bass- *Micropterus punctulatus*
River redhorse- *Moxostoma carinatum*
Black redhorse- *Moxostoma duquesnei*
Greater redhorse- *Moxostoma valenciennesi*
Fourhorn sculpin- *Myoxocephalus quadricornis*
River chub- *Mocomis micropogon*
Pugnose shiner- *Notropis anogenus*
Bigeye shiner- *Notropis boops*
Ghost shiner- *Notropis buchanani*
Ironcolor shiner- *Notropis chalybaeus*
Blackchin shiner- *Notropis heterodon*
Blacknose shiner- *Notropis heterolepis*
Taillight shiner- *Notropis maculatus*
Ozark minnow- *Notropis nubilus*
Rosyface shiner- *Notropis rubellus*
Silverband shiner- *Notropis shumardi*
Weed shiner- *Notropis texanus*
Mountain madtom- *Notrurus eleutherus*
Slender madtom- *Noturus exilis*
Northern madtom- *Noturus stigmosus*
Pugnose minnow- *Opsopoeodus emilae*
Yellow perch- *Perca flavescens*
Trout-perch – *Percopsis omiscomaycus*
Southern redbelly dace- *Phoxinus erythrogaster*
North American paddlefish- *Polyodon spathula*
Blacknose dace- *Rhyinichthys atratulus*
Longnose dace- *Rhyinichthys cataractae*
Salvelinus fontinalis
Lake trout- *Salvelinus namaycush*
Pallid sturgeon- *Scaphirhynchus albus*
Shovelnose sturgeon- *Scaphirhynchus platorhynchus*
Sauger- *Stizostedion canadense*
Walleye- *Stizostedion vitreum*
Central mudminnow- *Umbra limi*

AMPHIBIANS

Jefferson salamander- *Ambystoma jeffersonianum*
Blue-spotted salamander- *Ambystoma laterale*
Silvery salamander- *Ambystoma platineum*
Mole salamander- *Ambystoma talpoideum*
Hellbender- *Cryptobranchus alleganiensis*
Spotted dusky salamander- *Desmognathus conanti*
Eastern narrowmouth toad- *Gastrophryne carolinensis*
Four-toed salamander- *Hemidacrylium scutatum*
Bird-voiced treefrog- *Hyla avivoca*
Mudpuppy- *Necturus maculosus*
Illinois chorus frog- *Pseudacris streckeri illinoensis*
Crayfish frog- *Rana areolata*
Pickerel frog- *Rana palustris*
Wood frog- *Rana sylvatica*

REPTILES

Smooth softshell turtle- *Apalone mutica*
Spotted turtle- *Clemmys guttata*
Kirtland's snake- *Clonophis kirtlandii*
Timber rattlesnake- *Crotalus horridus*
Great plains rat snake- *Elaphe emoryi*
Blanding's turtle- *Emydoidea blandingii*
Mud snake- *Farancia abacura*
Western hognose snake- *Heterodon nasicus*
Illinois mud turtle- *Kinosternon flavescens*
Eastern mud turtle- *Kinosternon subrubrum*
Alligator snapping turtle- *Macrochelys temminckii*
Coachwhip- *Masticophis flagellum*

Mississippi green water snake- *Nerodia cyclopion*
Copperbelly watersnake- *Nerodia erythrogaster neglecta*
Broad-banded water snake- *Nerodia fasciata*
Smooth green snake- *Liochlorophis vernalis*
Slender glass lizard- *Ophisaurus attenuatus*
River cooter- *Pseudemys concinna*
Eastern massasauga- *Sistrurus catenatus catenatus*
Flathead snake- *Tantilla gracilis*
Ornate box turtle- *Terrapene ornata*
Eastern ribbon snake- *Thamnophis sauritus*
Lined snake- *Tropidoclonion lineatum*

BIRDS

Henslow's sparrow- *Ammodramus henslowii*
LeConte's sparrow- *Ammodramus leconteii*
Nelson's sharp-tailed sparrow- *Ammodramus nelsoni*
Grasshopper sparrow- *Ammodramus savannarum*
American black duck- *Anas rubripes*
Great egret- *Ardea alba*
Short-eared owl- *Asio flammeus*
Lesser scaup- *Aythya affinis*
Canvasback- *Aythya valisineria*
Upland sandpiper- *Bartramia longicauda*
Ruffed grouse- *Bonasa umbellus*
American bittern- *Botaurus lentiginosus*
Red-shouldered hawk- *Buteo lineatus*
Broad-winged hawk- *Buteo platypterus*
Swainson's hawk- *Buteo swainsoni*
Smith's longspur- *Calcarius pictus*
Stilt sandpiper- *Calidris himantopus*
Chuck-will's-widow- *Caprimulgus carolinensis*
Whip-poor-will- *Caprimulgus vociferus*
Brown creeper- *Certhia americana*
Chimney swift- *Chaetura pelagica*
Piping plover- *Charadrius melodus*
Black tern- *Cheldonias niger*
Common nighthawk- *Chordeiles minor*
Northern harrier- *Circus cyaneus*
Marsh wren- *Cistothorus palustris*
Sedge wren- *Cistothorus platensis*
Yellow-billed cuckoo- *Coccyzus americanus*
Black-billed cuckoo- *Coccyzus erthropthalmus*
Northern flicker- *Colaptes auratus*
Northern bobwhite- *Colinus virginianus*
Yellow rail- *Coturnicops noveboracensis*
Trumpeter swan- *Cygnus buccinator*
Cerulean warbler- *Dendroica cerulea*
Prairie warbler- *Dendroica discolor*
Bobolink- *Dolichoryx oryzivorus*
Little blue heron- *Egretta caerulea*
Snowy egret- *Egretta thula*
Willow flycatcher- *Empidonax trailli*
Arcadian flycatcher- *Empidonax virescens*
Rusty blackbird- *Euphagus carolinus*
Peregrine falcon- *Falco peregrinus*
Common moorhen- *Gallinula chloropus*
Wilson's snipe- *Gallinago delicatata*
Whooping crane- *Grus americana*
Sandhill crane- *Grus canadensis*
Bald eagle- *Haliaeetus leucocephalus*
Worm-eating warbler- *Helmitheros vermiforma*
Wood thrush- *Hylocichla mustelina*
Yellow-breasted chat- *Icteria virens*
Mississippi kite- *Ictinia mississippiensis*
Least bittern- *Ixobrychus exilis*
Loggerhead shrike- *Lanius ludovicianus*
Black rail- *Laterallus jamaicensis*
Short-billed dowitcher- *Limnodromus griseus*
Swainson's warbler- *Limnothlypis swainsonii*
Hooded merganser- *Lophodytes cucullatus*
Red-headed woodpecker- *Melanerpes erthrocephalus*
Yellow-crowned night heron- *Nyctanassa violacea*
Black-crowned night heron- *Nycticorax nycticorax*
Connecticut warbler- *Oporornis agilis*
Kentucky warbler- *Oporornis formosus*
Osprey- *Pandion haliaetus*
Savannah sparrow- *Passerculus sandwichensis*
Wilson's phalarope- *Phalaropus tricolor*
American golden plover- *Pluvialis dominica*
Pied-billed grebe- *Podilymbus podiceps*
Prothonotary warbler- *Protonoraria citrea*
King rail- *Rallus elegans*
American woodcock- *Scolopax minor*
Ovenbird- *Seiurus aurocapillus*
Dickcissel- *Spiza americana*
Field sparrow- *Spizella pusilla*
Least tern- *Sterna antillarum*
Forster's tern- *Sterna forsteri*
Common tern- *Sterna hirundo*
Bewick's wren- *Thryomanes bewickii*
Brown thrasher- *Toxostoma rufum*
Greater yellowlegs- *Tringa melanoleuca*
Buff-breasted sandpiper- *Tryngites subruficollis*

Greater prairie chicken- *Tympanuchus cupido*
Barn owl- *Tyto alba*
Blue-winged warbler- *Vermiforma pinus*
Bell's vireo- *Vireo belli*
Yellow-headed blackbird- *Xanthocephalus xanthocephalus*

MAMMALS

Gray wolf- *Canis lupus*
Eastern big-eared bat- *Corynorhinus rafinesquii*
River otter- *Lontra canadensis*
Bobcat- *Lynx rufus*
Pygmy shrew- *Sorex hoyi*
Woodland vole- *Mocrotus pinetorum*
Least weasel- *Mustela nivalis*
Southeastern bat- *Myotis austroriparius*
Gray bat- *Myotis grisescens*
Indiana bat- *Myotis sodalis*
Eastern woodrat- *Neotoma floridana*
Golden mouse- *Ochrotomys nuttalli*
Muskrat- *Ondatra zibethicus*
Marsh rice rat- *Oryzomys palustris*
Cotton mouse- *Peromyscus gossypinus*
Franklin's ground squirrel- *Spermophilus franklinii*
Swamp rabbit- *Sylvilagus aquaticus*
Red squirrel- *Tamiasciurus hudsonicus*
American badger- *Taxidea taxus*
Gray fox- *Urocyon cinereoargenteus*