ENVIRONMENTAL ASSESSMENT

REDUCING BIRD DAMAGE

IN THE STATE OF NEW JERSEY

In cooperation with:

United States Department of Interior
United States Fish and Wildlife Service
Migratory Bird Program
Region 5

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

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ACRONYMS

APHIS	Animal and Plant Health Inspection Service
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
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
MA	Methyl Anthranilate
MBTA	Migratory Bird Treaty Act
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
NJDFW	New Jersey Department of Environmental Protection, Division of Fish and Wildlife
PRDO	Public Resource Depredation Order
ROD	Record of Decision
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
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 New Jersey.

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 1992). 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. The relationship in American culture of wildlife values and wildlife damage can be summarized in this way:

"*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 and 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) 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.

Normally, according to the APHIS National Environmental Policy Act (NEPA) implementing procedures, individual wildlife damage management actions may be categorically excluded {7 Code of Federal Regulation (CFR) 372.5(c), 60 Fed. Reg. 6,000 - 6,003 (1995)}. WS chose to prepare this EA to facilitate planning, interagency coordination and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed damage management program.

1.2 PURPOSE

The purpose of this EA is to evaluate cumulatively the individual projects conducted by WS and the U.S. Fish and Wildlife Service (USFWS) in New Jersey to manage damage and threats to agricultural resources, property, natural resources, and threats to humans associated with common loons (*Gavia immer*), pied-billed grebes (*Podilymbus podiceps*), brown pelicans (*Pelecanus occidentalis*), double-crested cormorants (*Phalacrocorax auritus*), great cormorants (*Phalacrocorax carbo*), great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), snowy egrets (*Egretta thula*), little blue herons (*Egretta caerulea*), tricolored herons (*Egretta tricolor*), cattle egrets (*Bubulcus ibis*), green herons (*Butorides virescens*), black-crowned night-herons (*Nycticorax nycticorax*), black vultures (*Coragyps atratus*), turkey vultures (*Cathartes aura*), snow geese (*Chen caerulescens*), Canada geese (*Branta canadensis*), Atlantic brant (*Branta bernicla hrota*), mute swans (*Cygnus olor*), tundra swans (*Cygnus columbianus*), free-ranging or feral domestic waterfowl[2], wood ducks (*Aix sponsa*), gadwall (*Anas strepera*), Eurasian wigeons (*Anas penelope*), American wigeons (*Anas americana*), American black ducks (*Anas rubripes*), mallards (domestic/wild) (*Anas platyrhynchos*), Northern shovelers (*Anas clypeata*), Northern pintails (*Anas acuta*), canvasbacks (*Aythya valisineria*), redheads (*Aythya americana*), ring-necked ducks (*Aythya collaris*), blue-winged teal (*Anas discors*), green-winged teal (*Anas carolinensis*), greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), king eiders (*Somateria spectabilis*), common eiders (*Somateria mollissima*), harlequin ducks (*Histrionicus histrionicus*), surf scoter (*Melanitta perspicillata*), white-winged scoters (*Melanitta fusca*), black scoters (*Melanitta americana*), long-tailed ducks (*Clangula hyemalis*), buffleheads (*Bucephala albeola*), common goldeneyes (*Bucephala clangula*), hooded mergansers (*Lophodytes cucullatus*), common mergansers (*Mergus merganser*), red-breasted mergansers (*Mergus serrator*), ruddy ducks (*Oxyura jamaicensis*), osprey (*Pandion haliaetus*), bald eagles (*Haliaeetus leucocephalus*), Northern harriers (*Circus cyaneus*), red-tailed hawks (*Buteo jamaicensis*), rough-legged hawks (*Buteo lagopus*), American kestrels (*Falco sparverius*), peregrine falcons (*Falco peregrinus*), ring-necked pheasants (*Phasianus colchicus*), wild turkeys (*Meleagris gallopavo*), Northern bobwhite (*Colinus virginianus*), common moorhens (*Gallinula chloropus*), American coots (*Fulica americana*), killdeer (*Charadrius vociferous*), lesser yellowlegs (*Tringa flavipes*), least sandpipers (*Calidris minutilla*), upland sandpipers (*Bartramia longicauda*), American woodcocks (*Scolopax minor*), laughing gulls (*Larus atricilla*), ring-billed gulls (*Larus delawarensis*), herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), common terns (*Sterna hirundo*), least terns (*Sterna antillarum*), rock pigeons (*Columba livia*), mourning doves (*Zenaida macroura*), barn owls (*Tyto alba*), snowy owls (*Bubo scandiacus*), great-horned owls (*Bubo virginianus*), short-eared owls *(Asio flammeus)*, chimney swifts (*Chaetura pelagica*), belted kingfishers (*Megaceryle alcyon*), monk parakeets (*Myiopsitta monachus*), red-bellied woodpeckers (*Melanerpes carolinus*), downy woodpeckers (*Picoides pubescens*), hairy woodpeckers (*Picoides villosus*), Northern flickers (*Colaptes auratus*), Eastern kingbirds (*Tyrannus tyrannus*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), fish crows (*Corvus ossifragus*), common ravens (*Corvus corax*), horned larks (*Eremophila alpestris*), purple martins (*Progne*

[2]Free-ranging or feral 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, mute swans, 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 duck, and mallard-Muscovy hybrids.

subis), tree swallows (*Tachycineta bicolor*), bank swallows (*Riparia riparia*), barn swallows (*Hirundo rustica*), American robins (*Turdus migratorius*), gray catbirds (*Durnetella carolinensis*), Northern mockingbirds (*Mimus polyglottos*), European starlings (*Sturnus vulgaris*), snow buntings (*Plectrophenax nivalis*), red-winged blackbirds (*Agelaius phoeniceus*), Eastern meadowlarks (*Sturnella magna*), common grackles (*Quiscalus quiscula*), brown-headed cowbirds (*Molothrus ater*), and house sparrows (*Passer domesticus*).

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 and the USFWS 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 New Jersey as part of a coordinated program.

To meet the goals and objectives of addressing requests for assistance, WS and the USFWS are 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 New Jersey Department of Environmental Protection, Division of Fish and Wildlife (NJDFW) and Pesticide Control Program, the New Jersey Department of Agriculture (NJDA), the New Jersey Department of Health (NJDH), and Rutgers – The State University New Jersey Agricultural Experiment Station (NJAES). To assist with the identification of additional issues and alternatives to managing damage associated with birds in New Jersey, this EA will be made available to the public for review and comment prior to the issuance of a Decision[3].

WS and the USFWS previously developed an EA that addressed WS' activities to manage damage associated with birds in the state (USDA 2003; see Section 1.4). 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 2003). Changes in the need for action and the affected environment have prompted WS and the USFWS 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.

[3]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.

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 habitat might have a biological carrying capacity to 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 1992). 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 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 et al. 2001).

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. For example, free-ranging waterfowl are extremely adaptable and may use the resources provided by humans in urban landscapes for nesting, raising young, molting, feeding, and loafing.

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 New Jersey, 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 New Jersey arises from requests for assistance[4] received by WS and the USFWS to reduce and prevent damage associated with birds from occurring to four major categories (USDA 2003, USFWS 2003, USFWS 2009). Those four major categories include agricultural resources, natural resources, property, and threats to human safety. WS and the USFWS have 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 to those four major resource types in New Jersey from the federal fiscal year[5] (FY) 2007 through FY 2012.

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 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 New Jersey. From FY 2007 through FY 2012, WS has conducted 3,643 technical assistance projects that addressed damage and threats of damage associated with those bird species addressed in this assessment. Many of the projects involved multiple resources and multiple species.

Table 1.1 – Technical assistance projects conducted by WS in New Jersey, FY 2007 - FY 2012

Species	Projects	Species	Projects
Double-crested Cormorant	20	**Laughing Gull**	89
Great Blue Heron	25	**Ring-billed Gull**	72
Great Egret	4	**Herring Gull**	105
Black Vulture	131	**Great Black-backed Gull**	54
Turkey Vulture	247	**Rock Pigeon**	29
Snow Goose	27	**Mourning Dove**	14
Atlantic Brant	4	**Snowy Owl**	2

[4]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.

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

Mute Swan	19	**Monk Parakeet**	1
Tundra Swan	9	**Downy Woodpecker**	29
Feral Goose	8	**Hairy Woodpecker**	6
Feral Duck	18	**Northern Flicker**	1
Wood Duck	5	**Blue Jay**	4
Gadwall	2	**American Crow**	13
American Black Duck	8	**Horned Lark**	2
Mallard	77	**Purple Martin**	6
Common Merganser	1	**Tree Swallow**	12
Osprey	17	**Barn Swallow**	14
Bald Eagle	2	**American Robin**	14
Northern Harrier	8	**Gray Catbird**	1
Cooper's Hawk	1	**Northern Mockingbird**	4
Red-tailed Hawk	26	**European Starling**	72
Rough-legged Hawk	4	**Red-winged Blackbird**	5
American Kestrel	11	**Eastern Meadowlark**	10
Peregrine Falcon	1	**Common Grackle**	4
Wild Turkey	33	**Brown-headed Cowbird**	2
Northern Bobwhite	2	**Blackbird (mixed species)**	25
Northern Cardinal	1	**Great-horned Owl**	1
American coot	2	**Chimney Swift**	1
House Finch	2	**Common Tern**	2
Purple Finch	1	**Cedar Waxwing**	1
Red-shouldered Hawk	1	**Red-headed Woodpecker**	2
Yellow-crowned Night Heron	2	**Upland Sandpiper**	5
Killdeer	15	**House Sparrow**	13
Canada Goose	2,294		
TOTAL:		**3,643**	

Table 1.2 lists those bird species and the resource types to which those bird species have caused damage in New Jersey. Many of the bird species addressed in this EA can cause damage to or pose threats to a variety of resources. Most 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, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists, such as swallows, cormorants, and gulls. The flocking behavior of many bird species during migration periods can pose increased risks when those species occur near or on airport properties. Aircraft striking multiple birds not only 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 New Jersey and the resource types damaged

Species	Resource*				Species	Resource			
	A	N	P	H		A	N	P	H
Common Loon			X	X	Red-tailed Hawk	X	X	X	X
Pied-billed Grebe			X	X	Rough-legged Hawk	X	X	X	X
Brown Pelican			X	X	American Kestrel	X	X	X	X
Double-crested Cormorant	X	X	X	X	Peregrine Falcon	X	X	X	X
Great Cormorant	X	X	X	X	Ring-necked Pheasant			X	X
Great Blue Heron	X	X	X	X	Wild Turkey	X		X	X
Great Egret	X	X	X	X	Northern Bobwhite			X	X
Snowy Egret	X	X	X	X	Common Moorhen			X	X
Little Blue Heron	X	X	X	X	American Coot			X	X
Tricolored Heron	X	X	X	X	Killdeer			X	X
Cattle Egret	X	X	X	X	Lesser Yellowlegs			X	X
Green Heron	X	X	X	X	Least Sandpiper			X	X
Black-crowned Night-heron	X	X	X	X	Upland Sandpiper			X	X
Black Vulture	X		X	X	American Woodcock			X	X
Turkey Vulture	X		X	X	Laughing Gull	X	X	X	X
Snow Goose	X	X	X	X	Ring-billed Gull	X	X	X	X
Atlantic Brant		X	X	X	Herring Gull	X	X	X	X
Mute Swan	X	X	X	X	Great Black-backed Gull	X	X	X	X
Tundra Swan	X	X	X	X	Common Tern			X	X
Feral Goose	X	X	X	X	Least Tern			X	X
Feral Duck	X	X	X	X	Rock Pigeon	X	X	X	X
Wood Duck			X	X	Mourning Dove			X	X
Gadwall			X	X	Barn Owl	X	X	X	X
Eurasian Wigeon			X	X	Snowy Owl			X	X
America Wigeon			X	X	Chimney Swift			X	X
American Black Duck			X	X	Belted Kingfisher	X		X	X
Mallard	X	X	X	X	Monk Parakeet		X	X	X
Northern Shoveler			X	X	Red-bellied Woodpecker			X	X
Northern Pintail			X	X	Downy Woodpecker			X	X
Canvasback			X	X	Hairy Woodpecker			X	X
Redhead			X	X	Northern Flicker			X	X
Ring-necked Duck			X	X	Eastern Kingbird			X	X
Blue-winged Teal			X	X	Blue Jay			X	X
Green-winged Teal			X	X	American Crow	X	X	X	X
Greater Scaup			X	X	Fish Crow	X	X	X	X
Lesser Scaup			X	X	Common Raven	X	X	X	X
King Eiders			X	X	Horned Lark			X	X
Common Eiders			X	X	Purple Martin			X	X
Harlequin Duck			X	X	Tree Swallow			X	X
Surf Scoter			X	X	Bank Swallow			X	X
White-winged Scoter			X	X	Barn Swallow	X		X	X
Black Scoter			X	X	American Robin			X	X

Species	Resource*				Species	Resource			
	A	N	P	H		A	N	P	H
Long-tailed Duck			X	X	Gray Catbird			X	X
Bufflehead			X	X	Northern Mockingbird			X	X
Common Goldeneyes			X	X	European Starling	X	X	X	X
Hood Merganser			X	X	Snow Bunting			X	X
Common Merganser			X	X	Red-winged Blackbird	X		X	X
Red-breasted Merganser			X	X	Eastern Meadowlark			X	X
Ruddy Ducks			X	X	Common Grackle	X		X	X
Osprey	X		X	X	Brown-headed Cowbird	X		X	X
Bald Eagle			X	X	House Sparrow	X	X	X	X
Dunlin			X	X	Northern Cardinal			X	X
House Finch			X	X	Short-billed Dowitcher			X	X
Purple Finch			X	X	Muscovy			X	X
Pea Fowl			X	X	Northern Harrier			X	X
Canada Goose	X	X	X	X					

*A=Agriculture, N =Natural Resources, P=Property, H=Human 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 2007 and FY 2012, bird damage has been reported to WS or has been verified to exceed $7,318,800 (see Table 1.3). Damages have been reported or verified as occurring primarily to property and agricultural resources. Nearly $4,705,332 in damage to property has been reported to or verified by WS between FY 2007 and FY 2012 with damage to agricultural resources exceeding $1,480,412. The majority of damage that occurred was by Canada geese. However vultures, gulls, starlings, osprey, tundra swans, and snow geese also greatly contributed to the bird damage reported to or verified by WS.

Table 1.3 – Reported or WS verified monetary damage by resource caused by birds in New Jersey

Resource Type	Fiscal Year						Total
	2007	2008	2009	2010	2011	2012	
Property	$711,600	$1,441,679	$1,530,827	$9,706	$440,580	$570,940	**$4,705,332**
Agriculture	$277,256	$305,875	$271,001	$5,180	$295,300	$325,800	**$1,480,412**
Natural Resources	$7,700	$9,442	$133,952	$0	$10,000	$5,000	**$166,094**
Human Safety	$141,414	$274,348	$475,000	$2,000	$49,200	$25,000	**$966,962**
Total	**$1,137,970**	**$2,031,344**	**$2,410,780**	**$16,886**	**$795,080**	**$926,740**	**$7,318,800**

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 733,450 acres devoted to agricultural production in New Jersey during 2007 with a market value of agricultural products sold estimated at nearly $1 billion in 2007 (NASS 2009). The top two farm commodities for cash receipts were greenhouse/nursery products and vegetables/fruits, which together accounted for over 78% of the cash receipts. The value of sales associated with the nursery, greenhouse, and sod industry ranked ninth in the United States during 2007. The livestock inventory in New Jersey during 2007 included 38,200 head of cattle and an estimated 1.5 million chickens (NASS 2009). Aquaculture sales were valued at over $6.6 million in New Jersey in 2007 (NASS 2009).

A variety of bird species can cause damage to agricultural resources (USDA 2003*a*, USFWS 2003, USFWS 2009). Damage and threats of damage to agricultural resources is often associated with bird species that exhibit flocking behaviors (e.g., red-winged blackbirds, European starlings) or colonial nesting behavior (e.g., swallows, 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 principal aquaculture products propagated at facilities in New Jersey are catfish, trout, baitfish, crustaceans, mollusks, and ornamental fish (NASS 2009). Of those birds shown in Table 1.2 associated with damage to agriculture, of primary concern to aquaculture facilities in New Jersey are gulls, osprey, herons, egrets, and to a lesser extent waterfowl, red-tailed hawks, gulls, kingfishers, double-crested cormorants, crows, and common grackles.

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 issue. 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).

In addition to herons, other bird species have been identified as causing damage or posing threats to aquaculture facilities. In 1984, a survey of fish-producing facilities identified 43 species of birds as foraging on fish at those facilities, including mallards, egrets, kingfishers, osprey, red-tailed hawks,

Northern harriers, owls, gulls, terns, American crows, mergansers, common grackles, and brown-headed cowbirds (Parkhurst et al. 1987).

During a survey of fisheries in 1984, osprey ranked third highest among 43 species of birds identified as foraging on fish at aquaculture facilities in the United States (Parkhurst et al. 1987). Fish comprise the primary food source of osprey (Poole et al. 2002). Parkhurst et al. (1992) found that when ospreys were present at aquaculture facilities over 60% of their mean time was devoted to foraging. The mean length of trout captured by osprey was 30.5 centimeters leading to a higher economic loss per captured fish compared to other observed species (Parkhurst et al. 1992).

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.

Damage and Threats to Livestock Operations

Damage to livestock operations can occur from several bird species in New Jersey (USDA 2003). 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.

Although damage and disease threats to livestock operations can occur throughout the year, 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, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists, such as barn swallows. Of primary concern to livestock operations in New Jersey are European starlings, red-winged blackbirds, grackles, cowbirds, pigeons, and to a lesser extent crows and barn swallows. The flocking behavior of those species either from feeding, roosting and/or nesting behavior 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.

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 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 affect livestock have been associated with rock pigeons, European starlings, and house sparrows (Weber 1979). Rock pigeons, starlings, and house sparrows have been identified as carriers of erysipeloid, salmonellosis, pasteurellosis, avian tuberculosis, streptococcosis, vibrosis, and listeriosis (Weber 1979). Weber (1979) also reported pigeons, starlings, and house sparrows as vectors of several viral, fungal, protozoal, and rickettsial diseases that are known to infect livestock and pets.

Although birds are known to be carriers of diseases (vectors) that are transmissible to livestock, the rate that transmission occurs is unknown, but is likely to be low. Since many sources of disease transmission exist, identifying a specific source can be difficult. Birds are known to be vectors of disease, which increases the threat of transmission when large numbers of birds are defecating and contacting surfaces and areas used by livestock.

Williams et al. (1977) and Johnston et al. (1979) reported that gulls can transmit salmonella to livestock through droppings and contaminated drinking water. The 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.

Waterfowl, including mallards, snow geese, tundra swans, feral geese and ducks, are also a concern to livestock producers. Waterfowl droppings in and around livestock ponds can affect water quality and are a source of a number of different types of bacteria, creating concerns about potential disease interactions between waterfowl and livestock. The transmission of diseases through drinking water is one of the primary concerns for a safe water supply for livestock. Bacteria levels for livestock depend on the age of the animal since adults are more tolerant of bacteria than young animals (Mancl 1989). The bacteria guidelines for livestock water supplies are <1000 fecal coliforms/100 ml for adult animals and < 1 fecal coliform/100 ml for young animals (Mancl 1989). Salmonella causes shedding of the intestinal lining and severe diarrhea in cattle. If undetected and untreated, salmonella can kill cattle and calves.

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).

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). While both turkey vultures and black vultures have been documented harassing expectant cattle, WS in New Jersey has documented calf predation by black vultures. 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.

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.

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. In 2007, the sale of fruits, tree nuts, and berries along with vegetables, melons, and potatoes accounted for 33.4% of the market value of the agricultural products sold in New Jersey. Other crop commodities harvested in 2007 include forage, corn, soybeans, and wheat (NASS 2009). Damage to agricultural field crops, as reported to WS, occurs primarily from American crows, snow geese, tundra swans, 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, peanuts), implement non-lethal wildlife management practices, purchase 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. In New Jersey, WS has received requests for assistance to alleviate damage to fruit and nut crops associated with gulls, starlings, tundra swans, and wild turkeys. 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 Safety

Several bird species listed in Table 1.2 can be closely associated with human habitation and often exhibit gregarious roosting behavior, such as vultures, 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, 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) where humans may encounter fecal droppings of those birds. For example, as many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, European starlings, and house sparrows (Weber 1979). Few studies are available on the occurrence and transmission of zoonotic diseases in 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. The risk of disease transmission from birds to humans is likely very low. The presence of disease causing organisms in bird feces is a result of the pathogens being present in the environment in which birds live. Birds likely acquire disease-causing organisms through ingestion of pathogens that originated in the environment. Disease-causing organisms do not originate with birds (i.e., birds do not produce disease-causing organisms), but those birds can act as reservoirs for disease causing organisms that are of concern to human safety.

Of concern, is the ability of birds to obtain disease causing organisms and transporting those organisms to other areas, especially to areas with a high amount of human activity. With the ability to fly and move from one location to another, birds can obtain a disease causing organism at one location and transfer the disease causing organism from that location to another location. Human exposure to fecal droppings through contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. Birds can be closely associated with human habitation where interaction with birds or fecal droppings can occur. Many bird species often exhibit gregarious behavior, which can lead to accumulations of fecal droppings in areas where those species forage or loaf. Accumulations of feces can be considered a threat to human health and safety due to the close association of those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often found in areas where humans may be exposed.

Public health officials and residents near areas where fecal droppings accumulate express concerns for human health related to the potential for disease transmission. Fecal droppings that accumulate from large communal bird roosts can facilitate the growth of disease organisms, which grow in soils enriched by bird excrement, such as the fungus *Histoplasma capsulatum*, which causes the disease histoplasmosis in humans (Weeks and Stickley 1984). The disturbance of soil or fecal droppings under bird roosts where fecal droppings have accumulated can cause *H. capsulatum* to become airborne. Once airborne, the fungus could be inhaled by people in the area.

Ornithosis (*Chlamydia psittaci*) is another respiratory disease that can be contracted by humans, livestock, and pets that can be associated with accumulations of bird droppings. Pigeons are most commonly associated with the spread of Ornithosis to humans. Ornithosis is a virus that is spread through infected bird droppings when viral particles become airborne after infected bird droppings are disturbed. In most cases in which human health concerns are a major reason for requesting assistance, no actual cases 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.

Waterfowl may affect human health through the distribution and incubation of various pathogens and through nutrient loading in water supplies. Avian botulism is produced by the bacteria *Clostridium botulinum* type C, which occurs naturally in wild bird populations across North America. Ducks are most often affected by this disease. Avian botulism is the most common disease of waterfowl. Salmonella (*Salmonella* spp.) may be contracted by humans by handling materials soiled with bird feces (Stroud and Friend 1987). Salmonella causes gastrointestinal illness, including diarrhea.

Chlamydia psittaci, which can be present in diarrhetic feces of infected waterfowl, can be transmitted if it becomes airborne (Locke 1987). Severe cases of chlamydiosis have occurred among wildlife biologists and others handling snow geese, ducks, and other birds (Wobeser and Brand 1982). Chlamydiosis can be fatal to humans if not treated with antibiotics. Waterfowl, herons, and rock pigeons are the most commonly infected wild birds in North America (Locke 1987).

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. Unfortunately, linking the elevated bacterial counts to frequency of waterfowl use and attributing the elevated levels to human health threats has been problematic until recently. Advances in genetic engineering have allowed

microbiologists to match genetic code of coliform bacteria to specific animal species and link those animal sources of coliform bacteria to fecal contamination (Simmons et al. 1995, Jamieson 1998). For example, Simmons et al. (1995) used genetic fingerprinting to link fecal contamination of small ponds on Fisherman Island, Virginia to waterfowl. Microbiologists were able to implicate waterfowl and gulls as the source of fecal coliform bacteria at the Kensico Watershed, a water supply for New York City (Klett et al. 1998, Alderisio and DeLuca 1999). In addition, fecal coliform bacteria counts coincided with the number of Canada geese and gulls roosting at the reservoir.

Research has shown that 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 has also been implicated in accelerated nutrient loading of aquatic systems (Portnoy 1990), which could have serious implications for municipal drinking water sources.

Public health concerns often arise when gulls feed and loaf near fast food restaurants, and picnic facilities; deposit waste from landfills in urban areas and drinking water reservoirs; and contaminate industrial facility ventilation systems with feathers, nesting debris, and droppings. Gulls feeding on vegetable crops and livestock feed can potentially aid in the transmission of salmonella.

While 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). Even though many people are concerned about disease transmission from feces, the probability of contracting a disease from feces is believed to be small. Financial costs related to human health threats involving birds may include testing of water for *coliform* bacteria, cleaning and sanitizing public-use areas, 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 health and 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). From 1990 through 2010, 2,940 birds have been reported as struck by aircraft in New Jersey (Dolbeer et al. 2012).

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 2010, 105,947 bird strikes have been reported to the Federal Aviation Administration (FAA) in the United States (Dolbeer et al. 2011). 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 2010, approximately 76% 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 97% occurred less than 3,500 feet above ground level (Dolbeer et al. 2012).

Gulls, pigeons/doves, raptors, and waterfowl have been the bird groups most frequently struck by aircraft in the United States. Of the total known birds struck in the United States from 1990 through 2010, gulls comprised 17% of the strikes, pigeons and doves comprised 15% of the total reported strikes where identification occurred, while raptors accounted for 13%, and waterfowl were identified in 7% of reported strikes (Dolbeer et al. 2012). Between 2010 and 2013, six red-tailed hawk strikes have occurred at Newark Liberty International Airport while Teterboro Airport has experienced 35 strikes associated with kestrels and red-tailed hawks from 2008 to 2012 (FAA 2013).

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 229 people worldwide have died in aircraft that have crashed after striking wildlife (Dolbeer et al 2012). Between 1990 and 2010, 24 people have died after commercial or private aircraft have stuck birds in the United States (Dolbeer et al. 2012). Of those 24 fatalities involving bird strikes, seven fatalities occurred after striking birds that were not identified while eight fatalities occurred after strikes involving red-tailed hawks (Dolbeer et al. 2012). 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 2010, 44 strikes involving waterfowl have resulted in injuries to 49 people while 29 strikes involving vultures resulted in injuries to 32 people (Dolbeer et al. 2012).

Additional Human Safety Concerns Associated with Birds

As people are increasingly living with 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 rearing of eggs and 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. Waterfowl aggressively defend their nests, nesting areas, and young, 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. 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, all of the bird species addressed in this assessment are known to cause damage to property in New Jersey. 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 also 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 from 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 black 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. Black vultures and turkey 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, 27% of the reported gull strikes resulted in damage to the aircraft or had a negative effect on the flight while 66% of the reported waterfowl strikes resulted in damage or negative effects on the flight compared to 26% of strikes involving raptors and 12% of strikes involving pigeons and doves (Dolbeer et al. 2012). Since 1990, over $150 million in damages to civil aircraft have been reported from strikes involving waterfowl (Dolbeer et al. 2012). In total, aircraft strikes involving birds have resulted in over $394 million in reported damages to civil aircraft since 1990 in the United States (Dolbeer et al. 2012).

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.

Waterfowl may cause damage to aircraft, landscaping, piers, yards, boats, beaches, shorelines, parks, golf courses, driveways, athletic fields, ponds, lakes, rafts, porches, patios, gardens, footpaths, swimming pools, play grounds, school grounds, and cemeteries. Property damage most often involves waterfowl fecal matter that contaminates landscaping and walkways, often at golf courses and water front property. Fecal droppings and the overgrazing of vegetation can be aesthetically displeasing. Businesses may be concerned about the negative aesthetic appearance of their property caused by excessive droppings and excessive grazing, and are sensitive to comments by clients and guests. 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 northeastern United States, landfills often serve as foraging and loafing areas for gulls throughout the year, while attracting larger populations of gulls during migration periods (Bruleigh et al. 1998). 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 New Jersey, has totaled $641,057 between FY 2007 and FY 2012, which is an average of $106,843 per year. 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.

Need to Resolve Bird Damage Occurring to Natural Resources

Birds can also 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 New Jersey 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. Overtime, 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, Bédard et al. 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 (U.S. Department of the Interior [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 the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The NJDFW is responsible for managing wildlife in the State of New Jersey, including birds. The NJDFW 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 NJDFW 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 NJDFW, which 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 the NJDFW; 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:

- Should BDM as currently implemented by the WS program be continued in New Jersey?
- If not, how can WS best respond to the need to reduce bird damage in New Jersey?
- Do the alternatives have significant impacts meriting 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 New Jersey, 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 NJDFW in compliance with New Jersey statutes and 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 cooperating 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.

Native American Lands and Tribes

The WS program in New Jersey 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.

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 New Jersey 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.

Period for which this EA is Valid

If the analyses in this EA indicate an Environmental Impact Statement (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 New Jersey 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 New Jersey 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 New Jersey. 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[6] 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 New Jersey. 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 and alternatives related to bird damage management as conducted by WS in New Jersey were initially developed by WS in consultation with the USFWS and the NJDFW. Issues were defined and preliminary alternatives were identified 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 noticed 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 and the USFWS 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) and made changes to the 1998 Aquaculture Depredation Order (AQDO; 50 CFR 21.47). To allow for an adaptive evaluation of activities conducted under the PRDO and the AQDO established by the FEIS, those Orders would have expired on April 30, 2009 (USFWS 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: The EA developed by the USFWS evaluated the issues and alternatives associated with permitting 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 authorized disturbance of

[6]At the time of preparation, WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

eagles, which constitutes "*take*" as defined under the Bald and Golden Eagle Protection Act, authorizes the removal of eagle nests where necessary to reduce threats to human safety, and evaluated the issuance of permits authorizing the lethal take of eagles in limited circumstances. A FONSI was made for the preferred alternative in the EA (USFWS 2001).

Atlantic Flyway Mute Swan Management Plan 2002-2013: In response to increasing populations of mute swans along the Atlantic Flyway, the Atlantic Flyway Council developed a mute swan plan to reduce swan populations in the Flyway to minimize negative ecological damages occurring to wetland habitats from the overgrazing of submerged aquatic vegetation by swans. Another goal of the Plan is to reduce swan populations in the Flyway to reduce competition between swans and native wildlife and to prevent the further expansion of mute swans (Atlantic Flyway Council 2003).

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, which 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) has been incorporated by reference into this EA.

Waterbird Conservation Plan: 2006-2010, Mid-Atlantic/New England/Maritimes Region: The Mid-Atlantic/New England/Maritime (MANEM) Working Group developed a regional waterbird conservation plan for the MANEM region of the United States and Canada (MANEM Waterbird Conservation Plan 2006). The MANEM region consists of Bird Conservation Region (BCR) 14 (Atlantic Northern Forest) and BCR 30 (New England/Mid-Atlantic Coast) along with the Pelagic Bird Conservation Region 78 (Northeast United States Continental Shelf) and Pelagic Bird Conservation Region 79 (Scotian Shelf). The plan consists of technical appendices that address: (1) waterbird populations including occurrence, status, and conservation needs, (2) waterbird habitats and locations within the region that are critical to waterbird sustainability, (3) MANEM partners and regional expertise for waterbird conservation, and (4) conservation project descriptions that present current and proposed research, management, habitat acquisition, and education activities (MANEM Waterbird Conservation Plan 2006). Information in the Plan on waterbirds and their habitats provide a regional perspective for local conservation action.

***WS' Environmental Assessments*:** WS has previously developed EAs that analyzed the need for action to manage damage associated with several bird species (USDA 2003). WS has also prepared a separate EA to evaluate the need to manage damage associated with Canada geese (USDA 2002). Those EAs identified the issues associated with managing damage associated with birds and analyzed alternative approaches to meet the specific need identified in those EAs while addressing the identified issues.

Changes in the need for action and the affected environment have prompted WS and cooperating agencies to initiate this new analysis to address the need for bird damage management. 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, as well as incorporating Canada goose damage and threats. 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 based on the analyses in this EA. However, the need for action associated with those previous EAs relative to birds continues to be appropriate to the need for action associated with this EA (USDA 2002, USDA 2003).

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 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.

New Jersey Department of Environmental Protection, Division of Fish and Wildlife (NJDFW)

The NJDFW and WS have signed a MOU, which establishes a cooperative relationship and outlines roles and responsibilities for resolving wildlife damage in New Jersey. The mission of the NJDFW is to protect and manage the State's fish and wildlife to maximize their long-term biological, recreational, and economic values. Under the MOU, the Wildlife Services Section (WSS) of the NJDFW assumes primary responsibility for responding to requests for assistance involving state-regulated wildlife species such as resident game and furbearer species, as well as resident game birds, such as wild turkeys. The NJDFW may permit/authorize WS to control offending individual target animals or populations of wildlife species normally managed by the state on a case-by-case basis. The NJDFW forwards requests for assistance associated with migratory birds, federally protected species, and wildlife hazards at airports to WS. The Waterfowl Ecology and Management Program of the NJDFW is responsible for research and management of waterfowl species, including mute swans, tundra swans, snow geese, mallards, black ducks, and others. The Endangered and Nongame Species Program (ENSP) of the NJDFW administers programs related to nongame birds, such as vultures and gulls. In addition, the ENSP conducts management and education programs for endangered, threatened, and nongame wildlife species in New Jersey.

New Jersey Department of Agriculture (NJDA)

The NJDA currently has a MOU with WS which establishes a cooperative relationship between the two agencies. The MOU outlines the roles and responsibilities for resolving wildlife damage in New Jersey. The mission of the NJDA is to develop, promote, conserve, and support the agriculture and agribusiness industry of the state and those natural and renewable resources that are associated with agriculture and other open lands for the benefit of all its citizens. Per the MOU, the NJDA provides non-confidential agricultural information and statistics to WS, forwards requests for wildlife damage assistance to WS, provides notification of livestock/poultry disease threats and outbreaks to WS, and communicates information regarding wildlife damage management the agricultural community.

New Jersey Department of Environmental Protection (NJDEP), Pesticide Control Program (PCP)

The NJDEP, PCP currently has a MOU with WS which establishes a cooperative relationship between the two agencies and outlines the roles and responsibilities for resolving wildlife damage in New Jersey. The

PCP enforces state laws pertaining to the use and application of pesticides, including those related to the registration of pesticide products, licensing of private and commercial pesticide applicators, and licensing of pesticide businesses. The PCP implements regulations found in N.J.A.C. Title 7 Chapter 30, Subchapters 1-12. Pesticide products for bird damage control are registered through the PCP. Per the MOU, the PCP provides guidance to WS on current and proposed Pesticide Control Regulations that may affect the required training, certification, and registration of commercial pesticide applicators and operators who engage in vertebrate pest control and those regulations that may affect the use of pesticides utilized to control vertebrate pests.

New Jersey Department of Health (NJDH)

The NJDH currently has a MOU with WS which establishes a cooperative relationship between the two agencies and outlines the roles and responsibilities for resolving wildlife damage in New Jersey. The mission of the NJDH is to improve health through leadership and innovation. Per the MOU, the NJDH provides technical guidance to WS on public health related issues, zoonotic diseases, and potential human health problems associated with wildlife, along with referring callers with wildlife damage related questions to WS.

Rutgers, The State University - New Jersey Agricultural Experiment Station (NJAES)

The NJAES currently has a MOU with WS which establishes a cooperative relationship between the two agencies and outlines the roles and responsibilities for resolving wildlife damage in New Jersey. NJAES is the research and outreach arm of Rutgers, The State University of New Jersey. Rutgers Cooperative Extension agents and specialists deliver wide-ranging educational programs in the areas of agriculture, fisheries, urban and community outreach, youth development, and related areas of economic and workforce development across New Jersey. Per the MOU, NJAES collaborates with WS in the development of educational publications and materials, and may provide educational sessions on wildlife management. NJAES also distributes notices of pesticide applicator training programs to WS.

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 NJDFW or NJDH 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.

NJDFW Agricultural Depredation Order for Canada Geese

The NJDFW may issue a free permit to farmers for the lethal control of geese between May 1 and August 31 when geese are causing damage to agricultural crops, and to prevent damage to agricultural crops. The permit must be obtained prior to implementing any control program.

NJDFW Public Health Depredation Order for Canada Geese

Municipalities, lake associations and county parks may apply to the NJDFW for a permit to control Canada goose when the geese are causing a direct threat to human health in lakes or ponds that are used for swimming. The permit applicant must submit a letter from the state, county or local health department stating that Canada geese are causing the health threat by creating conditions conducive to the transmission of pathogens. The permit applicant must describe the control method to be used, the agent carrying out the control method, agent qualifications and method of disposal or donation of geese. Control techniques may be employed April 1 – August 31. Culled geese may be by donated to museums or public institutions for scientific or educational purposes, processed for human consumption and subsequent distribution free of charge to charitable organizations, or buried or incinerated. Euthanasia must be by means approved by the American Veterinary Medical Association Guidelines on Euthanasia.

NJDFW Airport Depredation Order for Canada Geese

Permits may be issued by the NJDFW for lethal control on airports employed between April 1 and September 15. Only shotguns with nontoxic shot may be used.

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.

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)

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

While bald eagles were federally listed as a threatened species, the ESA was the primary regulation governing the management of bald eagles in the lower 48 states. Now that bald eagles have been removed from the federal list of T&E species, the Bald and Golden Eagle Protection Act is the primary regulation governing bald eagle management. Under the Bald and Golden Eagle Protection Act (16 USC 668-668c), the take of bald eagles is prohibited without a permit from the USFWS. Under the Act, the definition of "*take*" includes actions that can "*molest*" or "*disturb*" eagles. For the purposes of the Act under 40 CFR 22.3, the term "*disturb*" as it relates to take has been defined as "*to agitate or bother a*

bald……eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

Endangered Species Act (ESA)

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 also consulted with the USFWS concerning T&E species in New Jersey in regards to proposed bird damage management activities, which will be discussed in Chapter 4 of this EA.

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, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that 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 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 a draft MOU with the USFWS as required by this Executive Order and is currently waiting for USFWS approval. WS would abide by the MOU once it is finalized and signed by both parties.

Invasive Species - Executive Order 13112

Executive Order 13112 establishes guidance to federal agencies to prevent the introduction of invasive species, provide for the control of invasive species, and to minimize the economic, ecological, and human health impacts that invasive species cause. The Order states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations and provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education of invasive species.

The Native American Graves and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue 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 New Jersey pursuant to the alternatives would be

registered with the EPA and the PCP of the NJDEP, 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.

New Jersey Wildlife Laws, Regulations, and Policies Regarding Bird Damage Management

<u>New Jersey Statutes Annotated (NJSA) Title 23 contains fish, game, and wildlife law for the State of New Jersey. Bird damage-related laws and regulations are summarized below:</u>

1. NJSA 23:2A - Establishes a list of wildlife species designated by the State of New Jersey as threatened and endangered. The law prohibits taking, possessing, transporting, exporting, processing, selling, or shipping listed species. "Take" is defined by the law as harassing, hunting, capturing, or killing, or attempting to do so. A separate New Jersey State law, the Endangered Plant Species List Act, (N.J.S.A. 13:1B *et seq*.) "finds and declares that plant species have medicinal, genetic, ecological, educational and aesthetic value to the citizens of New Jersey; [and] that the perpetuation of many plant species native to New Jersey or the United States is in jeopardy," and establishes an official state list of endangered plants.

2. NJSA 23:4-16(a) – Hunting, shooting, or pursuing wildlife from within or on a motor vehicle, or by the aid or use of a light on or attached to the vehicle, is not a legal means.
3. NJSA 23:4-16(d) - In order for any person, except the owner or lessee of a building, to possess a loaded firearm within 450 feet on any occupied building, for the purposes of hunting, taking (includes use of a shotgun to harass birds with 12 gauge pyrotechnics), or killing of any animal, written authorization from the owner/lessee is required.
4. NJSA 23:4-22 - The pole trap is not a legal method to catch birds (such as raptors) in NJ.
5. NJSA 23:4-50(e) - English sparrows and European starlings are not protected bird species.
6. NJSA 23:4-50(f) - NJ adoption of provisions of the Federal Depredation Order for blackbirds, grackles, and cowbirds (50CFR 21.43).
7. NJSA 23:4-53 - Wild or passenger pigeons and their nests and eggs are protected.
8. NJSA 23:4-63.3 and .4 - Except as authorized pursuant to a permit issued by the NJDFW, or as provided for by the "Administrative Procedures Act," it is not legal to release indigenous or exotic animals, including birds and their eggs and young, into the environment.
9. NJSA 23:4-63.5 and .6 - Agricultural landowners may use noise making and other mechanical devices to scare or repel damaging birds or other wildlife in order to prevent the damage and destruction of crops and other property. The NJDFW shall issue permits to authorize this use.

<u>NJSA Title 26 contains the health laws for the State of New Jersey. Law and regulations related to bird damage management are summarized below:</u>

1. NJSA 26:2-86 (Destruction or Removal of Certain Domestic Pigeons) – Notwithstanding the provisions of section 23:4-53 of the Revised Statutes or any other law, the State Department of Health or any local board of health within its jurisdiction may order and provide for the destruction or removal of escaped domestic pigeons that have become feral from any area or place upon a finding by the department or the board, as the case may be, that the presence of such escaped domestic pigeons in such area or place is hazardous to the health of any of the inhabitants of this state.

<u>NJSA Title 2C contains the New Jersey Code of Criminal Justice. Laws and regulations related to bird damage management are summarized below:</u>

1. NJSA 2C:39-5(c)(1) and 58-3 - A person in possession of a shotgun must first obtain a firearms purchaser identification card (FID). Exemptions to this are contained in NJS 2C:39-6, and include the provision that no FID is required "*To keep or carry any firearm about a person's place of business, residence, premises, or other land owned or possessed by him; a place of business shall be deemed a fixed location.*"

<u>The New Jersey Administrative Code (NJAC) contains regulations necessary to implement laws. Bird damage–related laws and regulations are summarized below:</u>

1. NJAC 7:25-3.1 - Describes the process for legal use of propane/acetylene/carbide exploders to harass birds and mammals away from agricultural crops. This process includes completion of an application, inspection of a site by NJDFW personnel, and issuance of a permit by the NJDFW. Only devices with a sound level no greater than 128 decibels at 100 feet from the device may be used.
2. NJAC 7:25-5.12 – Steel-jaw leghold type traps were outlawed in this state as of October 27, 1985.
3. NJAC 7:25-5.22(a)(1) – A person must obtain a permit from the NJDFW prior to administering chemical or biological substances (i.e., drugs, pesticides, vaccines, immobilizing drugs, growth stimulants) or affixing any device to free-ranging wildlife.
4. NJAC 7:25-5.22(b) - English sparrows, European starlings, and blackbirds may be taken without a permit when they are damaging crops or other property.
5. NJAC 7:25-5.22(b)(1) - Under the Federal Depredation Order 50 CFR 21.43, a person may kill yellow-headed, red-winged, bicolored red-winged, tricolored red-winged, and Brewer's blackbirds, cowbirds, all grackles, common crows and magpies when found committing or about to commit serious depredations upon any ornamental or shade tree, agricultural crops, livestock, or wildlife, or

when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. (With this regulation, the NJDFW adopts the provisions of Federal Depredation Order 50 CFR 21.43.)

6. NJAC 7:25-5.22(c) - The NJDFW may issue permits for the possession or taking of specific birds.
7. NJAC 7:25-5.23(b) - Identifies the requirements for a rifle permit if in possession of a rifle while conducting certain activities. In New Jersey, it is not legal to shoot any bird with a rifle.
8. NJAC 7:25-5.23(u) – The NJDFW may authorize WS to shoot wildlife with an air rifle (.22 caliber or smaller) or a rifle (.22 caliber or as approved by the NJDFW) as long as the method is specifically listed on a State Depredation Control Permit, Special Wildlife Management Permit and/or a federal Migratory Bird Damage Permit.
9. NJAC 7:25-5.32(a and b) – The NJDFW may issue Special Wildlife Management Permits for the taking of any game species (i.e., wild turkey), indigenous animal, exotic animal, potentially dangerous animal by any lawful manner and means. The NJDFW shall consider data such as damage being done to crops or property, the hazard posed to safe airport operations, the biological condition of the animal or any other special management problem.

Policies of the NJDFW regarding wildlife damage management:

1. Policy on Relocation of Wildlife. The Policy identifies situations and requirements pertaining to the relocation of wildlife in New Jersey. For birds, the policy supports continuation of current practices. Release of rehabilitated passerines is done at the rehabilitation center, and larger birds can be released off site in suitable habitat and at the appropriate time of the year. General release criteria include: 1) release should be as close to the capture/rehabilitation site as possible, 2) avoid overpopulating a given site with the same species, 3) vary release locations to minimize interaction with "nuisance" animals, 4) relocate nesting birds with their young, 5) do not release birds that are unlikely to survive, and 6) unreleasable birds should be euthanized. Landowner permission must be obtained prior to release/relocation of birds.

New Jersey Pesticide Laws

New Jersey's pesticide regulations, N.J.A.C. Title 7 Chapter 30, Subchapters 1-12, are implemented and enforced by the NJDEP, PCP. These regulations include processes and requirements for pesticide product registration (Subchapter 2), certification of pesticide dealers (2), licensing of pesticide dealer businesses (3), licensing of commercial pesticide operators (5) and applicators (6), licensing of pesticide applicator businesses (7), certification of private pesticide applicators (8), pesticide exposure management (9), pesticide use (10), grace period regulations (11), and agricultural worker protection (12). In order for WS to apply a restricted use pesticide as part of bird damage management in NJ, the product must be registered with the PCP, the applicator must be licensed, and if a fee is charged, the agency possess a NJ pesticide applicator business license. Additionally, label instructions, and all other pesticide and wildlife laws and regulations must be adhered to (e.g., possession of a depredation permit from the USFWS and/or the NJDFW to take the protected bird species). Pesticide products are registered annually, and applicator licenses are obtained and maintained through completion of training courses and examinations conducted through the PCP.

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 New Jersey 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 New Jersey 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 New Jersey that are currently being conducted under a MOU 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, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, wetlands, restoration sites, cemeteries, public parks, bridges, industrial sites, urban/suburban woodlots, hydro-electric dam structures, reservoirs and reservoir shore lands, nuclear, hydro and fossil power plant sites, substations, transmission line rights-of-way, landfills, on ship fleets, military bases, or at any other sites where birds may roost, loaf, 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 NJDFW. 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. In addition, Muscovy ducks can also be removed in New Jersey pursuant to a control order without the need for a permit. 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, pigeons, pheasants, turkeys, and mute swans are protected under New Jersey State law and the lethal take of those species requires a permit from the NJDFW or the NJDH for pigeons.

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[7] 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 NJDFW 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 with 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 NJDFW. 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 permit 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 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

[7] 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.

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 New Jersey were developed by WS in consultation with the USFWS and the NJDFW. The EA will also be made available to the public for review and comment to identify additional issues.

The issues as those issues relate to the possible implementation of the alternatives, including the proposed action alternative, are discussed in Chapter 4. The issues analyzed in detail are the following:

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, 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. 2012). 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 whether it is statistically significant.

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. 2012).

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 relative abundance data from the BBS to yield a population estimate (Rich et al. 2004). The Partners in Flight Science Committee (2013) updated the database in the past year to reflect current population estimates.

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 New Jersey lies within the Appalachian Mountains (Bird Conservation Region 28), the Piedmont (Bird Conservation Region 29), and the New England/Mid-Atlantic Coast (Bird Conservation Region 30) regions. The majority of the state lies within the New England/Mid-Atlantic Coast region.

The other Bird Conservation Region that dominates the northeastern United States is the Atlantic Northern Forest region (Bird Conservation Region 14) which encompasses most of Maine, Vermont, New Hampshire, and parts of New York, Massachusetts, and Connecticut. Although the Atlantic Northern Forest region does not include any of the land area of New Jersey, several of the bird species addressed in this EA have breeding colonies that occur within the region. Those bird species with nesting colonies in

the Atlantic Northern Forest region also cause damage or pose a threat of damage in New Jersey, especially during the migration periods. For example, several of the gull species addressed in this EA do not have breeding colonies in the state; however, those species often cause damage or pose threats of damage, primarily during the migration periods. Several of the analyses in Chapter 4 of this EA will address birds with breeding populations that occur primarily in the Atlantic Northern Forest region.

Atlantic Flyway Breeding Waterfowl Plot Survey

The Atlantic Flyway Technical Section initiated the Atlantic Flyway Breeding Waterfowl Plot Survey during 1989 across 11 northeast states ranging from New Hampshire to Virginia. The survey collects breeding population abundance data used to support effective management of eastern waterfowl breeding populations. Prior to the initiation of the survey, populations of waterfowl in the eastern part of the continent were managed based on data collected for mid-continent populations. The Atlantic Flyway Breeding Waterfowl Plot Survey has been described in detail by Heusmann and Sauer (1997, 2000), and involves monitoring 1-km plots apportioned randomly across physiographic strata. Plots are monitored once each year during the April/May nesting period by ground and/or aerial surveys. Observers record numbers and species of all waterfowl seen on the plot.

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 NJDFW. Those species addressed in this EA that have established hunting seasons include snow geese, Atlantic brant, wood ducks, gadwall, Eurasian wigeons, American wigeons, American black ducks, mallards, Northern shovelers, Northern pintails, canvasbacks, redheads, ring-necked ducks, green-winged teal, blue-winged teal, greater scaup, lesser scaup, king eiders, common eiders, surf scoters, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, ring-necked pheasants, wild turkeys, Northern bobwhite, common moorhens, American coots, American woodcocks, American crows, and fish crows.

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 NJDFW in published reports.

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

The issue of non-target species effects, including effects on T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. To reduce the risks of adverse effects to non-target wildlife, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing non-target species. 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 states that all federal agencies *"...shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* [Sec. 7(a)(1)]. WS conducts

Section 7 consultations with the USFWS to ensure compliance with the ESA and to ensure that *"any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species…Each agency shall use the best scientific and commercial data available"* [Sec. 7(a)(2)].

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. As part of the scoping process to facilitate interagency cooperation, WS consulted with the USFWS pursuant to Section 7 of the ESA during the development of this EA, which is further discussed in Chapter 4.

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

An additional issue often raised is the potential risks 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 are 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. In addition to the potential risks to the public associated with WS' methods, risks to employees would also be an issue.

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, 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 New Jersey, 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. An additional repellent being considered for use in this assessment is mesurol, which is intended for use to discourage crows from predating on eggs of T&E species; however, mesurol is currently not registered for use in New Jersey. In addition, 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.

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 NJDEP through the PCP, by the FDA, and by WS Directives.

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. The cooperator requesting assistance would be made aware through a MOU, cooperative service agreement, or a similar document that those devices agreed upon could potentially be used on property owned or managed by the cooperator. 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 New Jersey 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.

Effects of Not Employing Methods to Reduce Threats to Human Safety

An issue identified is the concern for human safety from not employing methods or not employing the most effective methods to reduce the threats that birds can pose. The risks to human safety from diseases associated with certain bird populations were addressed previously in Chapter 1 under the need for action section. The low risk of disease transmission from birds does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonoses. Not adequately addressing the threats associated with potential zoonoses could lead to an increase in incidences of injury, illness, or loss of human life.

Additional concern is raised with inadequately addressing threats to human safety associated with aircraft striking birds at airports. Birds have the potential to cause severe damage to aircraft and can threaten the safety of passengers. If the use of certain methods to address the threat of aircraft striking birds was limited or were excluded from use, the unavailability of those methods could lead to higher risks to passenger safety. This issue will be fully evaluated in Chapter 4 in relationship to the alternatives.

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.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate damage management for societal benefits could be compatible with animal welfare concerns, if *"…the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

According to the American Veterinary Medical Association (AVMA 1987), suffering is described as a *"…highly unpleasant emotional response usually associated with pain and distress."* However, suffering *"…can occur without pain…,"* and *"…pain can occur without suffering…"* Because suffering carries with it the implication of a time frame, a case could be made for *"…little or no suffering where death comes immediately…"* (California Department of Fish and Game 1991). Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

Defining pain as a component in humaneness appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain and identifying the causes that elicit pain responses in humans would "*…probably be causes for pain in other animals…*" (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (California Department of Fish and Game 1991).

The AVMA states "*...euthanasia is the act of inducing humane death in an animal*" and "*... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness*" (Beaver et al. 2001). Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild animals. The AVMA states that "[f]*or wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible*" (Beaver et al. 2001).

Pain and suffering, as it relates to methods available for use to manage birds has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *"…neither medical nor veterinary curricula explicitly address suffering or its relief"* (California Department of Fish and Game 1991). Research suggests that some methods can cause "*stress*". However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The decision-making process involves trade-offs between the above aspects of pain and humaneness. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering.

The issue of humanness and animal welfare concerns will be further discussed as those concerns relate to the methods available under the alternatives in Chapter 4. SOPs to alleviate pain and suffering are discussed in Chapter 3.

Issue 6 - Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

Another issue commonly identified is a concern that damage management activities conducted by WS would affect the ability of persons to harvest those species during the regulated hunting seasons either by reducing local populations through the lethal removal of birds or by reducing the number of birds present in an area through dispersal techniques. Those species addressed in this EA that can also be hunted during regulated seasons in the state include snow geese, Canada geese, Atlantic brant, wood ducks, gadwall, Eurasian wigeons, American wigeons, American black ducks, mallards, Northern shovelers, Northern pintails, canvasbacks, redheads, ring-necked ducks, green-winged teal, blue-winged teal, greater scaup, lesser scaup, king eiders, common eiders, surf scoters, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, ring-necked pheasants, wild turkeys, Northern bobwhite, common moorhens, American coots, American woodcocks, American crows, and fish crows. Potential impacts could arise from the use of non-lethal or lethal damage management methods. Non-lethal methods are used to reduce bird densities through dispersal in areas where damage or the threat of damage is occurring. Similarly, lethal methods could lower densities in areas where damage is occurring resulting in a reduction in the availability of those species during the regulated harvest season. WS' bird damage management activities would primarily be conducted on local populations in areas where hunting access is restricted (e.g., airports, urban areas) or has been ineffective. The use of non-lethal or lethal methods often disperses birds from areas where damage is occurring to areas outside the damage area, which could serve to move those bird species from those less accessible areas to places accessible to hunters.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were identified by WS and the USFWS during the scoping process of this EA. Those issues were considered by WS and the USFWS; 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 New Jersey 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 New Jersey 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 New Jersey 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 New Jersey. 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. The cost effectiveness of methods and the effectiveness of methods are linked. The issue of cost effectiveness as it relates to the effectiveness of methods is discussed further in Section 2.2 of this EA.

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 take 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 take 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. WS' assistance would not be additive to the environmental status quo since 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 or from projectiles passing through carcasses. 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 after being lethally taken 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 order to address potential health concerns associated with consuming waterfowl, waterfowl donated for human consumption may be tested for exposure to substances such as organophosphate and carbamate insecticides, lead, mercury, arsenic, organochlorines, and organic chemicals prior to distribution. The entity selecting the capture/euthanize (and donation for charitable consumption) program would be responsible for all costs associated with legal and appropriate donation 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.

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.

Impacts of Dispersing a Bird Roost on People in Urban/Suburban Areas

Another issue often raised is that the dispersal of birds from a roost location to alleviate damage or conflicts at one site could result in new damage or conflicts at a new roost site. While the original complainant may see resolution to the bird problem when the roost is dispersed, the recipient of the bird roost may see the bird problem as imposed on them. Thus, overall, there is no resolution to the original bird problem (Mott and Timbrook 1988). Bird roosts usually are dispersed using a combination of harassment methods including pyrotechnics, propane cannons, effigies, and electronic distress calls (Booth 1994, Avery et al. 2008, Chipman et al. 2008). A similar continuing conflict can develop when habitat alteration is used to disperse a bird roost. This concern is heightened in large metropolitan areas where the likelihood of birds dispersed from a roost, finding a new roost location, and not coming into conflict is very low. WS has minimized the impact of dispersing bird roosts in urban/suburban areas by evaluating a management option to depopulate the bird roost that is creating the conflict problem.

In urban areas, WS often works with the community or municipal leaders to address bird damage involving large bird roosts that are likely affecting several people. Therefore, WS often consults not only with the property owner where roosts are located, but also with community leaders to allow for community-based decision-making on the best management approach. In addition, funding is often provided by the municipality where the roost is located, which allows for bird damage management activities to occur within city limits where bird roosts occur. This allows roosts that have been relocated and begin to cause damage or pose threats to be addressed effectively and often times, before roosts become well established. The community-based decision-making approach to bird damage management in urban areas is further discussed under the proposed action alternative in Chapter 3. Therefore, this issue was not analyzed further.

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 based on the issues using the WS Decision model (Slate et al. 1992). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. SOPs for bird damage management in New Jersey 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:

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 New Jersey. 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 NJDFW, 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 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 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 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) could issue a depredation permit at the take levels requested, or 3) could 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 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 that would not be available for use by those persons experiencing bird damage is the avicide DRC-1339, the immobilizing drug alpha-chloralose, and the repellent mesurol, 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 New Jersey 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.

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind integrated wildlife damage management is to implement the best combination of effective management methods in a cost-effective[8] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. Integrated damage management may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion, vegetation management), animal behavior modification (e.g., scaring, repellents), removal of individual offending animals (e.g., trapping, shooting, and avicides), local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

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[9] 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.

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[8]The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

[9]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"*.

Appendix B contains a thorough discussion 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 New Jersey 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 2007 through FY 2012, WS conducted 3,643 technical assistance projects that involved bird damage to agricultural resources, property, natural resources, and threats to human safety in New Jersey (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 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 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 activities because wildlife damage management is about finding balance 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.

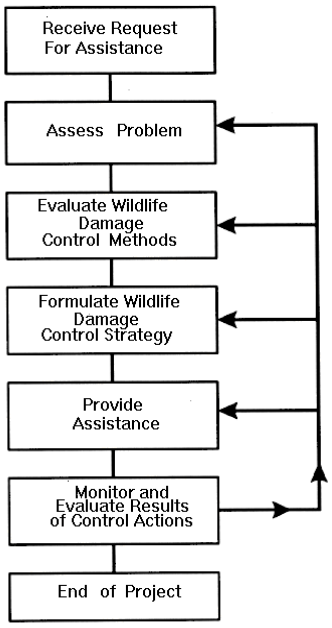


Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

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) 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 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 New Jersey 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 New Jersey (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 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 NJDFW, 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. 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, DRC-1339 for blackbirds and gulls, along with mesurol for crows (if registered by the state in the future), 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 and the USFWS; 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. Non-lethal methods have been effective in alleviating bird damage. For example, the use of non-lethal methods has been effective in dispersing urban crow roosts and vulture roosts (Avery et al. 2002, Seamans 2004, Avery et al. 2008, Chipman et al. 2008). In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. 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 NJDFW, 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 NJDFW. Therefore, the translocation of birds by WS would only occur as directed by those agencies. When requested by the USFWS and/or the NJDFW, 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 NJDFW, 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 NJDFW 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 individual 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 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 birds species.

- The take of birds would only occur when authorized by the USFWS, when applicable, and only at levels authorized.

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 and by 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.

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 NJDFW 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 NJDFW 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 NJDEP.

- 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 NJDFW.

- 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 NJDFW, 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.

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.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

- Personnel would be trained in the latest and most humane devices/methods for removing problem birds.

- 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.

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

- The NWRC is continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.

Issue 6 – Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

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

- WS' activities to manage damage and threats caused by birds would be coordinated with the USFWS and the NJDFW.

- WS' lethal take (killing) of birds would be reported to and monitored by the USFWS and/or the NJDFW to ensure WS' take is considered as part of management objectives for those bird species.

- WS would monitor bird damage management activities to ensure activities do not adversely affect bird populations.

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.

Cumulative Effects: Cumulative effects are discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and non-target species, including T&E species.

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 NJDFW.

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.

Double-Crested Cormorant Biology and Population Impacts

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). During the last 20 years, the cormorant population has expanded to an estimated 372,000 nesting pairs; with the population (breeding and non-breeding birds) in the United States estimated to be greater than one million birds (Tyson et al. 1999). The USFWS estimated the continental population at approximately two million cormorants during the development of the cormorant management FEIS (USFWS 2003). Tyson et al. (1999) found that the cormorant population increased about 2.6% annually during the early 1990s. The greatest increase was in the Interior region which was the result of a 22% annual increase in the number of cormorants in Ontario and those states in the United States bordering the Great Lakes (Tyson et al. 1999). From the early 1970s to the early 1990s, the Atlantic population of cormorants increased from about 25,000 pairs to 96,000 pairs (Hatch 1995). While the number of cormorants in this region declined by 6.5% overall in the early to mid-1990s, some populations were still increasing during this period (Tyson et al. 1999). The number of breeding pairs of cormorants in the Atlantic and Interior population was estimated at over 85,510 and 256,212 nesting pairs, respectively (Tyson et al. 1999).

Cormorants are most commonly found in New Jersey during the spring, summer, and fall months when the breeding and migrating populations are present (Wires et al. 2001, USFWS 2003). Cormorants found in New Jersey during those periods are comprised of birds from the Atlantic populations of cormorants (Tyson et al. 1999, USFWS 2003). Breeding populations of cormorants in New Jersey occur primarily along the coast. Breeding habitat includes lakes, rivers, swamps, and seacoasts where nesting can occur on the ground, in trees, and on coastal cliffs (MANEM Waterbird Management Plan 2006). The number of cormorants observed in the state along routes surveyed during the BBS has shown an increasing trend since 1966 estimated at 5.3% annually, with a 9.9% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). In the New England/Mid-Atlantic Coast BBS region, the number of cormorants observed during the BBS has shown an increasing trend estimated at 12.3% annually since 1966 (Sauer et al. 2012). Since 1966, the number of cormorants observed during the CBC has shown a general increasing trend in New Jersey (NAS 2010). The current breeding population in New Jersey is unknown.

Blackwell et al. (2000) examined the relationship between the number of fish-eating birds reported killed under depredation permits issued by the USFWS to aquaculture facilities in New York, New Jersey, and Pennsylvania and population trends of those bird species lethally taken within those respective states. Blackwell et al. (2000) found that the USFWS issued 26 depredation permits to nine facilities from 1985

through 1997 allowing the lethal take of eight species of fish-eating birds, but only six species were reported killed to reduce aquaculture damage. Those species lethally taken under those permits included black-crowned night herons, double-crested cormorants, great blue herons, herring gulls, ring-billed gulls, and mallards. The number of birds reported killed, relative to systematic long-term population trends, was considered to have had negligible effects on the population status of those species (Blackwell et al. 2000).

From FY 2007 through FY 2012, WS lethally removed three and dispersed ten cormorants in the stateto alleviate damage or threats (see Table 4.1). In addition to the limited take occurring by WS, the take of cormorants can also occur by other entities in New Jersey through the issuance of a depredation permit by the USFWS and the NJDFW.

Table 4.1 – Number of double-crested cormorants addressed in New Jersey from FY 2007 to FY 2012

Year	Dispersed by WS[1]	Take by Entity		
		Authorized Take[2]	WS[1]	Total Take by All Entities[2]
2007	0	55	0	13
2008	0	55	0	8
2009	0	75	0	8
2010	1	155	0	11
2011	5	165	1	25
2012	4	170	2	14
TOTAL	**10**	**675**	**3**	**79**

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

Although only limited cormorant damage management activities have been conducted by WS in New Jersey, WS anticipates the number of requests for assistance to manage damage caused by cormorants will increase based on the increasing number of cormorants observed during the breeding season and overwintering within the state and based on the increasing assistance by WS at airports and military installations. If an increase in the number of requests for assistance occurs, under the proposed action, the number of cormorants lethally taken annually by WS would also likely increase to address those requests for assistance. Based on increasing trends in the number of cormorants observed during the development of this EA and increasing requests for assistance, WS anticipates that up to 150 cormorants and 50 cormorant nests (with eggs) could be lethally taken by WS annually to alleviate damage under depredation permits.

The USFWS predicted through the analyses that the authorized take of cormorants and their nests and eggs for the management of double-crested cormorant damage, including those taken in New Jersey, was anticipated to have no significant impact on regional or continental double-crested cormorant populations (USFWS 2003, USFWS 2009). This includes cormorants that may be killed under USFWS issued depredation permits. Cormorants are a long-lived bird and nest/egg destruction programs are anticipated to have minimal effects on regional or continental cormorant populations (USFWS 2003).

WS' proposed take of up to 150 cormorants and 50 nests (including eggs) annually to address damage and threats falls within the parameters of take evaluated within the cormorant management FEIS (USFWS 2003, USFWS 2009). The average annual take of cormorants in the state by all entities has been 13 since 2007. If WS' anticipated take of up to 150 cormorants were included with the average take by all entities from 2007 through 2012 of cormorants, the combined take would be below the level of take analyzed in the FEIS. The highest level of take occurred in 2011 when 25 cormorants were lethally removed. When

the proposed take of 150 cormorants by WS is included with the highest level of take that has occurred in the state in 2011, the total take would be 175 cormorants, which would still be below the take level analyzed in the cormorant management FEIS.

Great Blue Heron Biology and Population Impacts

Great blue herons are a common widespread wading bird that can be found throughout most of North America and can be found year-round in most of the United States, including New Jersey (Butler 1992). Great blue herons are most often located in freshwater and brackish marshes, lakes, rivers, and lagoons (MANEM Waterbird Conservation Plan 2006).

Most nesting great blue heron colonies in the northeastern United States occur along the coastal areas located in BCR 14 and BCR 30. The majority of New Jersey lies within BCR 30. In BCR 14, the breeding population has been estimated at 12,000 herons while the breeding population in BCR 30 has been estimated at nearly 31,000 herons (MANEM Waterbird Conservation Plan 2006). Between 1966 and 2011, the number of herons observed in New Jersey during the BBS has shown an increasing trend estimated at 2.2% annually, which is statistically significant (Sauer et al. 2012). The number of herons observed in the New England/Mid-Atlantic Coast region of the BBS has increased annually since 1966 estimated at 2.7% from 1966 through 2011 (Sauer et al. 2012), also a statistically significant trend. CBC data from 1966 through 2011 shows an increasing trend for great blue herons wintering in New Jersey (NAS 2010). The current breeding population of herons is unknown in New Jersey.

In 2006, the breeding population of great blue herons was estimated at 42,232 breeding pairs or 84,464 adult herons in the northeastern United States (MANEM Waterbird Conservation Plan 2006). The overall population objective for herons in the northeastern United States is to maintain current population levels (MANEM Waterbird Conservation Plan 2006). In BCR 14, the breeding population of great blue herons was estimated at 11,662 breeding pairs in 2006 with the breeding population trend in the MANEM showing a "*large increase*" (MANEM Waterbird Conservation Plan 2006). In BCR 14 and BCR 30, which likely represents the herons that would be present in New Jersey, the MANEM Waterbird Conservation Plan (2006) assigned the great blue heron population a conservation status category of "*lowest concern*". The NJDFW lists great-blue herons as a species of *"special concern"* when it pertains to breeding status.

During the past few years, WS has received requests to provide direct operational assistance associated with great blue herons that pose aircraft strike risks to airports and military installations. In FY 2011, WS employed methods to lethally remove four herons and live-captured and translocated one heron to alleviate strike risks at airports (see Table 4.2). During FY 2012, WS used non-lethal methods to disperse six herons and lethally removed five herons that were posing strike risks at airports.

The USFWS and the NJDFW have also issued depredation permits to other entities in New Jersey for the take of herons to alleviate damage or threats of damage. As shown in Table 4.2, herons were lethally taken by other entities to alleviate damage or threats associated with great blue herons from 2007 through 2012. On average, 43 herons have been lethally taken under depredation permits to alleviate damage or threats from 2007 through 2012. The highest level of take occurred in 2011 when 54 herons were lethally removed pursuant to depredation permits issued by the USFWS and the NJDFW.

Table 4.2 – Number of great blue herons addressed in New Jersey from FY 2007 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits

		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	0	70	0	45
2008	0	70	0	42
2009	0	70	0	46
2010	2	70	0	40
2011	1	90	4	54
2012	6	130	5	28
TOTAL	**9**	**500**	**9**	**255**

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

To address requests for assistance to manage damage associated with great blue herons in the future, up to 150 herons and 50 nests (and eggs) could be lethally taken annually by WS to alleviate damage and threats of damage. The increased level of take analyzed when compared to the take occurring by WS previously would be in anticipation of requests to address threats of aircraft strikes at airports and military installations; as well as to reduce damage to natural resources, such as nest site competition between herons and other colonial nesting waterbirds, and at aquaculture facilities.

The number of great blue herons present in New Jersey at any given time likely fluctuates throughout the year. If the average annual take of herons by other entities were reflective of take that could occur in the future, the combined WS' take and take by other entities would total nearly 200 herons. When included with the highest heron take that occurred by all entities of 54 herons in 2011, take of up to 150 herons and 50 nests (and eggs) by WS annually would total 204 herons lethally taken. The USFWS and the NJDFW has authorized take of up to 130 herons in 2012. If 130 herons were removed by other entities, the combined take between WS and other entities would be 280 herons.

Given the increasing population trends observed for herons in the region, the limited take proposed by WS when compared to the estimated breeding population, the magnitude of WS' estimated take could be considered low. The permitting of take by the USFWS and the NJDFW ensures the cumulative take of herons in the northeastern United States, including the take proposed by WS in New Jersey under this assessment, would not reach a magnitude where undesired adverse effects would occur. The take of herons by WS would occur within allowed levels of take permitted by the USFWS and the NJDFW.

Great Egret Biology and Population Impacts

Great egrets can be found in freshwater, estuarine, and marine wetlands (Mccrimmon, Jr. et al. 2011). Since the initiation of the BBS in 1966, the number of egrets observed along routes surveyed in New Jersey has shown an increasing trend estimated at 3.9% annually, which is a statistically significant upward trend (Sauer et al. 2012). From 2001 to 2011, the number of great egrets observed in the state during the BBS has shown an increasing trend estimated at 4.2% annually (Sauer et al. 2012). New England/Mid-Atlantic Coast region BBS information also reflects an increasing trend estimated at 4.2% annually, which is statistically significant (Sauer et al. 2012). Across all BBS routes surveyed in the United States, the number of great egrets observed during the survey has shown an increasing trend estimated at 2.5% annually since 1966, with a 4.9% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The number of great egrets observed in areas surveyed during the CBC in the state has also shown an increasing trend since 1966 (NAS 2010). However, trending information indicates great egrets overwintering in New Jersey can be cyclical.

Of the five tiers of action levels for waterbirds in the southeastern United States, great egrets were assigned to the planning and responsibility tier which includes birds that require some level of planning to

maintain sustainable populations in the region (Hunter et al. 2006). The planning and responsibility tier is the second lowest tier in terms of action priority ahead of only the last tier which includes those waterbirds that are considered above management levels and could require population management (Hunter et al. 2006). The North American Waterbird Conservation Plan classifies the great egret in a category of conservation concern considered as not currently at risk (Kushlan et al. 2002).

Like other waterbirds addressed in this assessment, great egrets can cause damage to aquaculture and create threats to human health and safety, by posing a risks to aviation operations. To address damages and threats associated with great egrets; the USFWS and the NJDFW have issued depredation permits pursuant to the MBTA that allow the take of egrets to manage damage and threats of damage. The total take of great egrets per year under depredation permits issued by the USFWS and the NJDFW from 2007 through 2012 are shown in Table 4.3 along with the dispersal and take of great egrets by WS to alleviate damage or threats of damage. The highest level of take occurred in 2012 when 24 egrets were lethally taken by all entities. WS' highest level of take also occurred in FY 2012 when 18 egrets were taken to alleviate damage and threats of damage. WS has dispersed 29 great egrets between FY 2007 and FY 2012. Based on previous and current levels of take by WS to alleviate damage and threats of damage associated with great egrets, WS anticipates that up to 150 great egrets could be lethally taken by WS and up to 50 nests (including eggs) could be destroyed to minimize damage and threats of damage. Similar to great blue herons, the increased level of take analyzed when compared to the take that has occurred by WS previously would be in anticipation of requests to address damage to aquaculture and natural resources, such as nest site competition between egrets and other colonial nesting waterbirds, and threats to aviation operations.

Table 4.3 – Number of great egrets addressed in New Jersey from FY 2007 to FY 2012

		Take under Depredation Permits		
Year	**Dispersed by WS[1]**	**Authorized Take[2]**	**WS' Take[1]**	**Total Take by All Entities[2]**
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	9	0	0	0
2011	3	10	5	10
2012	17	75	18	24
TOTAL	**29**	**85**	**23**	**34**

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

Given the increasing population trends observed for egrets in the region, the limited take proposed by WS when compared to the estimated breeding population, the magnitude of WS' estimated take could be considered low. The permitting of the take by the USFWS ensures the cumulative take of egrets in the northeastern United States, including the take proposed by WS in New Jersey under this assessment, would not reach a magnitude where undesired adverse effects would occur. The take of egrets by WS would occur within allowed levels of take permitted by the USFWS and the NJDFW.

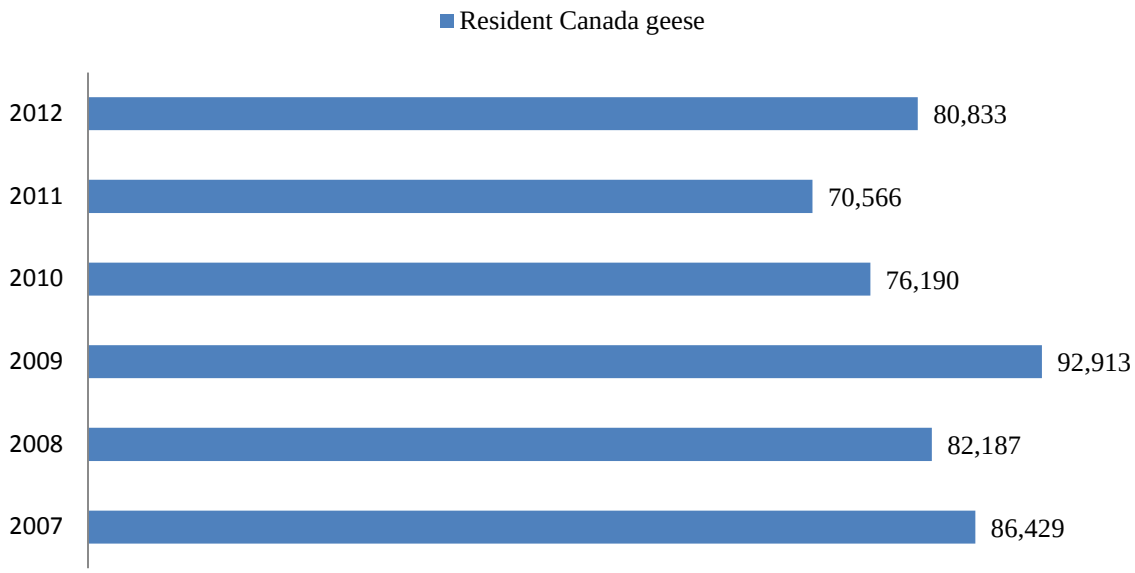
Canada Goose Biology and Population Impacts

Canada geese are one of the most readily recognized and observable birds in New Jersey. They can live approximately 20-25 years in the wild. There are two behaviorally-distinct types of Canada goose populations in New Jersey: resident and migratory. Although they may appear similar, they exhibit many different behaviors that affect the management of these birds. Typically resident geese are those that nest

south of the Canadian border. Migratory geese nest north of the Canadian border, migrating south beginning in October and returning back to Canada by March to begin nesting.

In the winter, resident geese may move south during cold weather. Additionally, resident geese from states further north may move into New Jersey at these times. Resident geese are found throughout New Jersey year-round and their populations have been estimated as low as 70,566 and as high as 92,913 between 2007 and 2012 (NJDFW 2014*c*), with an average of 81,520 estimated during this time period (Figure 4.0).

Figure 4.0 Resident Canada Goose Population in New Jersey 2007-2012



The establishment of resident Canada geese in New Jersey is not well documented (Atlantic Flyway Council 2011). However, resident geese are believed to have originated from the release and/or escape of captive birds from private waterfowl breeders and hunters as well as through purposeful introductions within the state and from adjacent states. These birds provided aesthetic and recreational values, but they are also associated with many damage and nuisance problems. As the number of resident geese increased in the late 1970's and 1980's federal wildlife agencies, with state assistance, captured molting resident geese and transferred them to several southern states. After 1984, there was a prohibition on trap and transfer operations due to an avian influenza outbreak (Atlantic Flyway Council 2011).

The population is monitored through the Atlantic Flyway Breeding Waterfowl Plot Survey (AFBWPS). Population estimates derived during this survey indicate that within New Jersey, resident geese doubled from the outset of the survey in the early 1990's to the late 1990's where it has remained relatively stable with an annual mean of 92,000 geese. Resident geese are most dense in suburban habitats within the Piedmont and Highlands physiographic zones. During the mid-1990's Walsh et al. (1999) conducted comprehensive census of breeding birds in the state. Presence or absence was documented during the spring in 852 survey blocks. Canada geese were well distributed throughout the state being encountered in 686 of the 852 total blocks. Resident geese were found in more than 85% of the survey blocks in all regions of the state except in the core of the Pine Barrens and in the Outer Coastal Plain (Atlantic Flyway Council 2011).

The New Jersey resident Canada goose population objective is 41,000 birds as measured in the AFBWPS. This is the same statewide population objective as published in the 1999 AFRP Canada Goose Management Plan. This population objective is based on a mean population from the early 1990's when damage and nuisance complaints were at more tolerable levels. In deriving this population objective, consideration was given to maintaining the significant aesthetic and recreational benefits these birds provide, while reducing damage problems as well as concerns about human health and safety (Atlantic Flyway Council 2011).

Migratory geese pass through or remain in New Jersey from October through March. Mid-winter waterfowl surveys conducted by the NJDFW indicate that for 2012, the mid-winter goose population in New Jersey totaled 187,685 migratory and resident birds. Migratory Canada geese, which occur in New Jersey during the winter, belong to the North Atlantic Population and the Atlantic Population, both of which nest north of the Canadian border.

The majority of Canada goose damage complaints in New Jersey involve accumulations of feces on lawns and walkways at homes, schools, hospitals, corporate campuses, and public parks. Goose feces damage property, compromise overall quality of life, and have the potential to pose serious health threats due to the presence of disease-causing organisms. Other damage associated with geese includes overgrazing of lawns and recreational fields, and goose aggression and human injury during the nesting season. Agricultural damage caused by Canada geese includes crop depredation to sweet and field corn, soybeans, winter wheat, rye, clover, sod, vegetables, and other crops. This damage reduces yield and may increase erosion. Natural resources such as native wetland habitats (wild rice) and wetland restoration sites (moist-soil impoundments) may also be damaged by goose grazing activities that remove and trample vegetation. Additionally, Canada geese may pose serious flight safety hazards at airports. Due to their large body size, flocking behavior, and relative abundance in urban/suburban areas, geese have the potential to be involved in damaging bird-aircraft strikes that have resulted in loss of human lives, injuries, and substantial financial losses.

Canada geese are migratory game birds that are afforded federal and state protection. In New Jersey, goose populations are managed by the USFWS and the NJDFW pursuant to the MBTA, Federal Regulations (50 CFR 10, 13, 20 & 21), NJ Statutes Annotated Title 23, the NJ Game Code, and other federal and state laws, regulations, policies, and court rulings. Procedures, such as handling nests and eggs, capturing and relocating birds, capturing and euthanizing birds, shooting birds to reduce damage, and any other activity that includes handling birds, their parts, and/or their nests and eggs requires compliance with these laws. A depredation permit is generally required to conduct any of these activities. Table 4.4 addresses the number of Canada geese removed under depredation permits in New Jersey from FY 2007-FY 2012.

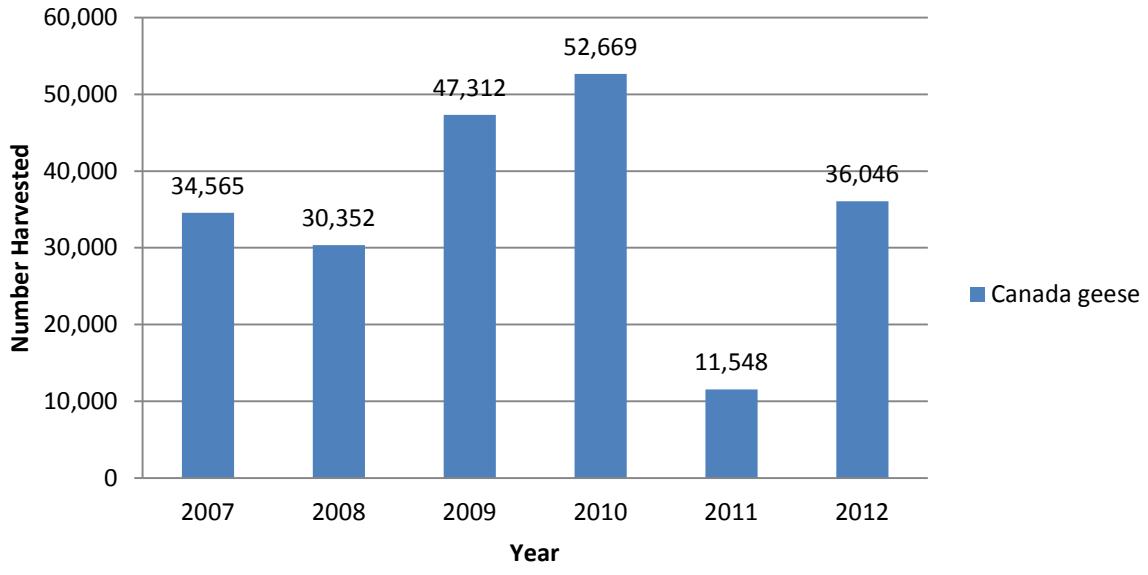
Table 4.4 – Number of Canada geese addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	1,771	14,641	1,286 + 353 nests/1,786 eggs	3,047
2008	1,028	16,918	2,183 + 487 nests/2,506 eggs	5,516
2009	1,210	19,876	1,957 + 554 nests/2,710 eggs	7,351
2010	2,641	23,292	3,305 + 890 nests/4,340 eggs	5,116
2011	49,691	21,316	2,634 + 868 nests/4,344 eggs	5,862
2012	49,651	20,627	1,896 + 775 nests/3,843 eggs	5,260
TOTAL	**105,992**	**116,670**	**13,261 + 3,927 nests/19,529 eggs**	**32,152**

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

Like many waterfowl species in New Jersey, Canada geese can be harvested during regulated hunting seasons. Canada geese can be harvested during a regular hunting season that traditionally occurs from late January through mid-February. They can also be harvested during a special "Resident Canada goose Hunting Season" that occurs during the month of September. Since migrant geese do not arrive in New Jersey until October, this hunt targets the overabundant resident goose population in New Jersey. During this hunting season, additional hunting methods including the use of electronic calls, unplugged shotguns, extended hunting hours and liberal bag limits are allowed. Figure 4.1 depicts the total number of hunter harvested geese between 2007 and 2012.

Figure 4.1 - Canada geese harvested annually in New Jersey, 2007-2012



Based on increasing requests for service, WS anticipates removal of up to 5,000 Canada geese annually. If up to 5,000 Canada geese were lethally taken by WS in New Jersey, WS' take would represent 6.0% of the average resident goose population (n=81,520) estimated in the state between 2007 and 2012. The New Jersey resident Canada goose population objective is 41,000 birds as measured in the AFBWPS. Based on a population objective of 41,000 resident birds, up to 40,520 geese could be taken annually to reach managable population levels. The proposed total take of Canada geese by WS (n=5,000) evaluated in this assessment when included with the average annual take (n=5,359) by all other entities between 2007 and 2012 would total 10,359 geese. This total would not exceed the level necessary to cause a decline in Canada goose populations as measured in the AFBWPS and would be way below the purposed population objective of 41,000 geese. WS does not typically remove geese during the migratory period; however, occasionally minimal numbers of geese are removed during this period at airports for the protection of human safety. This minimal removal is not expected to adversely affect migratory goose populations.

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 NJDFW through depredation permits issued to WS. Between 2007 and 2012, the number of goose nests destroyed in New Jersey by WS annually has ranged from as low as 353 nests in 2007 to as high as 890 nests in 2010. Nest destruction methods (i.e., treatment of eggs in the nest) are considered non-lethal when conducted before the development of an embryo. From FY 2007 to FY 2012, 3,927 nests were removed by WS in New Jersey to alleviate damage and reduce threats. The destruction/treatment of up to 6,000 Canada goose nests annually by WS would occur in localized areas where nesting takes place. As with the lethal take of geese, the take of nests must be authorized by the USFWS and the NJDFW. Therefore, the number of geese lethally removed and the number of nests taken by WS annually would occur at the discretion of the USFWS and the NJDFW. Provided that the goose population allows for an annual hunting harvest and WS' take is a fraction of a percent of the annual harvest, the cumulative take will not adversely affect Canada goose populations. WS' take could be considered of low magnitude when compare to the number of geese observed in New Jersey annually and will not hinder the ability of those interested persons to harvest geese during the hunting season.

Snow Goose Biology and Population Impacts

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 New Jersey. However, snow geese are common migrants through New Jersey with large concentrations of snow geese overwintering in the state (Mowbray et al. 2000). 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). The number of snow geese observed overwintering in the state has shown a general increase since 1966. The number of snow geese observed during the CBC conducted in the state from 2002 through 2011 has ranged from 96,792 snow geese to a high of 299,580 snow geese observed (NAS 2010). On average, 179,413 snow geese were observed annually during the CBC conducted from 2002 through 2011 (NAS 2002). During the 2012 USFWS Atlantic Flyway midwinter survey, 75,400 snow geese were observed in New Jersey (Klimstra and Padding 2012). The average number of snow geese observed in New Jersey during midwinter surveys from 2008 through 2012 has been 96,918 geese (Klimstra and Padding 2012).

Like many other waterfowl species, snow geese can be harvested during regulated hunting seasons, including those in New Jersey. Snow geese can be harvested during a regular hunting season that traditionally occurs during the fall migration period of waterfowl. Snow geese can also be harvested during their spring migration period under a Conservation Order established by the USFWS that includes New Jersey (see 50 CFR 21.60), which was authorized under the Arctic Tundra Habitat Emergency

Conservation Act (Public Law 106-108, Nov. 24, 1999, 113 Stat. 1491). The Conservation Order is intended to allow for the maximum number of snow geese to be taken annually in attempts to reduce the overall population of snow geese. Snow goose populations have increased dramatically since the mid-1970s and have reached historic highs across their breeding and wintering range. The current population level of snow geese has led to damage of fragile Arctic habitats on their breeding grounds from overgrazing. The greater snow goose population is monitored on spring staging areas near the St. Lawrence Valley in Quebec, Canada.

Under current regulations in New Jersey, snow geese can be harvested during a regular season which extends from October to February and during the Conservation Order season that extends from February through mid-April. During the regular harvest season, up to 25 geese can be removed daily with no possession limit. Under the Conservation Order season, there is no daily limit and no possession limit for snow geese (NJDFW 2013*a*). During the 2011 snow goose hunting season, an estimated 4,130 birds were harvested in the state, which compares to 4,060 birds harvested during the 2012 hunting season (Raftovich et al. 2012).

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. Based upon past requests for WS' assistance and in anticipation of additional efforts to reduce threats associated with snow geese, WS anticipates that no more than 300 snow geese could be lethally taken by WS annually under the proposed action. All take 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 take would occur as an agent of the cooperating entity under the depredation permit. WS has not received requests for direct operational assistance associated with snow geese previously; however, the increasing concentrations of snow geese combined with their large body size has potential to create hazards to aviation in New Jersey.

The average number of snow geese observed during the CBC conducted in the state since 2002 has been 179,413 geese. Take of up to 300 snow geese by WS to alleviate damage or threats would represent 0.2% of the average number of geese observed since 2002. WS' proposed take combined with the 2012 hunting harvest would represent 2.5% of the average wintering population. Provided that the snow goose population allows for an unlimited annual hunting harvest and WS' take is a fraction of a percent of the annual harvest, the cumulative take will not adversely affect goose populations.WS' take could be considered of low magnitude when compare to the number of snow geese observed in New Jersey annually.

Given the unlimited take allowed during the hunting seasons for snow geese and the desire of management agencies to reduce the overall population of snow geese to alleviate damage occurring to fragile habitat on their breeding grounds (USFWS 2007), the limited take proposed by WS to alleviate damage and threats would not adversely impact snow goose populations. WS' limited proposed take would not hinder the ability of those interested persons to harvest snow geese during the hunting seasons. WS' proposed take would be a limited component of the overall take occurring of snow geese.

Atlantic Brant Biology and Population Impacts

Brant are known as long distance migrants with wintering populations occurring along the west and east coastlines of North America. Along the Atlantic Coast, brant can be found during the winter from Massachusetts to North Carolina, including New Jersey (Reed et al. 1998). Most of the brant found along the Atlantic Coast nest on islands of the eastern Canadian Arctic (USFWS 2011). Brant begin arriving in

New Jersey during the fall migration in late October and early November; however, brant have arrived in New Jersey as early as mid-September (Reed et al. 1998). The spring migration northward generally begins in April and May (Reed et al. 1998).

During the Midwinter Waterfowl Survey conducted by the USFWS, 149,157 brant were observed along the Atlantic Flyway in 2012, which was 0.2% higher than the total for 2011 (Klimstra et al. 2012). During the Midwinter Waterfowl Survey conducted by the USFWS in 2012, 69,560 brant were observed in New Jersey (Klimstra et al. 2012). The number of brant observed in New Jersey in areas surveyed during the CBC has shown a general increasing to stable trend between 1966 and 2011 (NAS 2010). Between 2002 and 2011, an average of 39,552 brant have been observed in areas surveyed during the CBC, ranging from a high of 58,415 brant observed in 2008 to a low of 24,645 brant in 2009.

Like other waterfowl species, Atlantic brant maintain a sufficient population density to allow for annual hunting seasons that are established by the USFWS and implemented by the NJDFW. Under current regulations in New Jersey, brant can be harvested during a regular season which extends from October to January depending on zone location. During the regular harvest season, two brant can be harvested daily (NJDFW 2013*a*). During the 2011 hunting season, an estimated 2,770 brant were harvested in New Jersey, which compares to 8,787 brant harvested during the 2012 hunting season (Raftovich et al. 2013).

WS has previously removed and dispersed brant at a New Jersey airport. Similar to snow geese, brant are present in large concentrations which could pose aircraft strike risks if large groups of brant occur on or near civil or military airports. Therefore, WS anticipates additional requests for assistance to alleviate strike risks associated with brant at airports and other damage sites. If requested, WS anticipates that up to 150 brant could be lethally removed by WS annually to alleviate risks to human safety and property.

The average number of brant observed during the CBC in the state since 2002 has been 39,552 brant. Take of up to 150 brant by WS to alleviate damage or threats would represent 0.4% of the average. WS' proposed take combined with the 2012 hunting harvest would represent 23% of the average wintering population. Provided that the brant population allows for an annual hunting harvest and WS' take is a fraction of a percent of the annual harvest, the cumulative take will not adversely affect brant populations.WS' take could be considered of low magnitude when compare to the number of brant observed in New Jersey annually and will not hinder the ability of those interested persons to harvest brant during the hunting season.

Mute Swan Biology and Population Impacts

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 of captive birds. Mute swan populations have shown an increasing trend across their range from 1966 through 2011 (Sauer et al. 2012). 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. Fenwick (1983) found that female mute swans in Chesapeake Bay consumed 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 Des Plains, Illinois when he was attacked by a mute swan that knocked him out of his kayak (Golab 2012).

Mute swans are considered a non-native species under the MBTA, as amended by the Migratory Bird Treaty Reform Act of 2004. Therefore, mute swans are afforded no protection under the Act. 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.

In 2003, the Atlantic Flyway Council adopted a Mute Swan Management Plan with the goals of reducing mute swan populations in the flyway to levels that would minimize negative impacts on wetland habitats and native waterfowl, and prevent range expansion into unoccupied areas. To minimize negative impacts on wetlands and native waterfowl, the Plan called for a reduction of the mute swan population in the Atlantic Flyway to less than 3,000 swans by 2013 (Atlantic Flyway Council 2003). During a survey conducted along the Atlantic Flyway in 2008, the population of mute swans was estimated at 10,541 swans, with 1,253 swans occurring in New Jersey (Atlantic Flyway Council 2009). In 2012, the Atlantic Flyway Breeding Waterfowl Plot Survey estimated 30,606 mute swans in those areas surveyed along the Atlantic Flyway, with approximately 4,093 swans occurring in New Jersey (Klimstra and Padding 2012).

The management objective for mute swans in New Jersey is a statewide population of 500 swans (Atlantic Flyway Council 2003). A hunting season has not been established for mute swans, and a permit from the NJDFW is required to lethally remove swans. Trend data from the BBS shows the number of mute swans observed along routes surveyed in New Jersey is increasing annually, estimated at 5.0% since 1966 (Sauer et al. 2012). As with domestic and feral waterfowl, any reduction of the mute swan population in New Jersey, even to the extent of complete eradication from the natural environment, could be considered as providing some benefit to native waterfowl species and ecosystems.

Between FY 2007 and FY 2012, WS has employed non-lethal methods to disperse 134 mute swans and destroyed 33 nests containing 170 eggs to alleviate damage, as shown in Table 4.5. In addition, WS was requested to employ lethal methods to remove 161 swans from FY 2007 through FY 2012, with the highest annual take level occurring in FY 2011 when 61 swans were lethally removed.

Table 4.5 – Number of mute swans addressed in New Jersey from FY 2007 to FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	0	0
2008	0	0
2009	51	57
2010	14	12
2011	34	61
2012	35	31
TOTAL	**134**	**161**

[1] Data reported by federal fiscal year

Based on the desire by federal and state natural resource agencies to limit the expansion of mute swans and to further reduce the population in New Jersey to meet the population objectives established for the Atlantic Flyway and to address further requests for assistance in reducing damage and threats of damage, WS could be requested to remove up to 500 mute swans and 300 mute swan nests (and eggs) annually under the proposed action alternative. Based on a statewide population estimated at 4,093 swans, the

lethal removal of up to 500 mute swans by WS would be 12.2% of the estimated population. Any take by WS would occur within the current management objectives established in the Atlantic Flyway and any future management objectives, including those established by the NJDFW. The number of mute swans taken annually by other entities within New Jersey is currently unknown. However, cumulative take would occur within the management objectives for the Atlantic Flyway, including population objectives established for New Jersey.

Feral 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).

Many waterfowl of domestic or semi-wild genetic backgrounds have been released by humans into rural and urban environments, including numerous species of ducks, geese, and swans. Selective breeding has resulted in the development of numerous domestic varieties of the mallard duck that no longer exhibit the external characteristics or coloration of their wild mallard ancestors.

Domestic waterfowl have been purchased and released by property owners for their aesthetic value, but those released waterfowl may not always remain at the release sites; thereby, becoming feral. Feral waterfowl are defined as a domestic species of waterfowl that cannot be linked to a specific ownership. Examples of areas where domestic waterfowl have been released are 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.

Federal law does not protect domestic varieties of waterfowl (see 50 CFR 21), nor are domestic waterfowl specifically protected by state law in New Jersey. 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 taken 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 New Jersey.

The Muscovy ducks located in New Jersey 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 New Jersey. 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 New Jersey. 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.

From FY 2007 through FY 2012, the WS program in New Jersey lethally removed 127 domestic or feral waterfowl to reduce damage and threats of damage. In addition, WS destroyed 12 domestic or feral waterfowl nests and 219 eggs. Although no specific hunting season has been designated specifically for feral waterfowl, some domestic or feral waterfowl are taken during the annual hunting season for free-ranging waterfowl. During the 2010 waterfowl hunting season, an estimated 762 domestic mallards were harvested, while none were harvested during the 2011 season, and 201 were harvested during the 2012 season (Raftovich et al. 2012).

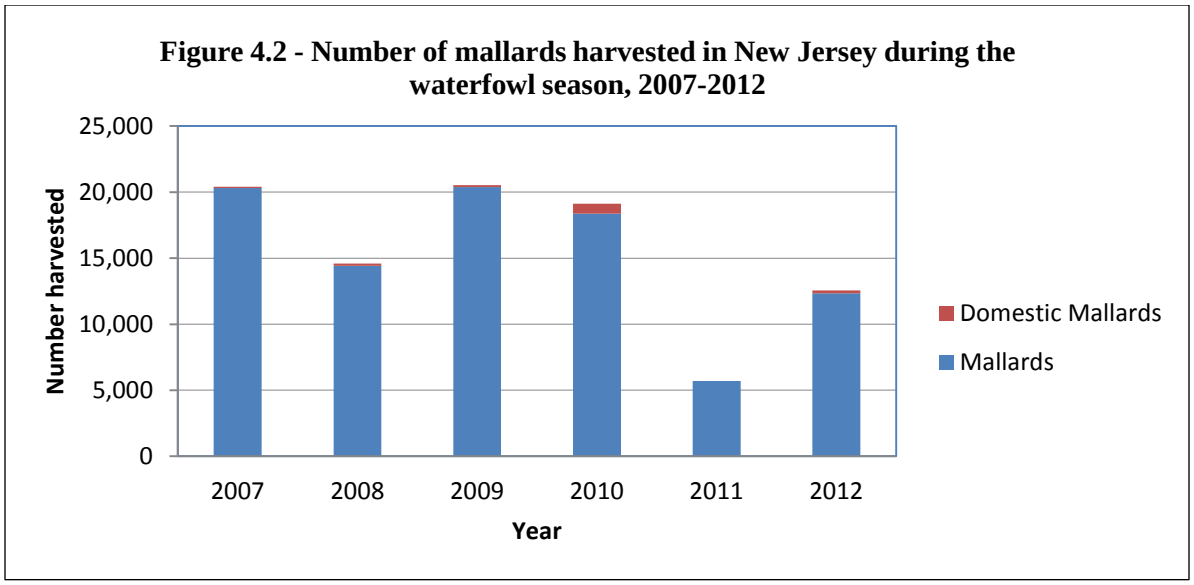
Based on previous requests for assistance and in anticipation of additional efforts, WS could lethally remove up to 300 feral ducks or feral geese and up to 200 feral waterfowl nests (and eggs) could be destroyed annually under the proposed action. Since feral waterfowl often compete with native wildlife species for resources, any take of feral waterfowl could be viewed as benefitting the natural environment. The number of feral waterfowl inhabiting New Jersey is currently unknown. However, based on the limited take proposed and the likely benefit to the natural environment that could occur, the lethal removal of up to 300 feral ducks or feral geese would not adversely affect populations of those feral species.

Mallard Biology and Population Impacts

In New Jersey, mallards can be found year-round (Drilling et al. 2002). The number of mallards observed in the state during the BBS has shown a stable trend since 1966, with minimal fluctuations occurring from 2001 through 2011 (Sauer et al. 2012). In the New England/Mid-Atlantic Coast region, an increasing trend has been observed with the number of mallards observed during the BBS increasing at a 2.0% annual rate since 1966, with a 0.3% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The Atlantic Flyway Breeding Waterfowl Plot Survey estimated the breeding population in New Jersey at 35,917 mallards in 2012, which corresponded with the estimated population of 35,151 mallards during the 2011 survey (Klimstra et al. 2012).

The number of mallards observed in the state during the CBC has shown a general increasing trend since 1966 (NAS 2010). The average number of mallards observed in areas surveyed during the CBC between the 2002 survey and the 2011 survey has been 21,593 birds. The lowest number observed occurred in 2003 when 16,417 mallards were observed. The highest number observed occurred in 2010 when 24,742 mallards were observed. The number of mallards observed in the state during the Midwinter Waterfowl Survey conducted in 2012 was estimated at 28,570 mallards (Klimstra et al. 2012). On average, 24,948 mallards have been observed during the Midwinter Waterfowl Survey conducted between 2007 and 2012 (Klimstra et al. 2012).

Like other waterfowl species, mallards can be harvested during a regulated season. The estimated numbers of mallards harvested from 2007 through 2012 during the annual hunting season are shown below in Figure 4.2. An estimated 5,708 mallards were harvested during 2011 and 12,344 mallards were harvested during the 2012 hunting season (Raftovich et al. 2013).



In addition to the take of mallards during the hunting season, a total of 123 mallards have been lethally removed by WS from FY 2007 through FY 2012. WS also destroyed two nests and 13 eggs during FY 2009 and one nest with 12 eggs during FY 2010. Under depredation permits, 224 mallards have been reported as lethally removed in the state from 2007 through 2012 by all entities issued permits by the USFWS. Based on the number of requests received for assistance previously and in anticipation of additional efforts to address damage or threats of damage, primarily at additional airports and military installations, an annual take of up to 300 mallards and 50 nests (and eggs) could occur under the proposed action. As with other waterfowl species, mallards can be found in large numbers during the winter and during the migration periods. When those large flocks occur on or near airports, they can pose aircraft strike risks.

As shown in Table 4.6, the USFWS has authorized a total lethal take of up to 2,420 mallards from 2007 through 2012. The highest level of take authorized was documented in 2010 when the USFWS permitted the potential take of 775 mallards to alleviate damage and threats of damage. If the USFWS authorized take of 775 mallards and WS lethally removed 300 mallards, the cumulative take would be 1,075 mallards.

Table 4.6 – Number of mallards addressed in New Jersey from FY 2007 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	0	295	0	11
2008	30	275	11	11
2009	17	350	0	19
2010	121	775	11	43
2011	267	275	20	52
2012	449	450	81	88
TOTAL	**884**	**2,420**	**123**	**224**

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

If up to 300 mallards were lethally taken by WS in New Jersey, WS' take would represent 0.8% - 0.9% of the breeding population estimated in the state during 2011 and during 2012. Take of up to 300 mallards

would represent 1.4% of the average number of mallards observed per year in areas surveyed during the CBC from 2002 through 2011. CBC data is best interpreted as an indication of long-term trends in the number of birds observed wintering in the state and is not intended to represent population estimates of wintering bird populations. However, the information is presented in this analysis and compared to WS' proposed take to indicate the magnitude of take occurring by WS when compared to the number of mallards observed during the CBC, which would be considered a minimum population estimate given the survey parameters of the CBC and the survey only covering a small portion of the state.

Take of 300 mallards would represent 1.1% of the 28,570 mallards observed in New Jersey during the Mid-winter Waterfowl Survey conducted in 2012. As shown in Table 4.6, the USFWS has authorized the lethal removal of up to 775 mallards for 2010 in New Jersey to alleviate damage or risks of damage. If the USFWS continued to authorize the lethal take of up to 775 mallards per year, along with the possible take of 300 mallards by WS under this proposed action, total take could equate to 1,075 mallards. This potential total take of 1,075 mallards would represent 3.8% of the number of mallards estimated in the state during the 2012 Mid-Winter Waterfowl Survey and 4.3% of the average number of mallards observed on the Survey from 2007 through 2012. When compared to the number of mallards estimated in the state during the breeding season, cumulative take of up to 1,075 mallards would represent 3.0% of the number estimated during the 2012 breeding season. Take of 1,075 mallards for damage management would also represent a range of 5.4% to 18.8% of the annual hunter harvest since 2007. This level of take is considered to be of low magnitude and not expected to result in adverse cumulative impacts.

Wood Duck Biology and Population Impacts

The wood duck is a waterfowl species associated with the riparian habitats, wooded swamps, and freshwater wetlands of the United States and southern Canada (Hepp and Bellrose 1995). The breeding range of the wood duck extends across most of the eastern United States and most of the Pacific Northwest with localized breeding in the prairie region of the United States (Hepp and Bellrose 1995). Wood ducks are cavity nesters and are most commonly found nesting in the cavities of trees near water (Hepp and Bellrose 1995). Therefore, breeding populations can be isolated to areas with appropriate habitat for nesting.

Observers noted drastic declines in the number of wood ducks during the late nineteenth century (Hepp and Bellrose 1995), including in New Jersey (Walsh et al. 1999). Since enactment of the MBTA, wood duck populations have increased (Hepp and Bellrose 1995), including in New Jersey (Walsh et al. 1999). According to Breeding Bird Atlas data, wood ducks have the widest distribution of the breeding duck species in New Jersey. The highest concentrations occur in the northern portion of the state (Walsh et al. 1999). The fall migration of wood ducks in New Jersey begins in mid-September, with peak periods occurring from mid- to late October. Aggregations of fall migrants can reach hundreds or thousands of wood ducks (Walsh et al. 1999).

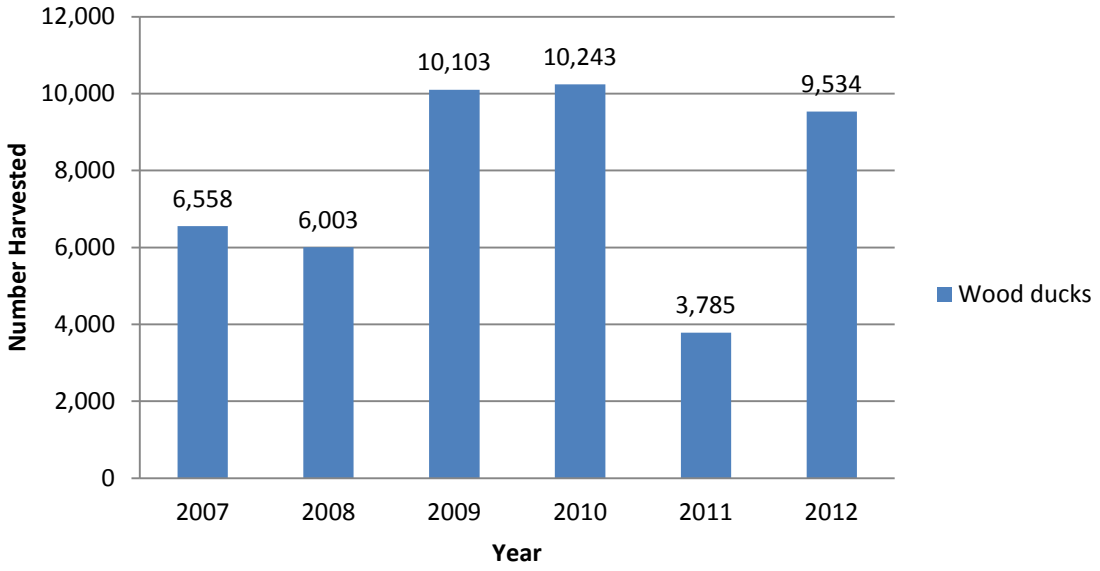
Between 1966 and 2011, the number of wood ducks observed in New Jersey during the BBS has shown a declining trend estimated at -0.2% annually; however, from 2001 through 2011, the number observed has shown an increasing trend estimated at 3.2% annually (Sauer et al. 2012). In the New England/Mid-Atlantic Coast region, the number of wood ducks observed in areas surveyed during the BBS has shown a 0.8% annual increase from 1966 through 2011 and a 2.0% annual increase from 2001 through 2011 (Sauer et al. 2012). Based on the Atlantic Flyway Breeding Waterfowl Plot Survey, the statewide breeding population of wood ducks in 2012 was estimated at 21,088 ducks (Klimstra and Padding 2012). Between 2007 and 2012, 19,081 wood ducks on average have been estimated breeding within the state based on the Atlantic Flyway Breeding Waterfowl Plot Survey. Between 2007 and 2012, the lowest breeding population estimate occurred in 2009 with 15,965 wood ducks. The highest breeding population was estimated in 2011 with 21,088 wood ducks (Klimstra and Padding 2012).

The number of wood ducks observed in areas surveyed during the CBC has shown a general increasing trend between 1966 through 2011, with a notable increase in the number observed from the mid- to late 1990s through 2011 (NAS 2010). Between 2002 and 2011, 278 wood ducks have been observed per year on average in areas surveyed during the CBC, with a range of 112 wood ducks to 638 wood ducks (NAS 2010).

Most requests associated with wood ducks that WS could receive would be due to concentrations of wood ducks on or near civil or military airports that are posing risks to aviation safety, primarily during the migration periods. WS addressed three wood ducks in FY 2011 and one in FY2012 using non-lethal dispersal methods to reduce risks to aviation safety. Since wood ducks often form large flocks during the migration periods, WS could be requested to mitigate hazards caused by large groups of ducks. Based on the possibility of addressing large flocks of wood ducks, WS could lethally remove up to 150 wood ducks annually under the proposed action alternative.

Like other waterfowl species, wood ducks can be harvested annually during hunting seasons. Wood ducks harvested annually in New Jersey from 2007 through 2012 are shown in Figure 4.3. From 2007 through 2012, 46,226 wood ducks have been harvested during the annual hunting season. The highest harvest level occurred in 2010 when 10,243 wood ducks were harvested. The lowest harvest level occurred in 2011 with 3,785 wood ducks (Richkus et al. 2008, 2010, 2012, 2013).

Figure 4.3 - Wood ducks harvested annually in New Jersey, 2007-2012



If WS had lethally removed 150 wood ducks during FY 2012, the number removed would represent 0.8% of the average annual breeding population from 2007 through 2012 estimated at 19,081 wood ducks. If WS had lethally removed 150 wood ducks during the breeding season in 2009 when the lowest population estimate occurred, the lethal removal of wood ducks by WS would have represented 0.9% of the estimated breeding population.

Between 2007 and 2012, an estimated 46,226 wood ducks were harvested in New Jersey during the annual hunting season, which is an annual average harvest of 7,704 wood ducks. The lethal removal of 150 wood ducks by WS would represent 1.9% of the average harvest. The take of 150 wood ducks by

WS would have represented 4.0% of the lowest number of wood ducks harvested in New Jersey and estimated at 3,785 in 2011. This level of take is considered to be of low magnitude and not expected to result in adverse cumulative impacts.

American Black Duck Biology and Population Impacts

The American black duck is a large dabbling duck found primarily in the eastern United States and eastern Canada (Longcore et al. 2000). Black ducks can be found in a variety of wetland habitat types including freshwater wetlands, lakes, ponds, streams, and bogs found in mixed hardwood and boreal forests, and salt marshes. The fall migration begins from September to early October as birds begin congregating near breeding areas. Breeding begins in February in the southern portion of the breeding range and may not begin until late-May in the northern portions of the range (Longcore et al. 2000).

The American black duck is considered a "*fairly common but somewhat local summer resident, common spring and fall migrant, and common winter resident*" in New Jersey (Walsh et al. 1999). Although breeding black ducks can be found statewide, the highest concentrations occur in the southern portion of the state (Walsh et al. 1999). Based on the Atlantic Flyway Breeding Waterfowl Plot Survey, the statewide breeding population of black ducks was estimated at 6,934 ducks in 2012 and 10,793 black ducks in 2011. Since 1966, the number of black ducks observed in New Jersey during the BBS has declined at an estimated rate of -5.7% annually, with a -7.0% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). Across all BBS routes surveyed in the United States, the number of American black ducks observed has shown annual declines since 1966 estimated at -3.5%, with a -0.5% annual decline occurring from 2001 through 2011 (Sauer et al. 2012).

The number of black ducks observed in areas surveyed during the CBC shows an overall decline since 1966 (NAS 2010). The average number of black ducks observed in areas surveyed during the CBC between the 2002 survey and the 2011 survey has been 13,722 black ducks, with the lowest number observed occurring in 2011 at 11,034 black ducks and the highest number observed in 2003 at 17,765 ducks. During the Mid-winter Waterfowl Survey conducted in 2012 along the Atlantic Flyway, 96,345 black ducks were observed in New Jersey (Klimstra et al. 2012). Between 2006 and 2010, 94,030 black ducks have been observed on average per year in New Jersey during the Midwinter Waterfowl Survey conducted along the Atlantic Flyway (Klimstra et al. 2012).

Like most waterfowl species, black ducks can be harvested during regulated hunting seasons in New Jersey. During the 2010, 2011, and 2012 hunting seasons, an estimated 11,766, 8,592, and 16,659 black ducks were harvested, respectively (Raftovich et al. 2012, Raftovich et al. 2013).

The USFWS authorized the annual take of 30 black ducks in New Jersey between 2007 and 2011; however, no black ducks were lethally removed by any entities within the state. In 2012, the USFWS authorized annual take was increased to 90; however no black ducks were lethally removed. WS employed non-lethal methods to disperse 32 black ducks in FY 2011 and 26 black ducks in FY 2012 to alleviate damage and threats at airports.

If large flocks of black ducks occur on or near airports, those ducks could pose a risk to aviation safety. If requested to assist with managing damage or threats of damage associated with black ducks, WS anticipates that up 150 black ducks and 20 nests (and eggs) could be taken annually to alleviate damage or threats primarily at civil or military airports.

If up to 150 black ducks were lethally taken by WS in New Jersey, WS' take would represent 2.2% of the breeding population estimated during 2012 and 1.4% of the breeding population estimated in 2011. Take of up to 150 black ducks would represent 1.1% of the average number of black ducks observed per year in

areas surveyed during the CBC from 2002 through 2011. When compared to the lowest number of black ducks observed during the CBC from 2002 through 2011, the lethal removal of 150 black ducks would represent 1.4% of the number of ducks.

Take of 150 black ducks would represent 0.2% of the 96,345 black ducks that were observed in New Jersey during the Midwinter Waterfowl Survey conducted in 2012 along the Atlantic Flyway. Similarly, the take of 150 black ducks by WS would represent 0.2% of the 89,574 black ducks observed on average per year in New Jersey during the Midwinter Waterfowl Survey conducted along the Atlantic Flyway between 2007 and 2012.

Table 4.7 – Number of American black ducks addressed in New Jersey from FY 2007 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	0	30	0	0
2008	0	30	0	0
2009	0	30	0	0
2010	13	30	0	0
2011	32	30	0	0
2012	26	90	0	0
TOTAL	**71**	**240**	**0**	**0**

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

As shown in Table 4.7, the USFWS has recently increased the authorized take of 90 black ducks per year in New Jersey to alleviate damage or risks of damage. If the USFWS continued to authorize the lethal take of up to 90 black ducks per year, the combined take of WS and other entities could total 240 black ducks. The take of 240 birds would represent 0.2% of the number of black ducks estimated during the 2012 Mid-Winter Waterfowl Survey and 0.3% of the average number of black ducks observed on the Survey from 2007 through 2012. When compared to the number of black ducks estimated during the 2012 breeding season, take of up to 240 black ducks would represent 3.4% and 2.2% of the black ducks observed during the breeding season in 2011. Take of 240 black ducks by all entities would represent 1.7% of the average number of black ducks observed in areas surveyed during the CBC from 2002 through 2011 and 2.2% of the lowest number of black ducks observed during the CBC from 2002 through 2011. Provided that the black duck population allows for an annual hunting harvest and WS' take is a small percentage of the annual harvest, the cumulative take will not adversely affect black duck populations.

Black Vulture Biology and Population Impacts

Historically in North America, black vultures occurred in the southeastern United States, Texas, Mexico, and parts of Arizona (Wilbur 1983). Black vultures have been expanding their range northward in the eastern United States (Wilbur 1983, Rabenhold and Decker 1989), and they are considered locally resident with little movement during the migration periods (Parmalee and Parmalee 1967, Rabenhold and Decker 1989); however, some populations will migrate (Eisenmann 1963 cited from Wilbur 1983). Black vultures typically feed by scavenging, but occasionally take live prey, especially newborn livestock (Brauning 1992). This species has been reported to live up to 25 years of age (Henny 1990).

According to BBS trend data provided by Sauer et al. (2012), the number of black vultures observed in New Jersey during the breeding season has increased at an annual rate of 19.1% from 1966 through 2011, with a 21.2% annual increase occurring from 2001 through 2011. From 1966 through 2011, the number

of black vultures observed in the New England/Mid-Atlantic Coast region during the BBS has also increased at an annual rate of 8.4%, which is a statistically significant increase (Sauer et al. 2012). Black vultures were not observed during the annual CBC in the state until 1980 when two vultures were counted in one survey area (NAS 2010). During the CBC conducted in 2011, 2,207 black vultures were observed in 27 different survey areas (NAS 2010).

Rich et al. (2004) estimated the statewide black vulture population at 190 vultures based on the best available data. However, WS personnel have surveyed 190 vultures in just one roost in the past few years. The population estimates provided by Rich et al. (2004) for some species are often poor due to high variance on BBS counts, low sample size, or due to other species-specific limitations of BBS methods. Estimates of bird populations calculated by Rich et al. (2004) were derived from BBS data for individual species. BBS data is derived from surveyors identifying bird species based on visual and auditory cues at stationary points along roadways. Vultures produce very few auditory cues that would allow for identification (Buckley 1999) and thus, surveying for vultures is reliant upon visual identification. For visual identification to occur during surveys, vultures must be either flying or visible while roosting. Coleman and Fraser (1989) estimated that black and turkey vultures spend 12 to 33% of the day in summer and 9 to 27% of the day in winter flying. Avery et al. (2011) found that both turkey vultures and black vultures were most active in the winter (January to March) and least active during the summer (July to September). Avery et al. (2011) found that across all months of the year, black vultures were in flight only 8.4% of the daylight hours while turkey vultures were in flight 18.9% of the daylight hours.

Most vultures are counted while flying during surveys since counting at roosts can be difficult due to obstructions limiting sight and constraints of boundaries used during the surveys. This is especially true with the BBS since observers are limited to counting only those bird species within a quarter mile of a survey point along a roadway. Bunn et al. (1995) reported vulture activity increased from morning to afternoon as temperatures increased. Avery et al. (2011) found turkey vulture flight activity peaked during the middle of the day. Three hours after sunrise, Avery et al. (2011) found only 10% of turkey vultures in flight and black vultures lagged about an hour behind turkey vultures in their flight activities. Therefore, surveys for vultures should occur later in the day to increase the likelihood of vultures being observed by surveyors. Observations conducted for the BBS are initiated in the morning since mornings tend to be periods of high bird activity. Since vulture activity tends to increase from morning to afternoon when the air warms and vultures can find thermals for soaring, vultures are probably under-represented in BBS data. The limitations associated with surveying for vultures under current BBS guidelines is likely resulting in lower than expected population estimates of black vultures and turkey vultures. Given the limitations of current survey protocols, populations of vultures in New Jersey are likely higher than derived by Rich et al. (2004) using data from the BBS.

The number of black vultures addressed by WS and other entities are shown in Table 4.8. From FY 2007 through FY 2012, WS has lethally removed seven black vultures to alleviate damage and threats. In addition, WS has employed non-lethal harassment methods (mainly vulture effigies) to disperse 310 vultures to address requests for assistance to manage damage to human safety and property. The number of black vultures taken by all entities under depredation permits has totaled 440 since 2007. Based on increasing requests for assistance in managing damage associated with black vultures in New Jersey, up to 300 black vultures and 50 nests (and eggs) could be lethally taken under the proposed action to address damage and threats associated with black vultures.

Table 4.8 – Number of black vultures addressed in New Jersey from FY 2007 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	0	185	2	51
2008	75	190	1	53
2009	130	210	4	93
2010	50	245	0	80
2011	55	255	0	73
2012	0	310	0	90
TOTAL	**310**	**1,395**	**7**	**440**

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

The authorized take by the USFWS and NJDFW has increased every year since 2007 which coincides with the steady increase in black vulture observations during the CBC. As shown in Table 4.8, a total of 440 black vultures have been taken in New Jersey from 2007 through 2012 to alleviate damage, which is an average of 73 vultures taken annually by all entities. The highest level of take occurred in 2009 when 93 black vultures were lethally removed by all entities to alleviate damage or threats of damage. Based on available survey data, the number of black vultures observed continues to increase annually, which indicates previous levels of lethal removal have not resulted in population declines.

WS proposed take of 300 vultures combined with the highest annual take of 93 vultures in 2009 would represent 17.8% of the number of vultures observed in the most recent CBC. This level of take is considered to be of low magnitude and will not create adverse cumulative impacts. Similar to the other native bird species addressed in this assessment, the take of vultures could only occur when authorized through the issuance of depredation permits by the USFWS and the NJDFW. The permitting of any lethal removal would ensure the cumulative take of black vultures annually would occur within allowable take levels to achieve desired population objectives for the species.

Turkey Vulture Biology and Population Impacts

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). Turkey vultures often roost in large groups near homes or other buildings where they can cause property damage from droppings or by pulling and tearing shingles. Turkey vultures prefer carrion, but will eat virtually anything, including insects, fish, tadpoles, decayed fruit, pumpkins, and recently hatched heron and ibis chicks (Brauning 1992). Turkey vultures have been reported to live up to 16 years of age (Henny 1990).

Turkey vultures can be found throughout the year in New Jersey (Kirk and Mossman 1998, Walsh et al. 1999). Walsh et al. (1999) considered turkey vultures as a "*fairly common and widespread summer resident, common spring and fall migrant,* [and] *common winter resident*" in New Jersey. Today, breeding turkey vultures are common throughout the state except for in some of the more urban areas in the eastern portion (Walsh et al. 1999). Walsh et al. (1999) noted the increasing presence of turkey vultures in the state during the winter since 1976, which is also supported by data from the CBC (NAS 2010). Although the reason for the increasing presence of turkey vultures is not well understood, Walsh et al. (1999) speculated the increase could be related to an overall increase in the population of turkey vultures rather than simply a change in the wintering patterns of the species.

The statewide breeding population of turkey vultures is currently unknown, but has been estimated at 13,000 turkey vultures based on BBS data (PFSC 2013). Trending data from the BBS indicates the number of turkey vultures observed along BBS routes in New Jersey have shown an increasing trend estimated at 4.0% annually since 1966, with a 5.4% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). In the New England/Mid-Atlantic Coast region, the number of turkey vultures observed in areas surveyed during the BBS has shown an annual increasing trend estimated at 3.9% annually since 1966, with a 3.9% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The numbers of turkey vultures observed during the CBC are also showing an increasing trend (NAS 2010).

The number of turkey vultures addressed in New Jersey by all entities to alleviate damage is shown in Table 4.9. From FY 2007 through FY 2012, WS lethally removed 20 turkey vultures in New Jersey and employed non-lethal methods to disperse 718 vultures to alleviate damage or threats of damage to human safety and property. A total of 107 turkey vultures (average of 18 per year) have been lethally taken from 2007 through 2012 by all entities pursuant to depredation permits issued by the USFWS and the NJDFW.

Table 4.9 – Number of turkey vultures addressed in New Jersey from FY 2007 to FY 2012

		Take under Depredation Permits		
Year	**Dispersed by WS[1]**	**Authorized Take[2]**	**WS' Take[1]**	**Total Take by All Entities[2]**
2007	53	155	6	13
2008	136	155	6	9
2009	148	155	3	21
2010	148	180	4	13
2011	75	130	0	23
2012	158	290	1	28
TOTAL	**718**	**1,065**	**20**	**107**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

As the population of turkey vultures in New Jersey has increased, the number of requests for assistance to alleviate damage and threats of damage associated with turkey vultures has also increased. Therefore, based on previous requests for assistance and in anticipation of an increasing number of requests and the subsequent need to address more vultures, up to 300 turkey vultures and 50 nests (and eggs) could be lethally taken annually by WS under this proposed action to alleviate damage and threats.

If up to 300 turkey vultures were removed annually by WS, WS' take would represent 2.3% of the estimated statewide breeding population of turkey vultures. If the take by other entities remains stable, the cumulative take of vultures annually by all entities could be 318 vultures. The cumulative take of vultures would represent 2.5% of the statewide population.

The 290 turkey vultures authorized by the USFWS and the NJDFW to be lethally removed by all entities during 2012 was the highest level permitted between 2007 and 2012. If the USFWS and the NJDFW authorized the lethal removal of 290 vultures to other entities within New Jersey and authorized the lethal removal of up to 300 vultures by WS, the cumulative lethal removal would be 590 turkey vultures, which would represent 4.5% of the estimated breeding population. This level of take is not expected to create cumulative adverse impacts to the statewide vulture population. The permitting of the take by the USFWS and the NJDFW pursuant to the MBTA ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for turkey vultures in New Jersey.

Bald Eagle Biology and Population Impacts

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).

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. In addition, the NJDFW lists the bald eagle as "*endangered"* when it pertains to breeding status and *"threatened"* in reference to non-breeding status in the state.

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).

WS has received requests for assistance associated with bald eagles posing threats to safety at or near airports in New Jersey. The large body size and soaring behavior of eagles can pose threats of aircraft strikes when eagles occur in close proximity to airports. Given the definition of *"disturb*" under the Act as described above, the use of harassment methods to disperse eagles posing threats at or near airports could constitute "*take*" as defined under the Act, which would require a permit from the USFWS to conduct those types of activities.

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 this 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. Therefore, 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.

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). During FY 2012, WS harassed a bald eagle from a New Jersey airport's air operations area to alleviate strike risks pursuant to a permit issued by the USFWS in accordance with the Bald and Golden Eagle Protection Act.

Additionally, WS has recently observed seven juvenile eagles within a mile of a major New Jersey airport. Harassment at airports may very well benefit individual birds by preventing birds from being killed in collisions with aircraft.

Osprey Biology and Population Impacts

Historically, nests of osprey were constructed on tall trees and rocky cliffs. Today, ospreys are most commonly found nesting on man-made structures such of power poles, cell towers, and man-made nesting platforms (Poole et al. 2002). Osprey can be located during the breeding season along the coastal areas of the state with breeding populations also occurring further inland (Poole et al. 2002). The NJDFW currently lists the breeding population of osprey as "*threatened*".

Since 1966, the number of osprey observed in the state during the BBS has shown an increasing trend estimated at 7.2% annually, with a 8.3% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). Along routes surveyed in the New England/Mid-Atlantic Coast region during the BBS, the number of osprey observed since 1966 has shown an increasing trend estimated at 7.0% annually, which is statistically significant, with a 8.0% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The PFSC (2013) estimated the statewide population of osprey at 1,300 birds.

The statewide census has not been conducted since 2009, when 486 nesting pairs were documeneted. However, current population estimates are thought to be well above 500 nesting pairs (Clark and Wurst 2012). In 2012, productivity across all nests averaged 1.81 young per active nest, which is slightly down from the previous year, but well above the minimum production of 0.80 young per active nest needed to sustain the population of osprey in New Jersey (Clark and Wurst 2012).

Requests for assistance received by WS to alleviate damage or threats of damage associated with osprey involved threats to aviation safety on or near airports and threats to human safety and property due to the osprey's nesting behavior. Osprey nests are often constructed of large sticks, twigs, and other materials that can cause damage and prevent access to critical areas when those nests are built on man-made structures (e.g., power lines, cell towers, boats). Disruptions in the electrical power supply can occur when nests are located on utility structures and can inhibit access to utility structures for maintenance by creating obstacles to workers.

Ospreys are also known to construct nests on property utilized for human activity, such as on boats. A survey of nesting osprey in New Jersey found that 75% of nesting osprey use single-post platforms erected for nesting while 8% of osprey nests occurred on cell towers, 4% occurred on channel markers, 3% nested on duck blinds, 2% occurred on dead trees, and 7% nested on other structures (Clark and Wurst 2010). Osprey nesting near airports can also pose risks to aviation safety. Since 1990, there have been seven strikes reported to the FAA involving an aircraft striking osprey at airports in the state (FAA 2013).

During FY 2009, the WS program in New Jersey, in coordination with the NJDFW, relocated one osprey nest containing two eggs to alleviate damage. During FY 2010, WS dispersed one osprey from an airport operations area as permitted by the state to reduce threats to aviation safety. Similarly, one osprey was dispersed from an airport environment during FY 2011. In FY 2012, two ospreys were dispersed to reduce aircraft strike hazards and one nest containing one egg was removed and destroyed to alleviate damage to property. WS received a request for assistance from fish biologists at the NJDFW's Pequest Trout Hatchery concerning predation by up to 20 osprey on trout and potential disease transfer between raceways of fish infected with Furunculosis and those determined free of disease. After conducting a site visit, WS recommended an integrated approach involving numerous harassment and exclusionary

techniques as well as removal, if authorized, of a small number of osprey to reinforce harassment methods. No lethal removal of ospreys was conducted by WS from FY 2007 through FY 2012.

WS' involvement in direct operational assistance to alleviate damage or reduce threats associated with osprey would be limited to nest removal or nest relocation activities, and capture and relocation and/or dispersal of osprey to alleviate damage or threats of damage. The removal of nests must be approved by the USFWS and the NJDFW through the issuance of depredation permits. Therefore, any activities conducted by WS involving osprey would occur only if those activities were approved by the NJDFW and the USFWS through the issuance of depredation permits which would ensure cumulative impacts are considered.

To alleviate damage and threats associated with osprey nests, WS anticipates up to five osprey nests could be removed based on previous requests for technical assistance. Any eggs or nestlings located in nests to be removed would be relocated to other osprey nests (preferred) or transported to a state-approved wildlife rehabilitator to be reared until they could be released into the wild. The clutch size for osprey ranges from one to four eggs (Poole et al. 2002). Therefore, up to 20 eggs and/or nestlings could be removed from nests and released to wildlife rehabilitators for rearing. If an appropriate rehabilitator could not be located, eggs could be destroyed through addling or shaking. Nestlings located in a nest to be removed would only be removed from the nest if a rehabilitator has agreed to rear the nestlings for release or placement into a wild nest; or if nestlings could be placed into nests with same-age nestlings for care by adult ospreys. If nestlings were present and a rehabilitator could not be located to rear the nestlings, the nest would not be removed until the nestlings had fledged and were no longer present in the nest. In addition, WS could live-capture and translocate up to 15 ospreys per year to areas with suitable habitat and with permission of the appropriate landowner.

The relocation of up to 20 eggs or the release of up to 20 eggs to wildlife rehabilitators would not adversely affect populations of osprey since those eggs are likely to be reared and released into the wild. The destruction of bird eggs as part of bird damage management activities is generally considered a non-lethal method that does not adversely affect populations when the number of eggs destroyed is limited. If 20 osprey eggs were destroyed, the take would represent 1.3% of the current estimated statewide population of osprey. However, take of up to 20 eggs annually would be unlikely given the average number of eggs per osprey nest ranges from one to four. The take of 20 eggs was analyzed to present a worst case scenario to determine the potential for population impacts. Since nests containing nestlings would only be removed if the nestlings could be provided to wildlife rehabilitators approved by the NJDFW, no adverse effect on osprey populations would be expected since those ospreys would be reared and released into the wild. In addition, the translocation of up to 15 osprey would not adversely affect breeding populations of osprey since those osprey would be released unharmed into appropriate habitat.

Northern Harrier Biology and Population Impacts

In New Jersey, Northern harriers can be found throughout the year in suitable habitat (Smith et al. 2011). Based on historic declines, the breeding population of Northern harriers was classified as *"threatened*" by the NJDFW in 1979. The breeding population was later reclassified as *"endangered"* in 1984 based on a limited population size, restricted range, sensitivity to disturbance, and continued nesting habitat loss (Wurst 2010). The breeding population of harriers was estimated at 40 to 50 pairs during the 1980s, with 20 to 30 pairs occurring in the Delaware Bay estuary. Today, wintering and breeding populations are considered stable (Wurst 2010). The non-breeding population is classified by the NJDFW as a species of "*special concern"*.

Although, breeding populations are known to occur in New Jersey, no data from the BBS is currently available for the state (Sauer et al. 2012). The number of Northern harriers observed along routes

surveyed during the BBS annually in the New England/Mid-Atlantic Coast region has shown an declining trend estimated at -0.4% since 1966; however, from 2001 through 2011, the number of harriers observed in areas surveyed has shown an increasing trend estimated at 0.8% annually (Sauer et al. 2012). Across all routes surveyed in the United States during the BBS, the number of harriers observed has shown a declining trend estimated at -0.2% annually since 1966; however, a 0.3% annual increase has been observed between 2001 and 2011 (Sauer et al. 2012). Between 1966 and 2011, the number of harriers observed in areas surveyed during the CBC has shown a general increasing trend in New Jersey (NAS 2010). Between 2002 and 2011, 467 harriers have been observed per year, on average, in areas surveyed during the CBC, with the highest count occurring in 2006 when 588 harriers were observed and the lowest count occurring in 2010 when 342 harriers were observed.

Most requests for assistance associated with Northern harriers are received from airport authorities and military installations where harriers are posing hazards to aviation safety. Between FY 2007 and FY 2012, the WS program in New Jersey dispersed 154 harriers using non-lethal harassment methods. In FY 2010, WS dispersed 51 harriers to alleviate damage or damage threats, which represented the highest number addressed per year from FY 2007 through FY 2012. No lethal removal of harriers occurred by WS from FY 2007 through FY 2012. To address threats associated with harriers, the USFWS has issued permits to other entities for lethal removal. Between 2007 and 2012, the highest annual level of lethal take authorized by the USFWS was 40 harriers.

WS would continue to disperse Northern harriers using non-lethal harassment methods from areas where damage or threats of damage were occurring. WS could also live-capture and translocate up to 50 harriers annually. Release sites would be identified prior to live-capture of the harriers. Harriers would only be released onto property containing appropriate habitat and only after obtaining permission from the property owner.

Red-tailed Hawk Biology and Population Impacts

The red-tailed hawk is one of the most widely distributed raptor species in North America with a breeding range extending from northern Canada and Alaska southward to northern and central Mexico (Preston and Beane 2009). In New Jersey, the red-tailed hawk is a year-round resident (Preston and Beane 2009). Red-tailed hawks are capable of exploiting a broad range of habitats with structures for perching and nesting, and the availability of prey items being the key factors.

Populations of red-tailed hawks in North America showed increasing trends during the mid- to late-1900s likely in response to the conversion of forested areas to more open environments for agricultural production (Preston and Beane 2009). Between 1966 and 2011, the number of red-tailed hawks observed in the United States during the BBS has shown an increasing trend estimated at 2.0% annually, which is a statistically significant trend (Sauer et al. 2012). In New Jersey, the number of red-tailed hawks observed during the BBS has also shown an increasing trend estimated at 4.7% annually between 1966 through 2011(Sauer et al. 2012). The breeding population in New Jersey has been estimated at 2,000 red-tailed hawks (PFSC 2013). The number of red-tailed hawks observed in areas surveyed during the CBC has also shown general increasing trends within the state between 1966 and 2011 (NAS 2010). The number of red-tailed hawks observed per surveyor hour during the CBC conducted in 2011 increased over 377% when compared to the number observed during the 1966 survey, which is more than triple the number of red-tailed hawks observed per surveyor hour.

The open grassland habitats of airports and the availability of perching structures often attract red-tailed hawks to airports where those birds can pose a risk to aviation safety. Most requests for assistance with red-tailed hawks that have been received by WS in New Jersey involve threats hawks pose to aircraft. However, WS occasionally receives requests involving red-tailed hawk damage or threats of damage to

agricultural resources, property, and human safety. For example, red-tailed hawks are known to capture and feed on free-ranging chickens.

From FY 2007 through FY 2012, the WS program in New Jersey employed non-lethal methods to disperse 223 red-tailed hawks and employed live-traps to capture and translocate 20 red-tailed hawks from airports. Red-tailed hawks were live-captured using bal-chatri traps or Swedish Goshawk traps and translocated to an area not less than 50 miles away and released into appropriate habitat with landowner permission. In addition, red-tailed hawks captured and translocated were banded for identification purposes using USGS approved leg-bands appropriate for the species. WS is authorized to band captured raptor species with auxiliary plastic colored leg bands under a Federal Bird Banding Permit (No. 23388) issued by the U.S. Geological Survey (USGS) Bird Banding Laboratory (BBL). Under this permit, WS is authorized to band birds captured on airports only and may not band birds with existing bands or remove any existing bands from captured species. Per WS' raptor relocation protocol, which was developed to create consistency in WS' operations across New Jersey airports, banded raptors that return to the same airport environment twice may be euthanized to protect aviation safety. In addition, when a red-tailed hawk is creating an immediate risk to aviation safety (e.g., perching along an active runway, flying into aircraft approach space) and after aggressive harassment has proven ineffective, lethal removal may be deemed necessary. Only in the past two years have eight red-tailed hawks been lethally removed from airports to protect aviation safety, either as banded returns or when the birds were creating an immediate threat to human safety.

Under the proposed action alternative, WS would continue to employ live-trapping for capturing red-tailed hawks and would continue to band and translocate hawks more than 50 miles from capture sites. Based on previous requests for assistance and in anticipation of receiving additional requests for assistance, mainly at civil and military airports, up to 200 red-tailed hawks could be live-captured and translocated annually.

Although the live-capture and translocation of red-tailed hawks would be a non-lethal method of reducing damage or threats of damage, red-tailed hawks could be translocated during their nesting season which could potentially lower nesting success. Since 2007, less than 25% of the relocated or killed hawks were removed during the nesting season. Eggs are generally observed in nests of red-tailed hawks as early as mid to late March (Preston and Beane 2009). Nestlings are generally present in nests from late-May through early-July (Preston and Beane 2009). Incubation of eggs can occur by either the male or female; however, incubation occurs primarily by the female while the male contributes a shorter amount of time to incubation each day (Preston and Beane 2009). Both the male and female red-tailed hawks feed the young once hatched; however, the female actually feeds the young more often while the male does more of the hunting (Preston and Beane 2009).

Although reduced nesting success could occur by removing one of the adult pairs of red-tailed hawks during the nesting season, available information indicates the successful raising of young could occur if only one adult was left to tend to the young. Given the statistically significant increase in the red-tailed hawk population and the low percentage of hawks removed during the nesting season, no adverse effects to the statewide population are expected to occur by any resulting reduced nesting success.

WS could also continue to be requested to employ lethal methods under the proposed action alternative to address damage or threats of damage associated with red-tailed hawks. Similar to the other raptor species addressed under the proposed action alternative, lethal take would only occur when birds were identified as being an immediate threat to human safety and/or property or after relocated hawks returned twice to the same airport environment. According to the USFWS, no red-tailed hawks were taken by other entities in the state from 2007 through 2012, although up to 15 hawks were authorized.

Based on previous requests received by WS, as well as anticipated requests, up to 100 red-tailed hawks could be lethally removed by WS to alleviate damage. Based on a breeding population estimated at 2,000 red-tailed hawks, the potential cumulative take of all entities (15 hawks) in the state including WS' take of up to 100 hawks annually would result in the lethal take of 5.8% of the estimated population. This level of take is considered to be of low magnitude and unlikely to result in any cumulative adverse impacts. Furthermore, the increasing population trend indicates that prior removal and relocation of red-tailed hawks has had no adverse effects on statewide populations. The permitting of the take by the USFWS and the NJDFW ensures WS' take would occur within allowable harvest levels of red-tailed hawks.

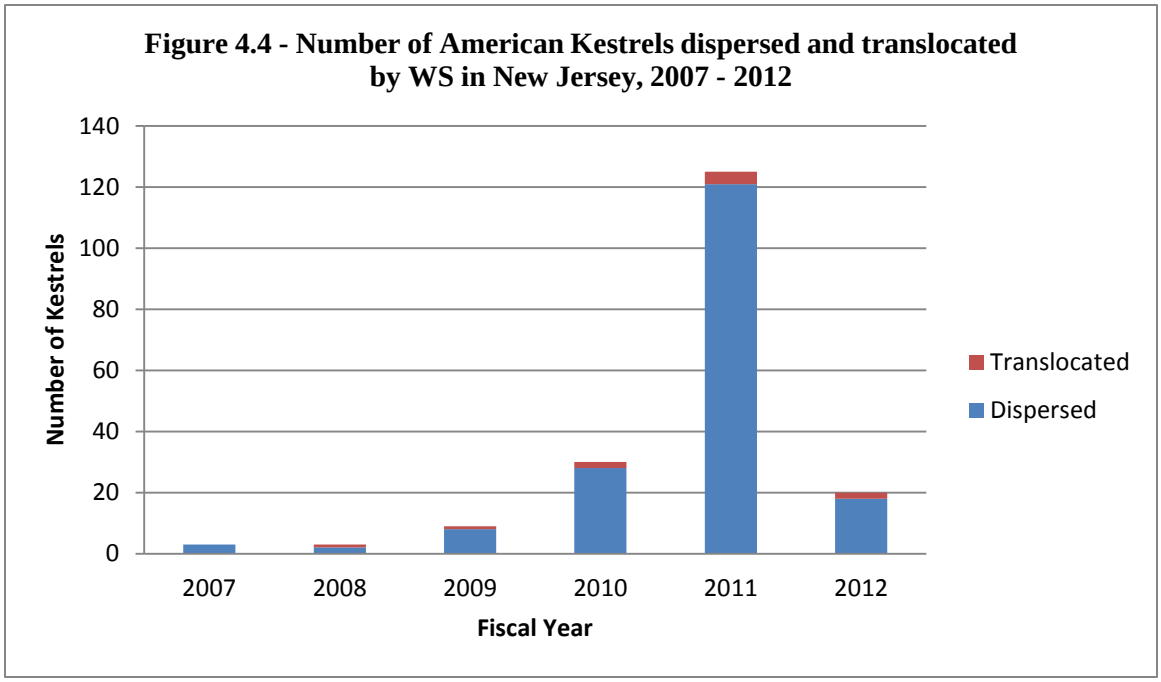
American Kestrel Biology and Population Impacts

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 capable of breeding as yearlings as is the case in about 80% of individuals. Average clutch size is most often four to five eggs, with an estimated 67% reproductive success (at least one fledgling) across their range.

Kestrels can be found throughout the year in New Jersey (Walsh et al. 1999, Smallwood and Bird 2002). Walsh et al. (1999) considered kestrels to be an uncommon summer resident with a fairly widespread distribution. Kestrels are considered fairly common during the spring migration periods and are a common migrant through the fall where they are more concentrated along the coast (Walsh et al. 1999).

Available data for American kestrels indicates the number of individuals observed has been declining (Walsh et al. 1999), prompting the NJDFW to consider kestrels as a *"threatened species."* Since 1966, the number of kestrels observed along routes surveyed during the BBS in the state has shown a declining trend estimated at -5.6% annually, with a -5.4% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). Similar trends have been observed in the New England/Mid-Atlantic Coast region estimated at -5.1% annually from 1966 through 2011 and -4.4% annually from 2001 through 2011 (Sauer et al. 2012). The PFSC (2013) estimated the state breeding population at 300 kestrels. The number of kestrels observed in areas surveyed during the CBC has also shown a declining trend since 1966 (NAS 2010). Walsh et al. (1999) speculated that the disappearance of open areas used by kestrels for hunting prey through reforestation or the loss of farmland to urban development may be partly responsible for the decline. Between 2002 and 2011, 26,450 kestrels have been observed per year on average in areas surveyed during the CBC in the state, with the range occurring from a low of 23,712 kestrels to a high of 28,871 kestrels (NAS 2010).

Most requests for assistance received by WS associated with kestrels occur at civil and military airports where those individuals are posing threats to aviation safety. WS has addressed those requests for assistance primarily with non-lethal dispersal methods and through live-capture and translocation of individual kestrels. As shown in Figure 4.4, WS has addressed an increasing number of kestrels since FY 2008. The sharpest increase was observed in FY 2011when WS dispersed 121 kestrels using non-lethal methods and translocated four kestrels to address damage or threats of damage.



Requests for assistance associated with kestrels primarily originate from airports and military installations where kestrels pose an aircraft strike risk. Based on the requests for assistance received previously and in anticipation of receiving additional requests for assistance to manage threats posed by kestrels at airports, up to 100 kestrels could be live-captured and translocated under the proposed action.

Although the live-capture and translocating of kestrels would be a non-lethal method of reducing damage or threats of damage, kestrels could be translocated during their nesting season which could lower nesting success. Since 2007, however, no kestrels have been removed prior to July which is outside most of the nesting season. Eggs are generally observed in nests of kestrels beginning at the very end of March through mid-June, with the peak period occurring from early-April through mid-May (Smallwood and Bird 2002). Nestlings are generally present in nests from early-May through late-August with the peak occurring from the end of May through the end of July (Smallwood and Bird 2002).

Although reduced nesting success could occur by removing one of the adult pairs of kestrels, available information indicates the successful raising of young could occur if only one adult was left to tend to the young. The degree of success would likely be related to the sex of the adult removed, the developmental stage of the eggs or nestlings, availability of food sources, and the time of year the removal of one of the adult pairs occurred. Provided that most of WS' relocation actions occur outside of the nesting season, and the kestrel's ability to successfully raise broods with only one parent, no cumulative adverse effects are expected to occur to the statewide kestrel population from relocation activities.

As with other raptor species, WS would continue to employ primarily non-lethal methods to address damage and threats of damage. However, lethal removal could be conducted when immediate threats to human safety occur, such as when banded kestrels have returned to the same airport twice after translocation or when habituation to non-lethal methods occurs. Based on previous requests for assistance received by WS, and in anticipation of receiving additional requests, the cumulative lethal removal of kestrels by WS, including kestrels that could be taken to alleviate nest predation, would not exceed 15 kestrels annually from October through February, which is outside of the breeding season. Between FY 2007 and FY 2012, WS lethally removed two kestrels during FY 2010 to address banded returns to airports after being translocated twice previously. According to the USFWS, no kestrels were

taken by other entities in the state between 2007 and 2012. However, the USFWS authorized the take of 50 kestrels by other entities in New Jersey during 2010 and then again in 2012. The WS proposed take of 15 birds represents 5% of the estimated breeding population and 0.06% of the winter population based on the average birds counted during the CBC. Combined with the USFWS authorized take of 50 birds by other entities, the cumulative take would represent 21.7% of the breeding population and 0.25% of the winter population. Provided that most of WS take occurs during the winter season, and little to no other take is expected by other entities based on historical evidence, no cumulative adverse effects are expected to occur to the statewide or regional kestrel population.

The take of kestrels, including live-capture and translocation, can only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits and authorized by the NJDFW permit's section and Endangered Species Program, in regards to their state "*threatened*" status. Therefore, all take, including take by WS, is authorized by the USFWS and the NJDFW and occurs at the discretion of both regulatory agencies. The take of American kestrels would only occur at levels authorized by the USFWS and the NJDFW which ensures cumulative take is considered as part of population management objectives for American kestrel in New Jersey.

Peregrine Falcon Biology and Population Impacts

Historically, peregrine falcons nested on the cliffs of the Palisades and the Delaware Water Gap. Today, peregrines can be found nesting atop man-made platforms along the Atlantic coast from Ocean to Cape May counties in New Jersey and on bridges spanning the Delaware and Hudson Rivers. Peregrine falcons also nest atop buildings in cities such as Jersey City, Newark, and Atlantic City. In recent years, peregrine falcons have returned to the cliffs of the Palisades, along the Hudson River (Conserve Wildlife Foundation of New Jersey 2013*d*).

Peregrine falcons are listed as an "*endangered*" species in New Jersey, with regard to breeding status. There are no statewide population estimates available for this species. In the past decade, the BBS has recorded a 9.3% increase in the population trend along routes surveyed in the U.S. (Sauer et al. 2012). The CBC has demonstrated a steady increasing trend from less than five falcons observed in the 1960's to 58 birds observed in 2012 (NAS 2010). Birdlife International (2014) lists the peregrine falcon as a species of least concern citing that the North American population has observed a statistically significant increase (2,600%) over the past 40 years. Since peregrines have made a strong comeback in urban areas that are often in close proximity to civil and military airports, WS has received and responded to requests for assistance in those areas as well. WS has dispersed eight peregrine falcons between FY 2007 and FY 2012. Requests for assistance primarily originated from airports where peregrines can pose risks to aviation safety. Based on the requests for assistance received previously and in anticipation of receiving additional requests for assistance to manage threats posed by peregrines at airports and military installations, up to 25 peregrines could be live-captured and translocated under the proposed action.

Barn Owl Biology and Population Impacts

The barn owl has a very widespread range. The barn owl prefers open habitats such as agricultural fields, pastures, and marshland. They roost by day in trees, but are occasionally found within manmade structures as well. These owls breed throughout New Jersey and are very common in some areas (Conserve Wildlife Foundation of New Jersey 2013*a*, Colvin and Hegdal 2006). Since 1966, the number of barn owls observed along routes surveyed during the BBS in the U.S has shown an increasing trend estimated at 2.4% annually, with a 9.8% annual increase occurring from 2001 through 2011 (Sauer et al. 2012).

Barn owls are listed as a species of *"special concern"* in New Jersey. It is theorized that the availability of cavities for nesting appears to be a limiting factor. Barn owls are secondary cavity nesters. They do not make their own cavity but use existing natural or man-made cavities (Conserve Wildlife Foundation of New Jersey 2013*a*). Since barn owls prefer nesting areas surrounded by suitable hunting grounds, they may be found or observed in close proximity to airports. To date WS has not received any requests to disperse or take barn owls. However in anticipation of receiving requests for assistance to manage threats posed by barn owls to aviation safety, up to 25 barn owls could be live-captured and translocated under the proposed action.

Snowy Owl Biology and Population Impacts

Snowy owls breed in open terrain of the artic barrens from the Aleutian Islands along the northern edge of Alaska, throughout the Canadian Arctic Islands and from northern Yukon, northeastern Manitoba, northern Quebec, and northern Labrador (Parmelee 1992). They can be found in similar open habitats during their winter migrations. During the winter 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, (Parmelee 1992) makes them a significant hazard for a damaging strike (Dolbeer et al. 2013). The number of snowy owls observed during the CBC across all areas surveyed in the United States has shown a variable trend over the past 20 years (NAS 2010). There are no breeding or year-round populations of snowy owls within New Jersey, and population trend data is limited and long-term data is lacking (Parmelee 1992).

Between 1990 and 2012, there have been 84 reported civil aircraft strikes involving snowy owls in the U.S. (Dolbeer et al. 2013). In FY 2012, WS dispersed snowy owls on 14 separate occasions to protect human safety at NJ airports. 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/relocate) to disperse or move snowy owls when appropriate and safe. If snowy owls are deemed an immediate threat to aviation safety (e.g., flying along an active runway) or if repeated non-lethal methods have failed, WS may need to implement lethal removal options. Based on surveys at New Jersey airports and recent influxes of owls arriving at airports, WS anticipates banding and relocating up to 50 snowy owls and lethally removing up to 10 owls. Based on the limited emergency take proposed and the permitting of the take by the USFWS and the NJDFW, WS' lethal removal of snowy owls would not adversely affect snowy owl populations. The live-capture and translocation of owls to appropriate habitat would not adversely affect populations since the owls would be unharmed. Permitting by the USFWS and NJDFW ensure that cumulative impacts are within allowable take levels.

Short-eared Owl Biology and Population Impacts

The short-eared owl is a medium-sized owl typically seen flying low over open marshes or fields. Historically, they nested in New Jersey in marshes along the Atlantic and Delaware Bay coasts. By 1980, only three breeding areas, Barnegat, Turkey Point, and the Tuckahoe River, were found to be occupied by short-eared owls. In New Jersey, short-eared owls inhabit coastal tidal and brackish marshes, inland fields, pastures, and grasslands. Vast areas of low marsh or thick stands of phragmites do not offer high quality habitat for these owls. Prime habitat for the short-eared owl consists of large areas of coastal high marsh adjacent to undisturbed upland fields. Short-eared owls roost, forage, and nest at inland open areas, such as fallow fields, hay fields, grasslands, airports, and sedge meadows. They are very sensitive to human activity. They require large tracts of undisturbed open areas (Conserve Wildlife Foundation of New Jersey 2013*e*).

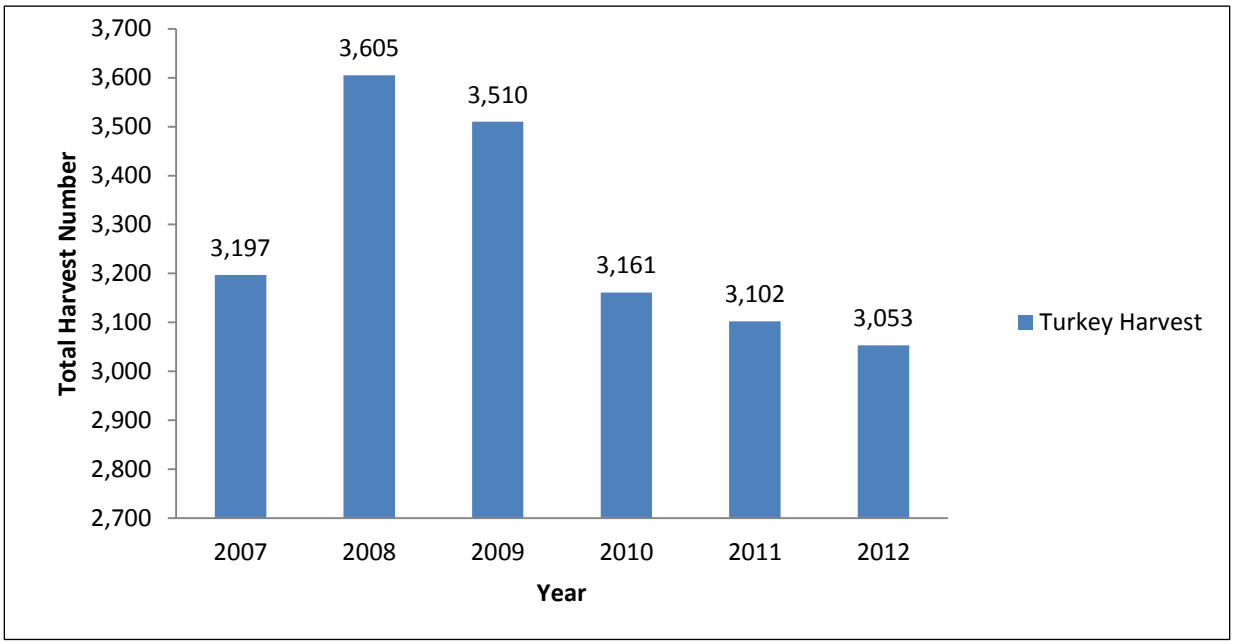
Short-eared owls are listed as an *"endangered"* species in New Jersey with regard to breeding status. The primary threats to short-eared owls in New Jersey are habitat loss, human disturbance, and prey availability (Conserve Wildlife Foundation of New Jersey 2013*e*). Short-eared owls prefer open areas for hunting purposes and are often found in upland fields, grasslands and airports with similar habitat. In FY 2009, WS dispersed nine short-eared owls to protect aviation safety and in FY 2010, eight short-eared owls were dispersed from New Jersey airports. In anticipation of receiving similar requests for assistance to manage threats posed by short-eared owls at airports, up to 20 owls could be live-captured and translocated under the proposed action.

Wild Turkey Biology and Population Impacts

Wild turkeys found in New Jersey consist of the Eastern wild turkey subspecies that is endemic to the eastern half of the United States (Kennamer 2010). The Eastern wild turkey can be found in 38 states and four Canadian provinces, ranging from southern Canada and New England to northern Florida and west to Texas, Missouri, Iowa, and Minnesota (Kennamer 2010). Wild turkeys inhabit hardwood, mixed, and pine forests foraging on a variety of acorns, fruit, seeds, and insects. Turkeys are considered permanent residents in states where they are present and are considered non-migratory. There are an estimated 5.1 million to 5.3 million wild turkeys in the Eastern subspecies in the United States and Canada (National Wild Turkey Federation 2010).

Today, wild turkeys are considered a fairly common permanent resident of New Jersey (Walsh et al. 1999). Populations of turkeys in New Jersey are sufficient to allow for annual hunting seasons. The statewide population is estimated between 20,000 and 23,000 birds with an annual hunting harvest of approximately 3,000 turkeys (NJDFW 2014*a*). The numbers of turkeys harvested from 2007 through 2012 during the annual turkey hunting seasons are shown in Figure 4.5. Since 2007, the highest number of turkeys harvested during the hunting seasons occurred in 2008 when 3,605 turkeys were harvested.

Figure 4.5–Turkey harvest in New Jersey 2007 – 2012 (NJDFW 2014*b*).



Since wild turkeys are considered non-migratory game birds, requests for assistance received by the WS program in New Jersey to manage damage or threats of damage are generally referred to NJDFW.

However, turkeys can pose strike risks to aviation safety. Between FY 2007 through FY 2012, WS has dispersed a total of 56 turkeys at airports to reduce threats to human safety and property. In addition, WS has employed lethal methods to take a total of 14 wild turkeys on airports between FY 2007 and FY 2012.

Based on previous requests for assistance and in anticipation of receiving an increasing number of requests for assistance at civil and military airports, in conjunction with the increasing turkey population, WS could lethally remove up to 100 wild turkeys annually under the proposed action alternative. With a minimum statewide population estimated at 20,000 turkeys (NJDFW 2014*a*), take of up to 100 turkeys by WS would represent 0.5% of the estimated statewide population if the population remains at least stable. WS proposed take combined with the highest recent hunter harvest (3,605) would represent 18.5% of the statewide population. Provided that the turkey population allows for an annual hunting harvest and WS' take is a fraction of a percent of the annual harvest, the cumulative take will not adversely affect the state turkey populations.

Killdeer Biology and Population Impacts

The killdeer is by far the most wide-spread and familiar of North American plovers because of its habitat, its tolerance of humans, its easily observed parental care, and its distinct vocalizations. The killdeer is probably more common today than at any time in its history as a result of habitat changes brought on by humans. It breeds and winters in New Jersey, and thus can be found year-round (Jackson and Jackson 2000).

Since 1966, the number of killdeer observed in New Jersey during the BBS route has shown a decreasing trend estimated at -1.7% annually, which is a statistically significant trend (Sauer et al. 2012). Killdeer observed on BBS routes in the New England/Mid-Atlantic Coast region of the BBS are also showing a decreasing trend estimated at -0.5% annually since 1966 (Sauer et al. 2012). No current population estimates are available for the number of killdeer residing in New Jersey; however, the NJDFW (2005) considers their population as stable. Survey data from the CBC indicates the number of killdeer overwintering in the state has shown a highly variable trend since 1966 (NAS 2010). 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).

From FY 2007 through FY 2012, WS has lethally taken a total of 318 killdeer at airports to reduce damages and threats of damage associated with aviation safety. The highest level of killdeer take by WS occurred in FY 2012 when 81 killdeer were lethally removed, and three nests containing 11 eggs were removed and destroyed (see Table 4.10). WS has also employed non-lethal methods to harass 337 killdeer at airports from FY 2007 through FY 2012.

Table 4.10 – Number of killdeer addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	2	45	10 + 6 eggs	10
2008	10	50	18	18
2009	90	100	64 + 1 nest/4 eggs	66
2010	71	100	69 + 1 nest/4 eggs	98
2011	95	145	76 + 1 nest/4 eggs	162
2012	69	240	81 + 3 nests/11 eggs	81
TOTAL	**337**	**680**	**318 + 6 nests/29 eggs**	**435**

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

Requests for assistance associated with killdeer occur primarily at airports. As the number of airports requesting assistance from WS to manage damage and threats associated with killdeer increases, the number of killdeer lethally taken annually is also likely to increase when lethal methods are deemed appropriate for use to resolve damage and threats. To address an increasing number of requests for assistance, up to 350 killdeer and 75 nests (and eggs) could be taken by WS annually under the proposed action.

WS would continue to assist airport personnel in identifying habitat and other attractants to killdeer on airport property. Killdeer would continue to be addressed using primarily non-lethal harassment and dispersal methods. All take of killdeer would occur within the levels permitted by the USFWS pursuant to the MBTA and when permitted by the NJDFW.

Gull Population Impact Analysis

Biological assessments for identifying the potential impact of harvest and/or removal programs on bird populations have a long history of application in the United States. Population modeling and extensive monitoring programs form the basis of an adaptive decision-making process used each year for setting migratory game bird harvest regulations, while ensuring that levels of take are sustainable. Increasing human-wildlife conflicts caused by migratory bird species (both game and nongame), and their potential impacts on sensitive species and their habitats, has resulted in greater use of analytical tools to evaluate the effects of authorized take to achieve population objectives (Runge et al. 2009). One such tool is referred to as the Potential Biological Removal (PBR) model (Wade 1998, Runge et al. 2004).

The USFWS recently completed PBR models for ring-billed gulls, herring gulls, great black-backed gulls, and laughing gulls that nest in BCR 14 and BCR 30. The majority of New Jersey lies within BCR 30. BCR 14 and BCR 30 cover most of the coastal and inland areas of the upper northeastern United States. Since population estimates and trends for gulls in New Jersey are limited, the PBR models developed by the USFWS for BCR 14 and BCR 30 will be used to analyze potential population impacts under the proposed action alternative.

Allowable harvest models for bird species have had a long history of use in the United States, primarily with waterfowl species, to determine allowable harvest during annual hunting seasons. Although no

hunting season exists for gulls, the take of gulls under depredation permits issued by the USFWS and the NJDFW can occur in New Jersey. The USFWS recently prepared PBR models using population parameters for each gull species to estimate the allowable take level for gulls in BCR 14 and BCR 30. Population parameter estimates were taken from available literature for each gull species (see Table 4.11), or in cases where estimates were not available, surrogate estimates from closely-related species were used (Seamans et al. 2007). Because there was uncertainty associated with demographic parameter estimates, allowable take levels were calculated using a simulation approach to estimate a range of R_{max} values with parameter estimates randomly drawn from normal distributions based on reported standard errors (see Table 4.12; Seamans et al. 2007).

To use the PBR method to determine levels of allowable take, or cumulative impacts over a large geographic area, the information required includes a minimum estimate of the population size using science-based monitoring programs (e.g., BBS, CBC, coordinated colony surveys) and the intrinsic rate of population growth. The formula for PBR is:

$$\text{PBR} = ½\, R_{max} N_{min} F_R$$

where R_{max} is the maximum population growth rate at low densities and in the absence of removal, N_{min} is the minimum population size, and F_R is a recovery factor ranging from 0.1 to 2.0 (Runge et al. 2004). The recovery factor is a qualitative assessment that is typically set at low levels for endangered (F_R = 0.1) or threatened species (F_R = 0.5; Taylor et al. 2000), or if the status of the population is poorly known (Runge et al. 2004). However, using a recovery factor above 1.0 has been discussed for species in which the management objective is to hold the population at a smaller fraction of its carrying capacity (Runge et al. 2009).

Table 4.11 - Demographic parameter estimates (θ) used for estimating R_{max} and Potential Biological Removal of gulls in BCR 14 and BCR 30 (Seamans et al. 2007).

		Great black-backed gull[1]		Herring gull[2]		Laughing gull[3]		Ring-billed gull[4]	
Parameter	**Age class**	**(θ)**	**SE (θ)**	**(θ)**	**SE (θ)**	**(θ)**	**SE (θ)**	**(θ)**	**SE (θ)**
p	Adult	0.87	0.03	0.87	0.03	0.87	0.03	0.87	0.03
$l\alpha$	Adult	0.42		0.42		0.56		0.56	
	Hatch Year	0.729	0.035	0.729	0.035	0.729	0.035	0.729	0.035
	Second Year	0.886	0.024	0.886	0.024	0.886	0.024	0.886	0.024
b		0.784	0.018	0.752	0.022	0.752	0.022	0.752	0.022
α		5		5		3		3	
ω		19		20		19		19	
N_{min}		250,000		390,000		270,000		54,000	
R_{max}		0.09	0.027	0.086	0.027	0.113	0.036	0.113	0.036

[1] Good 1998
[2] Pierotti and Good 1994
[3] Burger 1996, Dinsmore and Schreiber 1974
[4] Ryder 1993, Seamans et al. 2007

To estimate R_{max} for gulls, the Slade formula (Slade et al. 1998) was used:

$$1 = p\lambda^{-1} + 1_{\alpha}\, b\lambda^{-\alpha} - l_{\alpha} b p^{(\omega-\alpha+1)}\, \lambda^{-(\omega+1)}$$

where p is adult annual survival rate, $l\alpha$ is the survival rate from birth to age at first reproduction, b is the number of female offspring per female of reproductive age per year, α is the age at first reproduction, ω is the age at last reproduction, and λ is the intrinsic rate of population change. After solving the above equation for λ, R_{max} was estimated as $\ln(\lambda)$.

Population estimates (N_{min}) for each species were based on the number of gulls at known breeding colonies in BCR 14 and BCR 30 during the mid-1990s (MANEM Regional Waterbird Plan 2006), and adjusted using a conservative estimate of 0.75 non-breeding gull per breeder to estimate the total population (Seamans et al. 2007). Allowable take levels (± 95% CI) for each of the four gull species addressed in this assessment under three recovery factors (0.5, 1.0, 1.5) in BCR 14 and BCR 30 are presented in Table 4.12.

Table 4.12 - Potential Biological Removal (± 95% CI) of gulls in BCR 14 and BCR 30 under three recovery factors (Seamans et al. 2007).

Species	$F_R = 0.5$	$F_R = 1.0$	$F_R = 1.5$
Laughing Gull	7,685 (3,927–12,685)	15,274 (7,188–23,042)	26,044 (10,798–34,818)
Herring Gull	8,360 (3,892– 12,656)	16,725 (7,788–25,397)	25,048 (11,716–37,875)
Great Black-backed Gull	5,614 (2,764 – 8,358)	11,234 (5,561–16,670)	16,853 (8,364–25,086)
Ring-billed Gull	1,532 (713–2,318)	3,065 (1,455–4,634)	4,588 (2,161–6,951)

The PBR models were developed by the USFWS for BCR 14 and BCR 30 to evaluate harvest levels for gulls in the northeastern United States to ensure take occurred within levels to achieve desired population objectives for those species. The four gull species addressed in this assessment are known to breed along coastal areas and inland sites that are contained within BCR 14 and BCR 30. Some concerns arise regarding the use of regional gull population estimates for assessing allowable take in BCR 14 and BCR 30 as opposed to the more specific breeding population estimates in New Jersey. To address those concerns, the analyses for each species will include the evaluation of proposed take levels as they relate to the statewide breeding population, and how the proposed take relates to the PBR model for gulls in BCR 14 and BCR 30.

Most states in the northeastern United States conduct colonial waterbird surveys to determine breeding population trends for many colonial waterbirds, including gulls. Most state-level population estimates are provided as the number of breeding pairs of gulls surveyed. Therefore, one breeding pair equals two gulls. Gulls are migratory bird species and the breeding population of gulls estimated at the state-level is only representative of the number of gulls present in a state during a short period of time (i.e., during the breeding season). The breeding colony surveys do not account for migratory gulls present during the winter, nor do they account for the population of non-breeding gulls (i.e., sub-adults and non-breeding adults) present during the breeding season. Therefore, to better account for the mobility of gulls and the fact that gulls present in the northeastern United States are likely gulls that nest and migrate throughout BCR 14 and BCR 30, the USFWS developed models based on the geographical scope of the nesting populations of gulls. In addition, PBR models developed by the USFWS are based on breeding and non-breeding gulls, as opposed to colonial waterbird surveys. PBR models estimate allowable take by calculating a total population for each gull species using 0.75 non-breeding gulls for every breeding adult. Since the take of gulls to alleviate damage can occur throughout the year and not just during the breeding season, a comprehensive model like the PBR that includes non-breeding populations of gulls allows for a more systemic analysis of allowable take on gull populations.

The level of annual take evaluated for each gull species under the proposed action was based on the number of gulls lethally taken during requests received by WS in New Jersey from FY 2007 through FY

2012. As the number of requests for assistance received by WS increases, the number of gulls that are addressed to alleviate damage is also likely to increase. Based on prior requests for assistance, WS anticipates requests to alleviate damage associated with gulls to increase at airports, military installations, landfills, transfer stations, and building rooftops. WS also anticipates an increase in requests to alleviate predation and nest site competition with other colonial nesting waterbirds.

Laughing Gull Biology and Population Impacts

Laughing gulls can be found nesting along the coastal areas of BCR 14 and BCR 30 with most breeding colonies occurring in BCR 30 (MANEM Regional Waterbird Plan 2006). Over 200,000 laughing gulls nest along the coastal areas in BCR 30 and have been given a conservation rank of lowest concern (MANEM Regional Waterbird Plan 2006). In BCR 14, nesting laughing gulls are estimated at 2,704 birds and have also been given a conservation rank of lowest concern (MANEM Regional Waterbird Plan 2006). The breeding population of laughing gulls in the 1970s was estimated at 129,768 birds in 63 colonies. In the 1990s, the breeding population had increased to 205,348 laughing gulls in 275 colonies which represented a 58% increase in regional abundance (MANEM Regional Waterbird Plan 2006). BBS trend data for laughing gulls in the Eastern BBS Region shows a statistically significant increasing trend estimated at 3.3% annually since 1966 with an estimated 5.3% increase occurring in the past decade (Sauer et al. 2012). In the New England/Mid-Atlantic Coast region, BBS trend data shows an increasing trend estimated at 5.2% annually since 1966 with a 4.3% increase occurring from 2001 through 2011 (Sauer et al. 2012). In New Jersey, the number of laughing gulls observed during the BBS has shown an increasing trend since 1966 estimated at 6.4% annually (Sauer et al. 2012). CBC data for laughing gulls observed overwintering in New Jersey has shown a decreasing trend since 1966 (NAS 2010). Aerial surveys of laughing gulls conducted by the NJDFW from 2012 – 1013 have also shown a decreasing trend since 1995 (NJDFW 2013*b*).

Laughing gulls are protected under the MBTA. However, take can occur pursuant to the MBTA through depredation permits issued by the USFWS and the NJDFW. WS' take of gulls occurs under permits issued to WS or under permits issued to cooperators where WS is acting as an agent on the permit. The take of laughing gulls in New Jersey authorized by the USFWS is shown in Table 4.13.

Table 4.13 – Number of laughing gulls addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	6,674	1,945	435	1,011
2008	1,993	2,120	198	554
2009	13	2,250	0	543
2010	5,405	2,100	465	763
2011	1,484	1,905	25	483
2012	3,096	4,705	145	748
TOTAL	**18,665**	**15,025**	**1,268**	**4,102**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

Based on the number of laughing gulls lethally taken from FY 2007 through FY 2012 and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 1,500 laughing gulls and 600 laughing gull nests (and eggs) in New Jersey as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with laughing gulls at airports and waste management facilities, and from gulls nesting on rooftops.

From 2007 through 2012, the lethal annual take of laughing gulls by all entities in the northeastern United States (USFWS Region 5) has ranged from 2,140 to 6,032 gulls with an average annual take of 4,918 laughing gulls (S. Slonka, USFWS, pers. comm. 2013). The PBR model for laughing gulls in BCR 14 and BCR 30 estimates that nearly 15,000 laughing gulls can be taken annually with no adverse effect on the current population. Current take levels from all known entities in the breeding range of laughing gulls has not exceeded the level of annual take that would cause a decline in the breeding laughing gull population based on the PBR model. Based on the increasing populations observed during summer and winter surveys and the cumulative take of laughing gulls in the northeastern United States being below the level where a decline would occur in the population, WS' take of laughing gulls since 2007, with the oversight of cumulative take by the USFWS, has not adversely affected laughing gull populations.

If WS lethally takes 1,500 laughing gulls and 600 laughing gull nests annually, and if the take of laughing gulls under depredation permits from 2007 through 2012 is indicative of future lethal take in the northeastern United States, the total take of gulls in BCR 14 and BCR 30 would range from 3,640 to 7,532 gulls with an average annual take of 6,418 laughing gulls. As stated previously, based on the PBR model developed for laughing gulls by the USFWS, up to 15,000 laughing gulls could be taken in BCR 14 and BCR 30 annually to maintain current population levels. The proposed total take of laughing gulls by WS evaluated in this assessment when included with take by all other entities would not exceed the level necessary to cause a decline in laughing gull populations based on the PBR model.

Based on the best available information described above, WS' potential impacts to populations of laughing gulls has been, and is expected to continue to be, insignificant to the overall viability and reproductive success of laughing gull populations on a local, regional, and nationwide scale. With management authority over migratory birds in the New Jersey, the USFWS and the NJDFW could impose stricter take limits if warranted based on population data. This should assure that cumulative impacts on laughing gull populations would have no significant adverse impact on the quality of the human environment.

Ring-billed Gull Biology and Population Impacts

Regional populations of ring-billed gulls have increased at a rate of 8% to 11% per year since 1976, with a regional breeding population of 40,844 gulls in 13 colonies reported in the 1990s (MANEM Regional Waterbird Plan 2006). The overall regional population of ring-billed gulls in BCR 14 and BCR 30 is estimated at 54,000 gulls. No breeding populations are currently known to occur in New Jersey; however, ring-billed gulls can be found throughout the year and can be observed throughout much of the state.

Ring-billed gulls are considered a species of lowest concern in BCR 14 and BCR 30 (MANEM Regional Waterbird Plan 2006). Almost 41,000 ring-billed gulls are believed to breed in BCR 14. There are no known breeding colonies in BCR 30. CBC data from 1966 to 2011 shows a general increasing trend for wintering populations of ring-billed gulls throughout New Jersey. A similar increasing trend has also been documented on BBS routes in the United States (Sauer et al. 2012). In the New England/Mid-Atlantic Coast BBS region, the ring-billed gull population is also showing an increasing annual trend estimated at 2.1% since 1966 with the trend in the Eastern BBS Region estimated to be increasing at 5.1% annually (Sauer et al. 2012). In New Jersey, the number of ring-billed gulls observed during the BBS has shown an increasing trend since 1966 estimated at 10.6% annually (Sauer et al. 2012).

Ring-billed gulls are protected under the MBTA. However, take can occur pursuant to the MBTA through depredation permits issued by the USFWS and the NJDFW. WS' take of gulls occurs under permits issued to WS or under permits issued to cooperators where WS is acting as an agent on the permit. The USFWS-authorized take of ring-billed gulls in New Jersey issued to all entities is shown in

Table 4.14. In 2012, the USFWS authorized take of up to 1,075 ring-billed gulls for damage management purposes to all entities, which would comprise 2.0% of the population estimated at 54,000 gulls if take had occurred at the authorized levels.

Table 4.14 – Number of ring-billed gulls addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	235	620	0	3
2008	131	665	0	4
2009	60	725	0	34
2010	449	775	15	164
2011	1,844	1,025	17	138
2012	513	1,075	47	87
TOTAL	**3,232**	**4,885**	**79**	**430**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

The USFWS also authorized ring-billed gull nests to be destroyed as part of depredation permits to prevent and alleviate damage. The number of permits for nest destruction and the reported take are also shown in Table 4.14. Since 2007, no ring-billed gull nests have been reported as destroyed in New Jersey.

Based on the number of ring-billed gulls lethally taken from FY 2007 through FY 2012 and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 600 ring-billed gulls and 500 nests (and eggs) in New Jersey as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with ring-billed gulls at airports and waste management facilities, and from gulls nesting on rooftops.

From 2007 through 2012, the number of ring-billed gulls taken annually in the northeastern United States (USFWS Region 5) has ranged from 1,403 to 4,641 ring-billed gulls with an average annual take of 3,022 ring-billed gulls. The PBR model developed by the USFWS currently predicts that 3,065 ring-billed gulls could be taken annually to maintain the current breeding population levels in BCR 14 and BCR 30 (MANEM Regional Waterbird Plan 2006). Non-breeding ring-billed gulls are also known to occur throughout BCR 14 and BCR 30 during the breeding season. Based on the known take of ring-billed gulls occurring annually in BCR 14 and BCR 30, the take level from all known sources has been below the estimated level that would result in a breeding population decline.

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. With management authority over migratory birds in New Jersey, the USFWS and the NJDFW could impose stricter take limits if warranted based on population data. This should assure that cumulative impacts on ring-billed gull populations would have no significant adverse impact on the quality of the human environment.

Herring Gull Biology and Population Impacts

Herring gulls nest along the Atlantic coast using natural or man-made sites, such as rooftops and breakwalls. Herring gulls are increasingly nesting on man-made structures, particularly on rooftops or in areas with complete perimeter fencing such as electrical substations.

The population of herring gulls in the southern New England and Mid-Atlantic Coast region was estimated at approximately 66,000 breeding pairs (MANEM Regional Waterbird Plan 2006). Herring gulls have decreased approximately 38% in the same area between 1970 and into the 1990s (MANEM Regional Waterbird Plan 2006). According to the MANEM Waterbird Conservation Plan (2006), herring gulls are considered a species of low concern in North America. Almost 91,000 herring gulls are believed to breed in BCR 30. In addition, over 196,000 herring gulls are believed to breed in the neighboring BCR 14 (MANEM Regional Waterbird Plan 2006).

CBC data gathered in New Jersey from 1966 through 2011 indicates the number of herring gulls observed during surveys has shown a decreasing trend (NAS 2010). The number of herring gulls observed during BBS surveys from 1966 to 2011 has shown an increasing trend of 3.3% annually in New Jersey (Sauer et al. 2012). However, the New England/Mid-Atlantic Coast region displayed a declining trend of -5.1% annually (Sauer et al. 2012). Existing BBS survey routes and coastal counts of nesting herring gulls may not sufficiently take into account the change in nesting behavior from islands to rooftops exhibited by numerous nesting herring gull pairs. Aerial surveys of herring gulls conducted by the NJDFW from 2012 – 2013 have shown a stable trend (NJDFW 2013*b*).

Herring gulls are protected under the MBTA, but can be taken pursuant to the issuance of a depredation permit by the USFWS and the NJDFW when gulls are causing or about to cause damage (see Table 4.15). Based on the PBR model, an allowable harvest of up to 16,725 herring gulls in BCR 14 and BCR 30 would maintain current population levels in those two regions. The take of herring gulls also occurs by other entities (e.g., airports, landfills) through depredation permits issued by the USFWS and the NJDFW.

Based on the level of take since FY 2007 and the anticipation of requests to manage damage and threats to human health and safety, WS reasonably expects the need to lethally take herring gulls to increase, but would not exceed 600 herring gulls annually.

Table 4.15 – Number of herring gulls addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	298	770	1	79
2008	102	855	1	71
2009	14	855	12 + 3 nest/9 eggs	112
2010	5,175	905	34	219
2011	7,063	1,130	17 + 277 nests/643 eggs	123
2012	551	2,480	7+ 173 nests/431 eggs	371
TOTAL	**13,203**	**6,995**	**72 + 453 nests/1,083 eggs**	**975**

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

The increase in the estimated annual take level by WS in New Jersey, when compared to take by WS in previous years arises primarily from the increased requests to address damage associated with herring gulls at waste management facilities, airports, military installations, and rooftops. The take of 600 herring gulls would represent 0.9% of the MANEM estimated herring gull breeding population in Mid-Altantic.

In addition to the lethal take of herring gulls, up to 500 nests (and eggs) could be destroyed annually to reduce damage and threats to human health and safety, property, agricultural resources, and natural resources.

The highest level of herring gull take occurred in 2012 when 371 gulls were taken by all entities in New Jersey. Based on a stable population of herring gulls, take in 2012 represented 0.6% of the breeding population estimated in the mid-Atlantic, without accounting for the non-breeding and wintering populations.

From 2007 through 2012, the number of herring gulls taken annually by all entities in the northeastern United States (USFWS Region 5) has ranged from 1,964 to 7,885 gulls with an average of 4,366 gulls. This average annual take of 4,366 gulls is below the level of annual take required to maintain current population levels predicted by the PBR model. To cause a population decline, the PBR model estimates that nearly 16,725 herring gulls would have to be taken annually in the region. If WS annual take reaches 600 herring gulls and the take of herring gulls remains similar to the take that occured from 2007 through 2012 in the northeastern United States, the combined total would not reach a magnitude that the PBR model predicts would result in a decline in the population of herring gulls in BCR 14 and BCR 30. Hence, WS' proposed take of up to 600 herring gulls and 500 nests (and eggs) annually, along with take by other entities, is expected to continue to be insignificant to the overall viability and reproductive success of herring gull populations on a local, regional, and nationwide scale. Known take of herring gulls is below the level that the PBR model predicts will cause a decline in the population in the northeastern United States from take permitted by the USFWS and the NJDFW. The permitting of take by the USFWS and the NJDFW provides outside evaluation to ensure WS' take occurs within the allowed limits to achieve desired population management objectives for herring gulls in New Jersey and the northeastern United States.

Herring gull nests were authorized to be destroyed by the USFWS and the NJDFW through depredation permits issued to WS. The number of herring gull nests destroyed in New Jersey by WS annually has ranged from zero nests in 2007 to a high of 277 nests in 2011. Impacts due to nest removal and destruction should have little adverse impact on the herring gull population regionally. Nest destruction methods are considered non-lethal when conducted before the development of an embryo. Additionally, herring gulls are a long-lived species that have the ability to identify areas with regular human disturbance and low reproductive success which causes them to relocate and nest elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected, this activity has no long term effect on breeding adult herring gulls. Nest removal is not used by WS as a population management method. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is intended to relocate a nesting pair or colony of herring gulls to an area where there are no conflicts. The destruction of up to 500 herring gull nests (and eggs) annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on herring gull populations would occur. As with the lethal take of gulls, the take of nests must be authorized by the USFWS and the NJDFW. Therefore, the number of nests taken by WS annually would occur at the discretion of the USFWS and the NJDFW.

Based on the best available information described above, WS' potential impacts to populations of herring 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. The permitting of take by the USFWS and the NJDFW provides outside evaluation to ensure WS' take occurs within the allowed limits to achieve desired population management objectives for herring gulls in New Jersey and the northeastern United States.

Great Black-backed Gull Biology and Population Impacts

In BCR 14, the breeding population of great black-backed gulls has been estimated at 115,546 birds (MANEM Regional Waterbird Plan 2006). In BCR 30, the breeding population of great black-backed gulls has been estimated at 37,372 birds (MANEM Regional Waterbird Plan 2006). The population of great black-backed gulls in the New England/Mid-Atlantic Coast region is approximately 28,000 breeding pairs (MANEM Regional Waterbird Plan 2006). Great black-backed gulls have increased about 39% across the entire 13 northeast states in the region from the 1970s through the 1990s (MANEM Regional Waterbird Plan 2006). In the United States, great black-backed gull breeding populations have increased 109% from the 1970s to 1990s (MANEM Regional Waterbird Plan 2006).

CBC data gathered in New Jersey, from 1966 through 2012, shows the number of great black-backed gulls observed during surveys to be decreasing (NAS 2010). In the Eastern BBS Region, populations are decreasing at an estimated rate of -2.6% annually since 1966. However, estimates for the New England/Mid-Atlantic Coast BBS region indicate populations are increasing at a rate of 14.5% in the past decade. BBS data for New Jersey shows a 29.7% increase since 2001 (Sauer et al. 2012). Aerial surveys of great black-backed gulls conducted by the NJDFW from 2012 – 1013 have shown a stable or increasing trend (NJDFW 2013*b*).

Table 4.16 shows the authorized take of great black-backed gulls in New Jersey permitted by the USFWS and the NJDFW, and the reported take for all entities receiving depredation permits.

Table 4.16 – Number of great black-backed gulls addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2]
2007	0	495	0	0
2008	0	590	0	0
2009	0	580	0	5
2010	25	620	0	3
2011	5	605	0	1
2012	0	930	2 nests/6 eggs	137
TOTAL	**30**	**3,820**	**2 nests/6 eggs**	**146**

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

Increases in the number of requests for assistance to manage damage are likely to involve gull damage at airports, military installations, landfills, on rooftops, and involve reducing threats to natural resources. Based on those anticipated increases in requests for assistance, WS could lethally take up to 600 great black-backed gulls and 500 nests (and eggs) annually under the proposed action alternative in New Jersey.

Great black-backed gulls are considered a species of lowest concern in BCR 30 and of low concern in BCR 14 (MANEM Regional Waterbird Plan 2006). Over 37,000 great black-backed gulls are believed to breed in BCR 30 with over 115,000 great black-backed gulls nesting in BCR 14. The breeding population goal for great black-backed gulls is between 137,626 to 168,210 gulls in BCR 14 and BCR 30 (MANEM Regional Waterbird Plan 2006). To maintain the current population levels in BCR 14 and BCR 30, the PBR model developed by the USFWS predicts take of 11,234 great black-backed gulls

would not cause a decline in gull populations in BCR 14 or BCR 30. With $F_R = 0.5$ (recovery factor), the PBR predicted 5,614 great black-backed gulls could be harvested annually in BCR 14 and BCR 30 and still allow those populations to increase.

From 2007 through 2012, the number of great black-backed gulls taken annually by all entities in the northeastern United States (USFWS Region 5) has ranged from 348 to 860 gulls with an average of 584 gulls. This average annual take of 584 gulls is below the level of annual take required to maintain current population levels predicted by the PBR model. To cause a population decline, the PBR model estimates that nearly 17,000 great black-backed gulls would have to be taken annually in the region. If WS annual take reaches 600 great black-backed gulls and the take of great black-backed gulls remains similar to the average annual take that occured from 2007 through 2012 in the northeastern United States, the combined total (n= ~1,184 gulls) would not reach a magnitude that the PBR model predicts would result in a decline in the population of black-backed gulls in BCR 14 and BCR 30.

Based on the best available information, WS' take of great black-backed gulls in New Jersey has not adversely affected the statewide population nor will WS' proposed take of up to 600 great black-backed gulls annually in New Jersey. The permitting of take by the USFWS and the NJDFW provides outside evaluation to ensure WS' take occurs within the allowed limits to achieve desired population objectives.

The destruction of up to 500 great black-backed gull nests (and eggs) annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on great black-backed gull populations would occur. As with the lethal take of gulls, the take of nests must be authorized by the USFWS and the NJDFW. Therefore, the number of nests taken by WS annually would occur at the discretion of the USFWS and the NJDFW.

Rock Pigeon Biology and Population Impacts

Pigeons are an introduced rather than native species and, thereforethey are not protected by federal law. The NJDFW Assistant Director Larry Herrighty (pers. comm. 2014) clarified that the New Jersey fish, game, and wildlife law (NJSA 23:4-53) to protect pigeons only applies to the extinct passenger pigeon (*Ectopistes migratorius*), and has no applicability to rock pigeons.

Pigeons are closely associated with humans as human structures and activities provide them with food and sites for roosting, loafing, and nesting (Williams and Corrigan 1994). Thus, they are commonly found around city buildings, bridges, parks, farm yards, grain elevators, feed mills, and other man-made structures (Williams and Corrigan 1994). Additionally, although pigeons are primarily grain and seed eaters, they will readily feed on garbage, livestock manure, spilled grains, insects, and any other available bits of food (Williams and Corrigan 1994).

According to BBS trend data provided by Sauer et al. (2012), from 1966 through 2011 pigeon populations have decreased at an annual rate of -4.5% in New Jersey and have decreased at an annual rate of -3.4% in the New England/Mid-Atlantic Coast region of the United States. The statewide population of pigeons is currently estimated at 50,000 pigeons based on BBS data (PFSC 2013). New Jersey CBC data from 1966 through 2011 also shows a decreasing population trend for wintering populations of pigeons (NAS 2010).

Since pigeons are a non-native species and are, therefore, afforded no protection under the MBTA, the take of pigeons to alleviate damage or to reduce threats can occur without the need for a depredation permit from the USFWS. WS' take of pigeons from FY 2007 through FY 2012 to alleviate damage and threats of damage on airports when requested is shown in Table 4.17.

Table 4.17 – Number of rock pigeons addressed by WS on airports from FY 2007 through FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	0	0
2008	0	0
2009	0	0
2010	9	8
2011	19	25
2012	0	80 + 3 nests/5 eggs
TOTAL	**28**	**113 + 3 nests/5 eggs**

[1]Data reported by federal fiscal year

Based on the gregarious behavior of pigeons (i.e., forming large flocks) and in anticipation of the number of requests for assistance by WS to alleviate damage and threats to increase, WS could annually take up to 3,000 pigeons and 500 nests (and eggs). Based on a population estimated at 50,000 pigeons, take of up to 3,000 pigeons by WS would represent 6.0% of the estimated statewide population. 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. WS' proposed take is of a low magnitude compared with the statewide population; however, any take of invasive species can be considered a positive impact to the environment.

Mourning Dove Biology and Population Impacts

Mourning doves are migratory birds with substantial populations throughout much of North America and can be found in New Jersey year-round. Mourning doves are considered migratory game birds and although many states have regulated annual hunting seasons for doves, New Jersey does not. Across the United States, the preliminary mourning dove harvest in 2010 was estimated at almost 17.2 million doves and in 2011 at 16.6 million doves (Raftovich et al. 2012).

According to BBS trend data provided by Sauer et al. (2012), mourning dove populations have decreased at an annual rate of -0.3% in New Jersey since 1966. BBS routes in the New England/Mid-AtlanticCoast region are showing an annual increase estimated at 0.3% since 1966 (Sauer et al. 2012). The breeding mourning dove population in New Jersey has been estimated to be 220,000 doves (PFSC 2013). CBC data indicates a stable population trend for doves observed wintering in New Jersey (NAS 2010).

The number of mourning doves addressed in New Jersey by WS and other entities is shown in Table 4.18. Requests for assistance often arise from airports where the gregarious flocking behavior of doves can pose risks to aircraft at or near airports. Based on the number of requests to manage damage associated with doves received previously and based on the increasing need to address damage and threats associated with doves in New Jersey, up to 1,000 mourning doves and 100 nests (and eggs) could be taken by WS annually to address damage or threats.

Table 4.18 – Number of mourning doves addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2,3]
2007	210	80	8	3
2008	35	240	83	0
2009	534	140	99	95
2010	546	390	144 + 6 nests	182
2011	2,661	270	130 + 2 nests/4 eggs	204
2012	549	420	93	84
TOTAL	**4,535**	**1,162**	**557 + 8 nests/4 eggs**	**568**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

[3]Total take by all entities includes take reported by selected depredation permit holders allowed to take additional species and numbers in emergency situations to protect human health and safety.

An annual take by WS of up to 1,000 mourning doves would represent 0.5% of the estimated statewide breeding population. This potential limited take of doves, in comparison to the overall population and the permitting take by the USFWS and NJDFW through the issuance of depredation permits, should not adversely affect dove populations in New Jersey. Local populations of mourning doves in the New Jersey are likely augmented by migrating birds during during the winter months. Like other native bird species, the take of mourning doves by WS to alleviate damage will only occur when permitted by the USFWS and the NJDFW pursuant to the MBTA through the issuance of depredation permits. Therefore, the take of mourning doves by WS will only occur at levels authorized by the USFWS which ensures WS' take and take by all entities are considered to achieve the desired population management levels of doves in the New Jersey.

European Starling Biology and Population Impacts

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 thoughout North America. Additionally, they form large winter roosts in urban and suburban areas causing conflicts with society. In New Jersey, starlings are probably the second most abundant bird behind only the American robin (Homan et al. 2012).

The starling is found in virtually all New Jersey habitats. Starlings nest in cavities and will readily evict most native hole-nesting species. In the absence of natural cavities, they will nest in almost any enclosed area such as a street light, a mail box, or an attic (Brauning 1992).

European starlings are considered a non-native species in New Jersey and are afforded no protection under the MBTA. Therefore, no depredation permits, from either the USFWS or the NJDFW, are needed for the take of starlings. The number of starlings lethally removed to alleviate damage or threats in the New Jersey is unknown since the reporting of starling take is not required. 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 starlings observed in the New Jersey along routes surveyed during the BBS has shown a statistically significant downward trend since 1966 estimated at -2.6% annually (Sauer et al. 2012). A similar trend in the number of starlings observed during the BBS has occurred in the New England/Mid-Atlantic Coast BBS region (Sauer et al. 2012). Using data from the BBS, the PFSC (2013) estimated the statewide breeding population at 250,000 starlings.

To alleviate damage and threats of damage, the WS program in New Jersey has lethally taken a total of 10,828 starlings from FY 2007 through FY 2012, with an average annual take of 1,805 starlings (see Table 4.19). Based on previous requests for assistance received and in anticipation of receiving additional requests for assistance, up to 50,000 starlings and 5,000 nests (and eggs) could be taken by WS annually to alleviate damage and threats. Damage and threats are primarily associated with aviation safety at and near airports and military installations, as well as in agricultural settings.

Table 4.19 – Number of European starling addressed by WS from FY 2007 through FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	174	978
2008	232	2,371
2009	1,709	919
2010	6,807	1,964 + 18 nests/18 eggs
2011	2,850	3,088 + 16 nests/15 eggs
2012	3,102	1,508
TOTAL	**14,874**	**10, 828 + 34 nests/33 eggs**

[1]Data reported by federal fiscal year

The proposed take of up to 50,000 starlings annually by WS to alleviate damage or threats would represent 20% of the estimated statewide starling population. WS' proposed take could be considered as benefiting the environment by reducing the competition between starlings and native bird species.

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 New Jersey. The USFWS has established a Federal Depredation Order (50 CFR 21.43) for blackbirds (Sobeck 2010). Therefore, no federal permit is required to remove blackbirds, cowbirds, grackles, crows and magpies 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. 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.

Red-winged Blackbird Biology and Population Impacts

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 New Jersey throughout the year (Yasukawa and Searcy 1995). The breeding habitat of red-winged blackbirds includes marshes and upland habitats from

southern Alaska and Canada southward to Costa Rica extending from the Pacific to the Atlantic Coast along with the Caribbean Islands (Yasukawa and Searcy 1995). Primarily associated with emergent vegetation in freshwater wetlands and upland habitats during the breeding season, red-winged blackbirds also nest in marsh vegetation in roadside ditches, saltwater marshes, rice paddies, hay fields, pasture land, fallow fields, suburban habitats, and urban parks (Yasukawa and Searcy 1995).

In New Jersey, red-winged blackbirds are estimated to have a breeding population estimated at 110,000 birds (PFSC 2013). Trend data from the BBS indicates the number of red-winged blackbirds observed in the state during the breeding season has shown a statistically significant decreasing trend since 1966 estimated at -1.9% annually (Sauer et al. 2012). Across all survey routes in the New England/Mid-Atlantic Coast BBS region, the number of red-winged blackbirds observed has shown statistically significant downward trends since 1966 estimated at -2.0% annually (Sauer et al. 2012). The number of red-winged blackbirds observed during the CBC in the state has shown a negative trend since 1966 (NAS 2010).

To alleviate damage and threats of damage, the WS program in New Jersey has dispersed 634 red-winged blackbirds using non-lethal methods, primarily to alleviate damage occurring at and near airports between FY 2007 through FY 2012. A total of 532 red-winged blackbirds have been lethally removed and a total of 4 nests containing 11 eggs have been destroyed during this time period (see Table 4.20). Based on previous requests for assistance received and in anticipation of receiving additional requests for assistance, up to 5,000 red-winged blackbirds and 1,000 nests (and eggs) could be taken by WS annually. Damage and threats are primarily associated with human safety at airports and military installations, as well as in agricultural settings.

Table 4.20 – Number of red-winged blackbirds addressed by WS from FY 2007 through FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	8	3
2008	0	5
2009	70	72
2010	95	83 + 1 nest/4 eggs
2011	213	206 + 3 nests/7 eggs
2012	248	163
TOTAL	**634**	**532 + 4 nests/11 eggs**

[1]Data reported by federal fiscal year

If up to 5,000 red-winged blackbirds were taken annually by WS, the take would represent 4.6% of the estimated population. Based on the limited take by WS when compared to the estimated breeding population, WS' proposed annual take of red-winged blackbirds would be a low magnitude when compared to the estimated breeding populations, especially given the the USFWS maintains a Federal Blackbird Depredation Order for this species.

Common Grackle Biology and Population Impacts

Another 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 eastern United States which provides suitable nesting habitat and the planting of trees in residential areas which has led to an expansion of the species' range into the western United States (Peer and Bollinger 1997).

Common grackles can be found throughout the year in New Jersey with an estimated breeding population calculated at 400,000 birds (PFSC 2013). The number of common grackles observed during the BBS in the state has shown a statistically significant declining trend since 1966, which has been estimated at -2.9% (Sauer et al. 2012). A similar downward trend, estimated at -2.2% annually since 1966, has also been observed for grackles along BBS routes across the New England/Mid-Atlantic Coast region of the United States (Sauer et al. 2012). Across the United States, the number of common grackles observed during the annual BBS has also shown a statistically significant downward trend estimated at -1.8% since 1966 (Sauer et al. 2011). The number of grackles observed in New Jersey during the annual CBC surveys has also shown a negative trend since 1966 (NAS 2010).

Like other blackbird species, the take of common grackles can occur under the previously referenced Federal Blackbird Depredation Order 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. To alleviate damage and threats of damage, the WS program in New Jersey has dispersed 109 common grackles using non-lethal methods, primarily to alleviate damage occurring at and near airports from FY 2007 through FY 2012. A total of 73 common grackles were lethally removed and a total of 54 nests containing 63 eggs were destroyed during this time period (see Table 4.21). Based on previous requests for assistance received and in anticipation of receiving additional requests for assistance, up to 3,000 common grackles and 500 nests (and eggs) could be taken by WS annually. Damage and threats are primarily associated with human safety at and near airports and military installations, as well as in agricultural settings.

Table 4.21 – Number of common grackle addressed by WS from FY 2007 through FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	0	1
2008	0	0
2009	12	9 + 2 nests
2010	10	28 + 30 nests/19 eggs
2011	49	17 + 22 nests/44 eggs
2012	38	18
TOTAL	**109**	**73 + 54 nests/63 eggs**

[1]Data reported by federal fiscal year

If up to 3,000 common grackles are taken annually by WS, the take would represent 0.75% of the estimated population. The take of common grackles by WS is expected to be of low magnitude when compared to the statewide estimated population. Based on the above information and WS anticipated lethal take of common grackles in New Jersey, WS should have minimal effects on local, statewide, regional or continental populations.

Brown-headed Cowbird Biology and Population Impacts

Brown-headed cowbirds are another species of the blackbird family commonly found in mixed species flocks during migration periods. Brown-headed cowbirds can be found during all seasons in New Jersey and are a common summer resident (Lowther 1993). 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 up to 40 eggs per season with eggs reportedly being laid in the nests of over 220 species of birds, of which, 144 species have actually raised cowbird young (Lowther 1993). No

parental care is provided by cowbirds with the raising of cowbird young occurring by the host species (Peterson 1980).

In New Jersey, the number of cowbirds observed in areas surveyed during the BBS has shown a statistically significant increasing trend, estimated at 1.9% annually, between 1966 and 2011 (Sauer et al. 2012). The PFSC (2013) estimated the statewide breeding population of cowbirds at 140,000 birds. In the New England/Mid-Atlantic Coast region of the United States, cowbirds have shown an increasing trend since 1966, estimated at 0.3% annually (Sauer et al. 2012). The number of cowbirds observed during the CBC conducted annually in the state has shown a stable trend (NAS 2010).

The take of brown-headed cowbirds can occur under the Federal Blackbird Depredation Order which allows blackbirds, including cowbirds, to be taken when committing damage or about to commit damage without the need for a depredation permit. Therefore, the number of cowbirds taken annually by other entities is currently unknown. To alleviate damage and threats of damage, the WS program in New Jersey has dispersed 3,829 brown-headed cowbirds using non-lethal methods, primarily to alleviate damage occurring at and near airports from FY 2007 through FY 2012. A total of 735 cowbirds have been lethally removed and a total of two eggs have been destroyed during this time period (see Table 4.22). Based on previous requests for assistance received, and in anticipation of receiving additional requests for assistance, up to 3,000 brown-headed cowbirds (and 50 eggs) could be lethally taken in the New Jersey by WS annually. Damage threats are primarily associated with human health and safety requests on airports, as well as agricultural damage occurring.

Table 4.22 – Number of brown-headed cowbirds addressed by WS from FY 2007 through FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	0	0
2008	30	0
2009	390	62
2010	1,264	148 + 2 eggs
2011	797	402
2012	1,348	123
TOTAL	**3,829**	**735 + 2 eggs**

[1]Data reported by federal fiscal year

Based on the statewide breeding population, take of up to 3,000 birds by WS to alleviate damage or threats of damage would represent 2.1% of the estimated population. 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 of starlings and blackbirds. Given the relative abundance of brown-headed cowbirds, 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, we conclude that the proposed action will not adversely impact the state, regional or national brown-headed cowbird population.

American Crow Biology and Population Impacts

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, highway turnarounds, feedlots, and the shores of rivers, streams, and marshes. Crows tend to avoid unbroken expanses of forest, but do show up at forest campgrounds and travel into forests along roads and rivers

(Verbeek and Caffrey 2002). American crows are one of the most recognizable birds in New Jersey (Tekiela 2000).

Large flocks of crows tend to concentrate in some areas where abundant food and roosting sites are available. In the fall and winter, crows often form large roosting flocks in urban areas. These large flocks disperse to different feeding areas during the day. Crows will fly up to 6-12 miles from the roost to a feeding site each day (Johnson 1994). 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.

The American crow population in New Jersey has been estimated at 73,000 birds (PFSC 2013). From 1966 through 2011, trend data from the BBS indicates the number of crows observed in New Jersey during surveys has increased at an annual rate of 0.1% (Sauer et al. 2012). Crow populations in the New England/Mid-Atlantice region have increased at an annual rate of 1.0%, which is statistically significant (Sauer et al. 2012). The number of crows observed in New Jersey in areas surveyed during the CBC has shown a stable trend since 1966 (NAS 2010). In New Jersey, American crows can be harvested from August through mid-March (typically 4 days per week, Monday, Thursday, Friday and Saturday). The number of crows harvested during the hunting season has averaged 20,650 crows over the past five years with a high of 35,780 birds in 2011-12 (NJDFW 2014*b*).

Between FY 2007 and FY 2012, WS has dispersed 663 American crows and lethally removed a total of five crows and two nests (containing four eggs) in New Jersey. In anticipation of increased requests for assistance, primarily to alleviate damage and threats of damage associated with aviation safety and urban crow roosts, take of up to 300 American crows and 50 nests (including eggs) annually could occur by WS in New Jersey. Based on a statewide population estimated at 73,000 American crows, WS' proposed take of up to 300 birds and 50 nests annually would represent 0.4% of the estimated statewide American crow population. WS' take combined with the highest recent hunting harvest (35,780 birds) would represent 49.4% of the statewide population. Although, this is a high percentage of cumulative take, crow populations remain viable enough to support an annual hunting season and a Federal Blackbird Depredation Order. Additionally, WS' proposed take represents only 0.84% of the 2012 hunting harvest. Based on the above information and WS' limited lethal take of crows in New Jersey, WS should have minimal effects on local, statewide, regional or continental American crow populations.

Horned Lark Biology and Population Impacts

Horned larks have become increasingly localized in New Jersey. Strongholds include the Wallkill River Valley, parts of Warren, Salem, and Cumberland Counties, and Lakehurst Naval Station in Ocean County. Mowed areas around airstrips support populations where suitable agricultural and non-forested habitats are scarce (Conserve Wildlife Foundation of New Jersey 2013*c*).

Horned larks are afforded *"threatened"* status in New Jersey in terms of breeding. The open areas found at airports makes the habitat ideal for horned larks to forage and nest while providing ample perching areas. Most requests for assistance to reduce threats associated with horned larks occur at airports and military installations in New Jersey. As mentioned above, the mowed environment of an airfield is attractive to this species which can pose a hazard to aviation safety and hazards to the birds as well.

As reported by the BBS, populations of horned larks in New Jersey have decreased since 1966 at an estimated rate of -4.8% annually (Sauer et al. 2012). In the United States, BBS data indicates horned larks are showing a statistally significant declining trend estimated at -1.9% annually since 1966 (Sauer et al. 2012). CBC data from 1966 through 2011 shows a stable trend for horned larks wintering in New

Jersey (NAS 2010). The Partners in Flight landbird database estimated the population of horned larks in New Jersey to be 1,400 birds (PFSC 2013).

Since FY 2007, a total of 695 horned larks have been dispersed by WS to alleviate damage on airports. Based on the number of requests received to alleviate the threat of damage associated with horned larks and the number of horned larks addressed previously to alleviate those threats, WS anticipates that up to 50 horned larks could be taken annually.

Based on the estimated population, WS' take of up to 50 horned larks would represent 3.6% of the estimated population. Although take could occur by other entities when authorized by the USFWS and the NJDFW through the issuance of depredation permits, the take of horned larks would not likely reach a magnitude where adverse effects to horned lark populations would occur from take to alleviate damage or threats.

Eastern Meadowlark Biology and Population Impacts

New Jersey's meadowlarks are most common in the agricultural areas of Sussex, Warren, Hunterdon, and Salem Counties and are often year-round residents. Preferred habitats include grasslands, prairies, lightly grazed pastures, mixed-grass hayfields, and fallow areas with a low percentage of forbs and less than one-third shrub cover. Dense grasses between 10-20 inches tall (medium height) seem to be used most for nesting. Meadowlarks may use cropland as well, although nesting is limited by the absence of grass cover. Ideal habitats have ample perches within the site along the perimeter. Fence posts, tall forbs, shrubs, trees, and even utility wires can serve as perches. Eastern meadowlarks are area-sensitive birds, requiring at least 15-20 acres of unbroken grassland habitat for nesting (Conserve Wildlife Foundation of New Jersey 2013*b*).

Eastern meadowlarks are a species of *"special concern"* in regard to breeding status in New Jersey. However, the open areas found at airports makes the habitat ideal for meadowlarks to forage and nest while providing ample perching areas. Most requests for assistance to reduce threats associated with meadowlarks occur at airports and military installations in New Jersey. Meadowlarks found on and adjacent to airport property can pose a hazard to aviation safety and the birds as well.

As reported by the BBS, populations of Eastern meadowlarks in New Jersey have decreased since 1966 at an estimated rate of -9.0% annually, which is statistically significant (Sauer et al. 2012). In the New England/Mid-Atlantic Coast region, BBS data indicates meadowlarks are showing a statistically significant declining trend estimated at -6.8% annually since 1966 (Sauer et al. 2012). CBC data from 1966 through 2011 shows a declining trend for meadowlarks wintering in New Jersey (NAS 2010). The Partners in Flight landbird database estimated the population of eastern meadowlarks in New Jersey to be 3,000 birds (PFSC 2013).

From FY 2007 through FY 2012, a total of 596 meadowlarks were dispersed by WS using non-lethal methods. Additionally, a total of 30 meadowlarks have been lethally taken by WS to alleviate damage or threats associated with airports and military installations, pursuant to depredation permits (see Table 4.23). In anticipation of damage associated with meadowlarks and the number of meadowlarks addressed previously to alleviate those threats, WS anticipates that up to 75 meadowlarks could be taken annually.

Table 4.23 – Number of Eastern meadowlarks addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2,3]
2007	0	0	0	0
2008	0	0	0	0
2009	29	20	0	0
2010	90	20	0	1
2011	368	20	13	29
2012	109	20	17	0
TOTAL	**596**	**80**	**30**	**30**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

[3]Total take by all entities includes take reported by selected depredation permit holders allowed to take additional species and numbers in emergency situations to protect human health and safety.

Based on the estimated population of 3,000 Eastern meadowlarks, WS' take of up to 75 birds would represent 2.5% of the estimated population. Although take could occur by other entities when authorized by the USFWS through the issuance of a depredation permit, the take of meadowlarks would not likely reach a magnitude where adverse effects to meadowlarks populations would occur from take to alleviate damage or threats. The permitting of the take by the USFWS and the NJDFW through the issuance of depredation permits pursuant to the MBTA ensures cumulative take of meadowlarks would be considered as part of population management objectives for this species.

Purple Martin Biology and Population Impacts

Specifically, purple martins are the largest swallow in North America and can be found in New Jersey during their breeding season, primarily nesting in man-made nest boxes (Tekiela 2000). According to BBS trend data, purple martin populations have decreased at an annual rate of -3.9% in New Jersey since 1966, which is statistically significant (Sauer et al. 2012). However, results for the New England/Mid-Atlantic Coast BBS region show an annual population increase of 1.0% since 1966 (Sauer et al. 2012). The breeding purple martin population in New Jersey has been estimated to be 13,000 birds (PFSC 2013).

Between FY 2007 and FY 2012, WS has dispersed 1,058 purple martins using non-lethal methods to protect human safety at airports. During this time period, 35 purple martins were lethally removed to mitigate hazards to aviation safety. In anticipation of receiving additional requests for assistance to manage threats posed by purple martins at airports and military installations, WS could lethally remove up to 100 purple martins annually under the proposed action. In addition, WS may remove up to 20 purple martin nests (and eggs) annually.

As with other species, WS would continue to employ primarily non-lethal methods to address damage and threats of damage. However, lethal take could be conducted when immediate threats to human safety occur, such as when habituation to non-lethal methods is observed. The take of 100 purple martins annually by WS would constitute 0.77% of the current statewide population. Although take could occur by other entities when authorized by the USFWS through the issuance of a depredation permit, the take of purple martins would not likely reach a magnitude where adverse effects to martin populations would occur from take to alleviate damage or threats. The permitting of the take by the USFWS and the NJDFW through the issuance of depredation permits pursuant to the MBTA ensures cumulative take of martins would be considered as part of population management objectives for this species.

Tree Swallow Biology and Population Impacts

Often seen flying back and forth across open fields and feeding on insects, tree swallows are usually the first swallow to return to New Jersey each spring (Tekiela 2000). According to BBS trend data, tree swallow populations have increased at an annual rate of 4.8% in New Jersey since 1966, which is statistically significant (Sauer et al. 2012). However, results for the New England/Mid-Atlantic Coast BBS region show a statistically significant annual population decrease of -0.2% since 1966 (Sauer et al. 2012). The breeding tree swallow population in New Jersey has been estimated to be 20,000 birds (PFSC 2013).

The number of tree swallows addressed by WS and other entities is shown in Table 4.24. The majority of requests for assistance with tree swallows are from airports and military installations, where the presence of swallows can pose risks to aviation safety. Based on the number of previous requests to manage tree swallow damage and the increasing need to address damage and threats associated with tree swallows at civil and military airports in New Jersey, up to 200 tree swallows and 100 nests (and eggs) could be taken by WS annually.

Table 4.24 – Number of tree swallows addressed in New Jersey from FY 2007 through FY 2012

		Take under Depredation Permits		
Year	**Dispersed by WS[1]**	**Authorized Take[2]**	**WS' Take[1]**	**Total Take by All Entities[2]**
2007	0	10	0	0
2008	9	10	0	0
2009	292	10	10	10
2010	148	10	0	0
2011	25	10	0	0
2012	153	30	0	0
TOTAL	**627**	**80**	**10**	**10**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

The annual take of up to 200 tree swallows by WS would represent 1.0% of the estimated statewide breeding population. Like other native bird species, the take of tree swallows by WS to alleviate damage would only occur when permitted by the USFWS and the NJDFW, pursuant to the MBTA, through the issuance of depredation permits. Therefore, the take of tree swallows by WS would only occur at levels authorized by the USFWS and the NJDFW, which ensures cumulative take by all entities is considered prior to any action being conducted.

Barn Swallow Biology and Population Impacts

According to BBS trend data, barn swallow populations have decreased at an annual rate of -1.0%% in New Jersey since 1966, which is statistically significant (Sauer et al. 2012). Similarly, barn swallow populations for the New England/Mid-Atlantic Coast BBS region show a statistically significant annual decrease of -1.2% since 1966 (Sauer et al. 2012). Across all BBS routes in the United States, barn swallows have exhibited an annual population decrease of -0.4% since 1966 (Sauer et al. 2012). The breeding barn swallow population in New Jersey has been estimated to be 60,000 birds (PFSC 2013).

The number of barn swallows addressed by WS and other entities is shown in Table 4.25. The majority of requests for assistance with barn swallows occur at airports and military installations, where the presence of swallows can pose risks to aviation safety.

Table 4.25 – Number of barn swallows addressed in New Jersey from FY 2007 through FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		Authorized Take[2]	WS' Take[1]	Total Take by All Entities[2, 3]
2007	60	10	0	0
2008	0	10	0	0
2009	209	10	9 + 4 nests	9
2010	177	70	10 + 18 nests/24 eggs	18
2011	353	70	18 + 20 nests/12 eggs	20
2012	631	110	44 + 115 nests/155 eggs	41
TOTAL	**1,430**	**280**	**81 + 157 nests/191 eggs**	**88**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

[3]Total take by all entities includes take reported by selected depredation permit holders allowed to take additional species and numbers in emergency situations to protect human health and safety.

Based on the number of previous requests to manage barn swallow damage and the increasing need to address damage and threats associated with barn swallows at civil and military airports in New Jersey, up to 300 barn swallows and 500 nests (and eggs) could be taken by WS annually. With an estimated population of 60,000 barn swallows, WS' take of up to 300 birds would represent 0.5% of the estimated number present in New Jersey. Like other native bird species, the take of barn swallows by WS to alleviate damage would only occur when permitted by the USFWS and the NJDFW, pursuant to the MBTA, through the issuance of depredation permits. Therefore, the take of barn swallows by WS would only occur at levels authorized by the USFWS and the NJDFW, which ensures cumulative take by all entities is considered prior to any action being conducted.

House Sparrow Biology and Population Impacts

House sparrows were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). Since its first appearance in Chatham, NJ in 1868, the house sparrow has become a common and broadly distributed breeding bird in the state (Walsh et al. 1999). 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. Like European starlings, because of their negative effects on and competition with native bird species, house sparrows are considered by many wildlife biologists, orinthologists, 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 take of house sparrows does not require depredation permits issued by either the USFWS or the NJDFW. 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.

According to BBS trend data provided by Sauer et al. (2012) from 1966 to 2011, house sparrow populations have decreased at an annual rate of -2.3% in New Jersey and have decreased at an annual rate of -2.4% in the New England/Mid-Atlantic Coast region of the United States. The statewide population of house sparrows is estimated at 200,000 birds (PFSC 2013). CBC data from 1966 to 2011 for New Jersey shows a negative trend for wintering populations of house sparrows (NAS 2010).

From FY 2007 through FY 2012, WS lethally removed an average of twenty house sparrows per year (see Table 4.26) to alleviate damage and threats of damage, primarily associated with aviation safety and agriculture. Since house sparrows 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 sparrows lethally removed by other entities is unknown. Based on the gregarious behavior of sparrows and in anticipation of receiving additional requests for assistance to alleviate damage and threats, WS could take up to 3,000 house sparrows and 500 nests (and eggs) annually.

Table 4.26 – Number of house sparrows addressed by WS from FY 2007 through FY 2012

Year	Dispersed by WS[1]	WS' Take[1]
2007	0	11
2008	0	1
2009	0	8
2010	102	77
2011	81	13 + 2 nests
2012	0	12 + 8 nests/1 egg
TOTAL	**183**	**122 + 11 nests/1 egg**

[1]Data reported by federal fiscal year

If up to 3,000 sparrows were lethally removed by WS annually in the state, the take would represent 1.5% of the statewide breeding population. As stated previously, the annual take of house sparrows by other entities is currently not known. Since house sparrows 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 New Jersey. WS' take of house sparrows to reduce damage and threats would be in compliance with Executive Order 13112.

Additional Target Species

Target species, in addition to those species analyzed previously, have been lethally taken in small numbers by WS and have included no more than 20 individuals and/or no more than 20 nests of the following species common loons, pied-billed grebes, brown pelicans, great cormorants, snowy egrets, little blue herons, tricolored herons, cattle egrets, green herons, black-crowned night herons, tundra swans, gadwall, Eurasian wigeons, American wigeons, Northern shovelers, Northern pintails, canvasbacks, redheads, ring-necked ducks, blue-winged teal, green-winged teal, greater scaup, lesser scaup, king eiders, common eiders, harlequin ducks, surf scoter, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, ring-necked pheasants, Northern bobwhite, common moorhens, American coots, lesser yellowlegs, least sandpipers, upland sandpipers, American woodcocks, common terns, least terns, chimney swifts, belted kingfishers, monk parakeets, red-bellied woodpeckers, downy woodpeckers, hairy woodpeckers, Northern flickers, Eastern kingbirds, blue jays, fish crows, common ravens, bank swallows, American robins, gray catbirds, Northern mockingbirds, and snow buntings.

Based on previous requests for assistance and the take levels necessary to alleviate those requests for assistance, no more than 20 individuals and 20 nests (and eggs) of any of those species could be taken annually by WS. In addition, WS anticipates that up to 10 rough-legged hawks and great horned owls could be taken if they return to airport environments under WS' raptor translocation protocol. None of those bird species are expected to be taken by WS at any level that would adversely affect populations of those species. 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 NJDFW 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.

Monk parakeets are not afforded protection under the MBTA and are considered a non-native species in New Jersey. The take of parakeets could occur without the need for a depredation permit from the USFWS. However, the limited take of those species is not expected to reach a level where the populations of those species would be adversely affected by WS' activities under the proposed action.

Gadwall, Eurasian wigeons, American wigeons, Northern shovelers, Northern pintails, canvasbacks, redheads, ring-necked ducks, blue-winged teal, green-winged teal, greater scaup, lesser scaup, king eiders, common eiders, harlequin ducks, surf scoter, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, ring-necked pheasants, Northern bobwhite, common moorhens, and American coots maintain sufficient population densities to allow for annual harvest seasons. The proposed take of up to 20 individuals of those species, including up to 20 nests, under the proposed action would be a minor component of the annual take of those species during the regulated hunting seasons.

Some of the species of birds addressed in this EA are listed as threatened, endangered, or species of concern by the NJDFW. Take of these species would only occur with approval by the NJDFW. The complete list of the state-listed wildlife in New Jersey 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 New Jersey is listed in Appendix C.

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 NJDFW and only at take levels allowed under those depredation permits. The permitting of the take by the USFWS and the NJDFW 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.

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.[10] 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; commingle in Alaska staging areas with species that could bring the virus from other parts of the world;

Sentinel Species: Waterfowl, gamefowl, and poultry flocks reared in backyard facilities may prove to be valuable for early detection and used as for surveillance of diseases. Sentinel duck flocks may also be placed in wetland environments where they are potentially exposed to and infected with disease agents as they commingle with wild birds.

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

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

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).

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 NJDFW and USFWS. 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. Depending upon the experience, training and methods available to the individuals conducting the BDM, potential 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 target species' populations would be adversely affected by implementation of this alternative. Impacts and hypothetical 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 hypothetically possible that frustration caused by the inability to reduce losses would lead to illegal use of toxicants by others which could increase adverse effects, however to an unknown degree. Because WS would be able to provide assistance with non-lethal BDM, risks of adverse 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 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*.

Local bird populations could decline, stay the same, or increase depending on actions taken by those persons experiencing bird damage. 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 effects on the populations of those bird species in the state 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.

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.

Personnel from WS 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. From FY 2007 through FY 2012, the WS program in New Jersey unintentionally killed a Northern mockingbird in a decoy trap and one gadwall with a firearm. In addition, one tree swallow was live-captured in a raptor trap and released unharmed.

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by 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. 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 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 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.

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 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. Methyl anthranilate has been used to flavor food, candy, and soft drinks. Anthraquinone naturally occurs in plants like aloe. Anthraquinone 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. Mesurol is applied directly inside eggs that are of a similar appearance to those being predated on by crows. Therefore, risks to non-target would be restricted to those wildlife species that would select for the egg baits. However, adherence to the label requirements of mesurol would ensure threats to non-targets would be minimal. Similarly, 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.

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 effects to non-targets would be expected from the use of alpha chloralose.

Nicarbazin is not currently registered for use in New Jersey. Analysis of the nontarget species risks from nicarbazin are analyzed here so that WS may have access to this method in the event that this product becomes available at a future date. 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 man. 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 in 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 a 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. There is effectively no risk of secondary toxicity (http://www.innolyticsllc.com/new%20pigeon%20pages/pigeon_FAQ.html).

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 to 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 is 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.

A common concern regarding the use of DRC-1339 is the potential non-target risks. 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 placed is quickly consumed by target bird species, especially when large flocks of target species are present. The acclimation period allows treated bait to be present 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. 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})[11] values for starlings, blackbirds, and magpies (Corvidae) range 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.

[11] 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.

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 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).

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 suggests crows can travel up to 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, and (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.

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 New Jersey 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 NJDFW 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.

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 New Jersey 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. WS conducted an informal Section 7 consult with the USFWS in 2003 in which the USFWS concurred with WS' determinations. WS determined that activities conducted pursuant to the proposed action would not likely adversely affect those species listed in the state by the USFWS and the NMFS nor their critical habitats. Six species have been added to the T&E list since 2003: Eastern prairie fringed orchid (*Platanthera leucophaea*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), and the Kemp's ridley sea turtle (*Lepidochelys kempii*). The Eastern prairie fringed orchid is not believed to exist in New Jersey. Therefore, WS has made a "No Effect" determination for the orchid.

WS previously made a "May Affect, but Not likely to Adversely Affect" determination for the bog turtle (*Clemmys muhlenbergii*), Indiana bat (*Myotis sodalist*), piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii dougallii*), and listed T&E plants. WS activities that may affect these species have not substantially changed since 2003. Therefore, WS maintains its determination for these species. Similar to WS predator management that benefits plover nesting habitat, WS also conducts predator management near potential sea turtle nesting habitat. Although not intended to protect sea turtle nests, WS' predator removal projects could possibly benefit turtle nests in addition to shorebird nests. Therefore, WS has included the listed sea turtles in the "Not likely to Adversely Affect" determination. Due to updated information and the expansion of the WS program, a new Section 7 consultation was initiated with the USFWS. The USFWS concurred with WS' determinations in a letter dated March 23, 2014.

State Listed Species **–** The current list of species designated as endangered, threatened, or special concern by the state, as determined by the NJDFW, was obtained and reviewed during the development of the EA (see Appendix D). Based on the review of species listed, WS has determined that the proposed activities would not likely adversely affect those species currently listed by the state. The NJDFW concurs with WS' determination for state-listed species through issuance of depredation permits.

Based on the methods available to resolve bird damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take under the proposed action of non-targets will not cumulatively affect non-target species. WS' has reviewed the T&E species listed by the NJDFW, the USFWS, and the National Marine Fisheries Service and has determined that bird damage management activities proposed by WS would not likely adversely affect T&E species. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed.

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, 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. 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 E). Potential hazards and threats 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.

Beneficial Effects on Non-target Species: 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.

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 NJDFW, 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.

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).

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; thereby, making the cooperator aware of the use of those methods on property they own or manage to 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 would be similar to those risks addressed by the other alternatives.

Lethal methods available under the proposed action would include the use of firearms, DRC-1339, 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 NJDFW. 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 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 issue. 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. 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. Risks to human safety associated with the use or recommendation 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.

Mesurol contains the active ingredient methiocarb and is registered by the EPA for use to condition crows not to feed on the eggs of T&E species. Mesurol is currently not registered for use in New Jersey, but will be evaluated in this assessment as a repellent that could be employed under the proposed action if the product becomes available. Human safety risks associated with the use of mesurol occur primarily to the mixer and handler during preparation. WS' personnel would follow all label requirements, including the personal protective equipment required to handle and mix bait. When used according to label requirements, the risks to human safety from the use of mesurol would be minimal.

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 New Jersey 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 during the development of this assessment essentially occurred from mid-August –mid-March with no daily take (bag) limit or possession limit (NJDFW 2013*a*). 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). 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.

The recommendation by WS that birds be harvested during the regulated hunting season, which is established by the NJDFW 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 NJDFW 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.

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.

No adverse effects to human safety have occurred from WS' use of methods to alleviate bird damage from FY 2007 through FY 2012. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low. The amount of chemicals used or stored by WS and cooperating agencies would be minimal to ensure human safety. 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 New Jersey.

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. 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 a greater risks 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 impacts to humans and pets.

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.

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 NJDFW. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Non-chemical methods available to alleviate or prevent damage associated with birds generally do not pose risks to human safety. 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 risks to human safety. Habitat modification and harassment methods are also generally regarded as posing minimal risks 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 NJDFW. Firearms, when handled appropriately and with consideration for safety, pose minimal risks to human safety.

Similar to the technical assistance only alternative, DRC-1339, mesurol, and alpha chloralose would not be available under this alternative to those experiencing damage or threats from birds. 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.

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.

Since those birds removed by WS under this alternative could be removed with a depredation permit issued by the USFWS, 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 2007 through FY 2012 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 would not adversely affect the aesthetic value of 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 low.

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.

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. 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 effects would then be similar to the Proposed Action Alternative.

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 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 bird damage management 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 any agency 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, 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. The potential impacts 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 NJDFW, then no 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 NJDFW with management authority over birds 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 NJDFW. The impacts to the aesthetic value of birds would be similar to the other alternatives.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

As discussed previously, a common issue often raised is concern about the humaneness of methods available under the alternatives for resolving bird damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

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

BDM methods viewed by some persons as inhumane would be employed by WS under this alternative. These methods would include shooting, trapping, toxicants, and repellents. Despite SOPs designed to maximize humaneness, the perceived stress and trauma associated with being held in a trap until the WS employee arrives at the capture site to dispatch or release the animal is unacceptable to some persons. Other BDM methods used to take target animals including shooting result in a relatively humane death because the animals die instantly or within seconds to a few minutes. These methods, however, are also considered inhumane by some individuals. WS' use of euthanasia methods under the proposed action would follow those required by WS' directives (WS Directive 2.430, WS Directive 2.505) and recommended by the AVMA for use on free-ranging wildlife under field conditions (AVMA 2013).

WS may use EPA registered and approved chemicals to manage damage. Some individuals consider the use of such chemicals to be inhumane. WS personnel are experienced, professional and humane in their use of management methods. Under this alternative, birds would be killed by experienced WS personnel using the best and most appropriate method(s) available.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some BDM methods are used in situations where non-lethal damage management methods are not practical or effective. If birds are to be live-captured by WS, WS' personnel would be present on-site during capture events or methods would be checked frequently to ensure birds captured are addressed timely and to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

The euthanasia methods being considered for use under the proposed action for live-captured birds are cervical dislocation and carbon dioxide. The AVMA guidelines on euthanasia list cervical dislocation and carbon dioxide as acceptable methods of euthanasia for free-ranging birds, which can lead to a humane death (AVMA 2013). The use of cervical dislocation or carbon dioxide for euthanasia would occur after the animal has been live-captured and away from public view. Although the AVMA guidelines also list gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (AVMA 2013). WS' personnel that employ firearms to address bird damage or threats to human safety would be trained in the proper placement of shots to ensure a timely and quick death.

Although the mode of action of DRC-1339 is not well understood, it appears to cause death primarily by nephrotoxicity in susceptible species and by central nervous system depression in non-susceptible species (DeCino et al. 1966, Westberg 1969, Schafer, Jr. 1984). DRC-1339 causes irreversible necrosis of the kidney and the affected bird is subsequently unable to excrete uric acid with death occurring from uremic poisoning and congestion of major organs (DeCino et al. 1966, Knittle et al. 1990). The external appearances and behavior of starlings that ingested DRC-1339 slightly above the LD_{50} for starlings appeared normal for 20 to 30 hours, but water consumption doubled after four to eight hours and decreased thereafter. Food consumption remained fairly constant until about four hours before death, at which time starlings refused food and water and became listless and inactive. The birds perched with feathers fluffed as in cold weather and appeared to doze, but were responsive to external stimuli. As death nears, breathing increased slightly in rate and became more difficult; the birds no longer responded to external stimuli and became comatose. Death followed shortly thereafter without convulsions or spasms (DeCino et al. 1966). Birds ingesting a lethal dose of DRC-1339 become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes, which are primarily disease, starvation, and predation. DRC-1339 is the only lethal method that would not be available to other entities under the other alternatives. DRC-1339 to manage damage caused by birds is only available to WS' personnel for use.

The chemical repellent under the trade name, Avitrol, acts as a dispersing agent when birds ingest treated particles causing them to become hyperactive, which elicits a flight response by other members of a flock (see discussion in Appendix B). Their distress calls generally alarm the other birds and cause them to leave the site. Only a small number of birds need to be affected to cause alarm in the rest of the flock. The affected birds generally die. In most cases where Avitrol is used, only a small percentage of the birds are affected and killed by the chemical with the rest being dispersed. In experiments to determine suffering, stress, or pain in affected animals, Rowsell et al. (1979) tested Avitrol on pigeons and observed subjects for clinical, pathological, or neural changes indicative of pain or distress but none were observed. Conclusions of the study were that the chemical met the criteria for a humane pesticide.

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

Alpha-chloralose is used by WS as a sedative to live-capture geese and other waterfowl. When using alpha chloralose, WS' personnel would be present on site to retrieve birds that become sedated. Some concern occurs that waterfowl may drown if sedation occurs while they are loafing on water. WS would ensure that a boat and/or a canoe were available for quick retrieval of birds that become sedated while in the water.

Since the majority of methods available to WS are still available to the public, WS' use of these methods would not be additive and cause cumulative adverse impacts to the environment.

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

The issue of humaneness of methods under this alternative is likely to be perceived as similar to humaneness issues discussed under the proposed action. Generally, non-lethal methods are considered humane. The humaneness of non-lethal methods would be similar as analyzed under Alternative 1.

Similar to Alternative 3, it is difficult to evaluate the behavior of individual people and what may occur if individuals implement BDM strategies themselves. If those persons apply methods as intended, then those methods would be applied as humanely as possible to minimize pain and distress. If those persons apply methods not as intended or without regard for humaneness, then the issue of method humaneness would be of greater concern since pain and distress of birds would likely be higher.

Alternative 3 – No Bird Damage Management Conducted by WS

Those persons experiencing damage or threats associated with birds could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods. A method considered inhumane would still be perceived as inhumane regardless of the person or entity applying the method. However, even methods generally regarded as being a humane method could be employed in inhumane ways if used by those persons inexperienced in the use of those methods or if those persons are not as diligent in attending to those methods.

The efficacy, and therefore, the humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to resolve damage and threats caused by birds. Therefore, those methods considered inhumane would continue to be available for use under this alternative. If those persons experiencing bird damage apply those methods considered to be humane methods as intended and in consideration of the humane use of those methods, then the issue of method humaneness would be similar across the alternatives. If persons employ humane methods in ways that are inhumane, the issue of method humaneness could be greater under this alternative if those persons experiencing bird damage are not provided with information and demonstration on the proper use of those methods. However, the level at which people would apply humane methods inhumanely under this alternative based on a lack of assistance is difficult to determine and could just as likely be similar across the alternatives.

Issue 6 - Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

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 in the state by the NJDFW. Those species addressed in this EA that have established hunting seasons include: Canada geese, snow geese, Atlantic brants, wood ducks, gadwall, Eurasian wigeons, American wigeons, American black ducks, mallards, Northern shovelers, Northern pintails, canvasbacks, redheads, ring-necked ducks, blue-winged teal, green-winged teal, greater scaup, lesser scaup, king eiders, common eiders, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, ring-necked pheasants, wild turkeys, Northern bobwhite, common Moorhens, American coots, American woodcocks, American crows, and fish crows. 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 NJDFW in published reports.

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

The magnitude of take of birds addressed in the proposed action would be low when compared to the mortality of those species from all known sources. When WS' proposed take of those bird species considered harvestable was included as part of the known mortality of those species and compared to the estimated populations of those species, the impact on those species' population was below the level of removal required to lower population levels.

With oversight of bird populations by the USFWS and the NJDFW, the number of birds that could be taken by WS would not limit the ability of those persons interested to harvest those bird species during the regulated season. All take by WS would be reported to the USFWS and the NJDFW annually to ensure take by WS is incorporated into cumulative population management objectives established for bird populations. Based on the limited take proposed by WS and the oversight of by the USFWS and the NJDFW, WS' take of birds annually under the proposed action would have no effect on the ability of those persons interested to harvest birds during the regulated harvest season.

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

Under this alternative, WS would have no direct impact on bird populations except for possibly dispersing birds from mostly non-huntable sites, such as airports. The use of non-lethal methods are likely to disperse birds from the damage area to areas outside the damage area, which could serve to move those birds from those less accessible areas to places accessible to hunters. Although lethal methods could be conducted by other entities, the use of those methods could only occur after the property owner or manager received a depredation permit from the USFWS, under depredation/control orders, or take could occur during the regulated hunting season. Therefore, shooting or hunting by non-WS entities under this alternative would not limit the ability of those persons interested in harvesting birds during the regulated season since the USFWS and NJDFW determine the number of birds that may be taken during the hunting season, under depredation permits, under depredation orders, and under control orders.

Alternative 3 – No Bird Damage Management Conducted by WS

WS would have no impact on the ability to harvest birds under this alternative. WS would not be involved with any aspect of bird damage management. The USFWS and the NJDFW would continue to regulate populations through adjustments of the allowed take during the regulated harvest season and the continued use of depredation orders and depredation permits.

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

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

Under the selected Alternative, WS would continue address damage associated with birds in situations throughout the state. The New Jersey WS bird damage management program is the primary federal program with bird damage management responsibilities; however, some state and local government agencies may conduct bird damage management activities in New Jersey as well. Through ongoing coordination and cooperation with the USFWS and the NJDFW, WS is aware of other bird damage management activities and may provide technical assistance in such efforts. WS does not normally

conduct operational damage management activities concurrent with other agencies in the same area, but may conduct bird damage management activities at adjacent sites within the same time frame. In addition, commercial pest control companies may conduct bird damage management activities in the same area. The potential cumulative impacts analyzed in this EA could occur either as a result of WS bird damage management, or as a result of the effects of other agencies and individuals. Those activities and the birds removed are tracked by the USFWS and the NJDFW through their permitting system to insure no long-term cumulative adverse effects on bird populations. The USFWS reviews annually the take of migratory birds under standard conditions of DPs (50 CFR 21.41) and has the ability to determine if the cumulative effects of all take under depredation permits may be negatively affecting a species.

Cumulative Impacts on Wildlife Populations

Evaluation of WS' activities relative to wildlife populations indicated that program activities will likely have no cumulative adverse effects on populations in New Jersey. WS' actions would be occurring simultaneously, over time, with other natural processes and human-generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of wildlife
- Human-induced mortality through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in population densities

All those factors play a role in the dynamics of wildlife populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. WS' actions taken to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of minimizing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the dynamics of the damaging species; determines appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

No cumulative adverse impacts on wildlife populations are expected from WS' actions based on the following considerations:

Historical outcomes of WS' programs on wildlife
No cumulative adverse effects have been identified for wildlife as a result of program activities implemented over time based on analyses contained in the EA, from annual monitoring reports, or from analyses contained in the proposed supplement. WS continues to implement an integrated damage management program that adapts to the damage situation and the species involved with causing the damage. WS only targets wildlife causing damage and only after a request for assistance is received. All program activities are coordinated with appropriate federal, state, and local entities to ensure WS' activities do not adversely impact the populations of any native wildlife species.

In the past several years, the number of species and the total number of bird species addressed by WS has increased annually which provides some indication that WS' activities are not cumulatively impacting populations. WS continues to implement an integrated program that employs primarily non-lethal dispersal and harassment methods. WS will continue to provide technical assistance to those persons requesting assistance to identify and alleviate damage.

SOPs built into WS' program
SOPs are designed to reduce the potential negative effects of WS' actions on wildlife, and are tailored to respond to changes in wildlife populations which could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in program activities are defined through SOPs, and implementation is insured through monitoring, in accordance with WS' Decision Model (Slate et al. 1992).

Migratory Bird Treaty Act, as amended
The Migratory Bird Treaty Act, as amended, places the protection of all bird species designated under the Act under the management authority of the USFWS. All take for damage management purposes is authorized by permit or order pursuant to the Act issued by the USFWS. Oversight of the allowed take of bird species by the USFWS ensures cumulative impacts are considered and addressed when determining the allowable take of bird species to ensure the viability of a population. The allowed take, including cumulative take, is analyzed and determine by the USFWS prior to the issuance of permits under the Act. Therefore, WS' allowed take, as authorized by the USFWS by permit, should not reach a level where cumulative take would adversely impact bird populations.

Summary of 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 New Jersey 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 with the included supplemental actions 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 bird damage management program would not result in significant cumulative adverse 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 and Masake 1983, Schmidt and Johnson 1984, Mott 1985, Graves and Andelt 1987, 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 (Johnson 1994). 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) (Johnson 1994). 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 and Masake 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 et al. 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.

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. 1981, Holler and Shafer 1982).

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 (Dolbeer et al. 1993). 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. 1984, 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[12]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[13]), 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 (Dolbeer et al. 1992). It has been listed as "*Generally Recognized as Safe*" by the U.S. Food and Drug Administration (Dolbeer et al. 1992).

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 (Vogt 1997). 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.

Mesurol was recently registered by WS to repel crows and ravens from bird nests of T&E species. It could be used by WS only as a bird repellent to deter predation by crows on eggs of threatened or endangered species. Dimmick and Nicolaus (1990) showed breeding pairs of crows could be conditioned with aversive chemicals to avoid eggs. However, Avery and Decker (1994) observed increased consumption of eggs treated with higher doses of Mesurol by fish crows. Sullivan and Dinsmore (1990) reported bird nests greater than 700 meters from crow nests were relatively safe from crow predation, thus nests beyond 700 meters from active crow nests may not need to be treated.

WS would treat eggs similar in appearance as those eggs of the species needing protection. The active ingredient is injected into eggs, which are placed in artificial nests or upon elevated platforms. Upon ingestion, crows develop post-ingestional malaise (Mason 1989) and subsequently develop an aversion to consuming similar-looking eggs (Dimmick and Nicolaus 1990). Repeated exposures may be necessary to develop and maintain aversion to eggs of T&E species as the learning curve for crows can take from 23 days to 3 months (Dimmick and Nicolaus 1990, Avery and Decker 1994).

Treated areas will be posted with warning signs at access points to exclude people from T&E species nesting areas. Treated eggs are not placed in locations where T&Especies may eat the treated eggs. Mesurol is highly toxic to birds and mammals and toxic to fish. It is also highly toxic to honey bees.

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 (Avery et al. 1997). It has also shown effectiveness as a foraging

[12]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.
[13]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.

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 (Mason and Clark 1992). 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 1998, 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 (Cramp and Simmons 1977) 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 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 NJDFW 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 and the Clemson University Department of Pesticide Regulation). WS' personnel that use restricted-use chemical methods are certified as pesticide applicators by the State of New Jersey and are required to adhere to all certification requirements set forth in FIFRA and New Jersey 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. 1981). 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.

APPENDIX C

USFWS Listing of Threatened and Endangered Species in New Jersey

Summary of Animals listings

Animal species listed in this state and that occur in this state (13 species)	
Status	**Species**
E	Bat, Indiana Entire (*Myotis sodalis*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Sea turtle, hawksbill Entire (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley Entire (*Lepidochelys kempii*)
E	Sea turtle, leatherback Entire (*Dermochelys coriacea*)
E	Sturgeon, shortnose Entire (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
T	Tiger beetle, Northeastern beach Entire (*Cicindela dorsalis dorsalis*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf Entire (*Alasmidonta heterodon*)
E	Whale, finback Entire (*Balaenoptera physalus*)
E	Whale, humpback Entire (*Megaptera novaeangliae*)
E	Whale, North Atlantic Right Entire (*Eubalaena glacialis*)

Animal species listed in this state that do not occur in this state (4 species)	
Status	**Species**
E	Beetle, American burying Entire (*Nicrophorus americanus*)
E	Butterfly, Mitchell's satyr Entire (*Neonympha mitchellii mitchellii*)
E	Puma (=cougar), eastern Entire (*Puma (=Felis) concolor couguar*)
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*)

Animal listed species occurring in this state that are not listed in this state (1 species)	
Status	**Species**
T	Sea turtle, green except where endangered (*Chelonia mydas*)

Summary of Plant listings

Plant species listed in this state and that occur in this state (6 species)

Status	Species
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Beaked-rush, Knieskern's (*Rhynchospora knieskernii*)
E	Chaffseed, American (*Schwalbea americana*)
T	Joint-vetch, Sensitive (*Aeschynomene virginica*)
T	Pink, swamp (*Helonias bullata*)
T	Pogonia, small whorled (*Isotria medeoloides*)

Plant species listed in this state that do not occur in this state (1 species)

Status	Species
T	Orchid, eastern prairie fringed (*Platanthera leucophaea*)

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.
- Click on the highlighted scientific names below to view a Species Profile for each listing.

Obtained from the USFWS website at http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=NJ&s8fid=112761032792&s8fid=112762573902 on 12/6/13.

APPENDIX D

NJDFW Listing of Endangered and Threatened Wildlife Species in New Jersey

BIRDS			
Endangered		**Threatened**	
Bittern, American BR	*Botaurus lentiginosos* BR	Bobolink BR	*Dolichonyx oryzivorus* BR
Eagle, bald BR	*Haliaeetus leucocephalus* BR	Eagle, bald NB	*Haliaeetus leucocephalus* NB
Falcon, peregrine BR	*Falco peregrinus* BR	Egret, cattle BR	*Bubulcus ibis* BR
Goshawk, northern BR	*Accipiter gentilis* BR	Kestrel, American	*Falco sparverius*
Grebe, pied-billed BR	*Podilymbus podiceps* BR	Lark, horned BR	*Eremophila alpestris* BR
Harrier, northern BR	*Circus cyaneus* BR	Night-heron, black-crowned BR	*Nycticorax nycticorax* BR
Hawk, red-shouldered BR	*Buteo lineatus* BR	Night-heron, yellow-crowned	*Nyctanassa violacea*
Knot, red NB	*Calidris canutus* NB	Osprey BR	*Pandion haliaetus* BR
Owl, short-eared BR	*Asio flammeus* BR	Owl, barred	*Strix varia*
Plover, piping**	*Charadrius melodus***	Owl, long-eared	*Asio otus*
Rail, black BR	*Laterallus jamaicensis* BR	Rail, black NB	*Laterallus jamaicensis* NB
Sandpiper, upland	*Batramia longicauda*	Sparrow, grasshopper BR	*Ammodramus savannarum* BR
Shrike, loggerhead NB	*Lanius ludovicianus* NB	Sparrow, Savannah BR	*Passerculus sandwichensis* BR
Skimmer, black	*Rynchops niger*	Woodpecker, red-headed	*Melanerpes erythrocephalus*
Sparrow, Henslow's	*Ammodramus henslowii*		
Sparrow, vesper BR	*Pooecetes gramineus* BR		
Tern, least	*Sternula antillarum*		
Tern, roseate**	*Sterna dougallii***		
Warbler, golden-winged BR	*Vermivora chrysoptera* BR		
Wren, sedge	*Cistothorus platensis*		
**Federally endangered or threatened			
BR - Breeding population only; NB - non-breeding population only			

REPTILES			
Endangered		**Threatened**	
Rattlesnake, timber	*Crotalus h. horridus*	Snake, northern pine	*Pituophis m. melanoleucus*
Snake, corn	*Elaphe g. guttata*	Turtle, Atlantic green**	*Chelonia mydas***
Snake, queen	*Regina septemvittata*	Turtle, wood	*Glyptemys insculpta*
Turtle, bog**	*Glyptemys muhlenbergii***		
Hawksbill, Atlantic**	*Eretmochelys imbricata***		
Leatherback, Atlantic **	*Dermochelys coriacea***		
Loggerhead, Atlantic **	*Caretta caretta***		
Ridley, Atlantic **	*Lepidochelys kempii***		
**Federally endangered or threatened			

AMPHIBIANS			
Endangered		**Threatened**	
Salamander, blue-spotted	*Ambystoma laterale*	Salamander, eastern mud	*Pseudotriton montanus*
Salamander, eastern tiger	*Ambystoma tigrinum*	Salamander, long-tailed	*Eurycea longicauda*
Treefrog, southern gray	*Hyla chrysocelis*	Treefrog, pine barrens	*Hyla andersonii*

INVERTEBRATES			
Endangered		**Threatened**	
Beetle, American burying**	*Nicrophorus americanus***	Baskettail, robust(dragonfly)	*Epitheca spinosa*
Beetle, northeastern beach tiger**	*Cincindela d. dorsalis***	Clubtail, banner (dragonfly)	*Gomphus apomyius*
Copper, bronze	*Lycaena hyllus*	Clubtail, harpoon (dragonfly)	*Gomphus descriptus*
Floater, brook (mussel)	*Alasmidonta varicosa*	Elfin, frosted (butterfly)	*Callophrys irus*
Floater, green (mussel)	*Lasmigona subviridis*	Emerald, Kennedy's (dragonfly)	*Somatochlora kennedyi*
Petaltail, gray (dragonfly)	*Tachopteryx thoreyi*	Floater, triangle (mussel)	*Alasmidonta undulata*
Satyr, Mitchell's (butterfly)**	*Neonympha m. mitchellii***	Fritillary, silver-bordered (butterfly)	*Bolaria selene myrina*
Skipper, arogos (butterfly)	*Atrytone arogos arogos*	Jewelwing, superb (dragonfly)	*Calopteryx amata*
Skipper, Appalachian grizzled (butterfly)	*Pyrgus wyandot*	Lampmussel, eastern (mussel)	*Lampsilis radiata*
Wedgemussel, dwarf**	*Alasmidonta heterodon***	Lampmussel, yellow (mussel)	*Lampsilis cariosa*
		Mucket, tidewater (mussel)	*Leptodea ochracea*

	Pondmussel, eastern (mussel)	*Ligumia nasuta*
	Snaketail, brook, (dragonfly)	*Ophiogomphus asperses*
	White, checkered (butterfly)	*Pontia protodice*
**Federally endangered or threatened		

MAMMALS	
Endangered	
Bat, Indiana**	*Myotis sodalis***
Bobcat	*Lynx rufus*
Whale, North Atlantic right**	*Eubalaena glacialis***
Whale, blue**	*Balaenoptera musculus***
Whale, fin**	*Balaenoptera physalus***
Whale, humpback**	*Megaptera novaeangliae***
Whale, sei**	*Balaenoptera borealis***
Whale,sperm**	*Physeter macrocephalus***
Woodrat, Allegheny	*Neotoma magister*
**Federally Endangered	

FISH	
Endangered	
Sturgeon, Atlantic**	*Acipenser oxyrinchus oxyrinchus***
Sturgeon, shortnose**	*Acipenser brevirostrum***
**Federally Endangered	

Obtained from NJDFW, Endangered and Nongame Species Program website at http://www.state.nj.us/dep/fgw/tandespp.htm on 12/6/13.

NJ Endangered and Nongame Species Program
Special Concern – Species Status Listing

Bird Species	Breeding Status	Non-breeding Status
American Bittern (*Botaurus lentiginosus*)	Endangered	Special Concern
American Oystercatcher (*Haematopus palliatus*)	Special Concern	Special Concern
Barn Owl (*Tyto alba*)	Special Concern	Special Concern
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	Special Concern	Stable
Blackburnian Warbler (*Dendroica fusca*)	Special Concern	Stable
Black-crowned Night-heron (Nycticorax nycticorax)	Threatened	Special Concern
Black-throated Blue Warbler (Dendroica caerulescens)	Special Concern	Stable
Black-throated Green Warbler (Dendroica virens)	Special Concern	Stable
Blue-headed Vireo (Vireo solitarius)	Special Concern	Stable
Bobolink (Dolichonyx oryzivorus)	Threatened	Special Concern
Broad-winged Hawk (Buteo platypterus)	Special Concern	Stable
Brown Thrasher (Toxostoma rufum)	Special Concern	Stable
Canada Warbler (Wilsonia canadensis)	Special Concern	Stable

Caspian Tern (Hydroprogne caspia)	Special Concern	Stable
Cattle Egret (Bubulcus ibis)	Threatened	Special Concern
Cerulean Warbler (Dendroica cerulea)	Special Concern	Special Concern
Cliff Swallow (Petrochelidon pyrrhonota)	Special Concern	Stable
Common Nighthawk (Chordeiles minor)	Special Concern	Special Concern
Common Tern (Sterna hirundo)	Special Concern	Stable
Cooper's Hawk (Accipiter cooperii)	Special Concern	Stable
Eastern Meadowlark (Sturnella magna)	Special Concern	Special Concern
Glossy Ibis (Plegadis falcinellus)	Special Concern	Stable
Golden-winged Warbler (Vermivora chrysoptera)	Endangered	Special Concern
Grasshopper Sparrow (Ammodramus savannarum)	Threatened	Special Concern
Gray-cheeked Thrush (Catharus minimus)	N/A	Special Concern
Great Blue Heron (Ardea herodias)	Special Concern	Stable
Gull-billed Tern (Gelochelidon nilotica)	Special Concern	Special Concern
Hooded Warbler (Wilsonia citrina)	Special Concern	Stable
Horned Lark (Eremophila alpestris)	Threatened	Special Concern
Ipswich Sparrow (Passerculus sandwichensis princeps)	N/A	Special Concern
Kentucky Warbler (Oporornis formosus)	Special Concern	Special Concern
Least Bittern (Ixobrychus exilis)	Special Concern	Special Concern
Least Flycatcher (Empidonax minimus)	Special Concern	Stable
Little Blue Heron (Egretta caerulea)	Special Concern	Special Concern
Nashville Warbler (Oreothlypis ruficapilla)	Special Concern	Stable
Northern Goshawk (Accipiter gentilis)	Endangered	Special Concern
Northern Harrier (Circus cyaneus)	Endangered	Special Concern
Northern Parula (Parula americana)	Special Concern	Stable
Peregrine Falcon (Falco peregrinus)	Endangered	Special Concern
Pied-billed Grebe (Podilymbus podiceps)	Endangered	Special Concern
Red-shouldered Hawk (Buteo lineatus)	Endangered	Special Concern
Saltmarsh Sparrow (Ammodramus caudacutus)	Special Concern	Stable
Sanderling (Calidris alba)	N/A	Special Concern
Semipalmated Sandpiper (Calidris pusilla)	N/A	Special Concern
Sharp-shinned Hawk (Accipiter striatus)	Special Concern	Special Concern
Short-eared Owl (Asio flammeus)	Endangered	Special Concern
Snowy Egret (*Egretta thula*)	Special Concern	Stable
Spotted Sandpiper (*Actitis macularius*)	Special Concern	Stable
Tricolored Heron (*Egretta tricolor*)	Special Concern	Special Concern
Veery (*Catharus fuscescens*)	Special Concern	Stable
Vesper Sparrow (*Pooecetes gramineus*)	Endangered	Special Concern
Whimbrel (*Numenius phaeopus*)	N/A	Special Concern
Whip-poor-will (*Caprimulgus vociferus*)	Special Concern	Undetermined
Winter Wren (*Troglodytes hiemalis*)	Special Concern	Stable
Wood Thrush (*Hylocichla mustelina*)	Special Concern	Stable
Worm-eating Warbler (*Helmitheros vermivorum*)	Special Concern	Stable
Yellow-breasted Chat (*Icteria virens*)	Special Concern	Stable

Reptile and Amphibian Species
Eastern Box Turtle (*Terrapene carolina carolina*)
Eastern King Snake (*Lampropeltis getula getula*)
Northern Copperhead Snake (*Agkistrodon contortrix mokasen*)
Spotted Turtle (*Clemmys guttata*)
Carpenter Frog (*Lithobates virgatipes*)
Fowlers Toad (*Anaxyrus fowleri*)
Jefferson Salamander (*Ambystoma jeffersonianum*)
Marbled Salamander (*Ambystoma opacum*)
Northern Spring Salamander (*Gyrinophilus porphyriticus porphyriticus*)

Invertebrate Species
Allegheny River Cruiser (*Macromia alleghaniensis*) – dragonfly
Arrowhead Spiketail (*Cordulegaster obliqua*) – dragonfly
Brush-tipped Emerald (*Somatochlora walshii*) – dragonfly
Cobra Clubtail (*Gomphus vastus*) – dragonfly
Coppery Emerald (*Somatochlora georgiana*) – dragonfly
Creeper (*Strophitus undulatus*) - mussel
Crimson-ringed Whiteface (*Leucorrhinia glacialis*) – dragonfly
Dotted Skipper (*Hesperia attalus slossonae*) – butterfly
Extra-striped Snaketail (*Ophiogomphus anomalus*) – dragonfly
Forcipate Emerald (*Somatochlora forcipata*) – dragonfly
Georgia Satyr (*Neonympha areolatus septentrionalis*) – butterfly
Golden-winged Skimmer (*Libellula auripennis*) – dragonfly
Green-faced Clubtail (*Gomphus viridifrons*) – dragonfly
Harris' Checkerspot (*Chlosyne harrisii*) – butterfly
Hessel's Hairstreak (*Callophrys hesseli*) – butterfly
Hoary Elfin (*Callophrys polios*) – butterfly
Hudsonian Whiteface (*Leucorrhinia hudsonica*) – dragonfly
Leonard's Skipper (*Hesperia leonardus*) - butterfly
Maine Snaketail (*Ophiogomphus mainensis*) – dragonfly
Midland Clubtail (*Gomphus fraternus*) – dragonfly
New England Bluet (*Enallagma laterale*) – dragonfly
Northern Metalmark (*Calephelis borealis*) – butterfly
Pine Barrens Bluet (*Enallagma recurvatum*) – dragonfly
Rapids Clubtail (*Gomphus quadricolor*) – dragonfly
Sable Clubtail (*Gomphus rogersi*) – dragonfly
Scarlet Bluet (*Enallagma pictum*) – dragonfly
Septima's Clubtail (*Gomphus septima*) – dragonfly
Ski-tailed Emerald (*Somatochlora elongata*) – dragonfly
Spatterdock Darner (*Rhionaeschna mutata*) – dragonfly
Subarctic Darner (*Aeshna subarctica*) – dragonfly
Tiger Spiketail (*Cordulegaster erronea*) – dragonfly
Two-spotted Skipper (*Euphyes bimacula*) – butterfly
Williamson's Emerald (*Somatochlora williamsoni*) – dragonfly
Zebra Clubtail (*Stylurus scudderi*) – dragonfly

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